

Regional Science Inquiry



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Editorial Note

In the second semester of 2021, where the global society shares an evident optimism towards an ending to the fight against the COVID-19 pandemic, the Regional Science Inquiry Journal (RSIJ), which is published under the aegis of the Hellenic Association of Regional Scientists, launches its second issue (2) of the thirteenth volume (Vol. XIII) since the first day it was published. Being consistent with its main purpose, to freely promote the academic dialogue on Regional Science worldwide, this issue (RSIJ, Vol. XIII, (2), 2021) consists of twenty-three papers dealing with several modern and important aspects of Regional research. Such topics concern (but are not restricted to) labor taxation and investment; cohesion policy; development and convergence; economic integration; overcoming the COVID-19 pandemic; teleworking and digitalization; budget capacity; insurance-economic growth; maritime economy; national policy, regional development, and disparities; climate, marketing, and rural development; cities interconnectedness; marketing efficiency; energy crisis and regional development; sustainable tourism development and marketing; institutions, resources, and development; and apply to a broad range of administrative and geographical scales (European Union, Balkan countries, ASEAN countries, D8 countries, Russian Federation, Republic of Kazakhstan, Indonesia, and Greece), social or religious spaces (Developed Countries, Jewry), and periods (from last century until today).

The Editor in Chief, Prof. Christos Ap. Ladas, the Editorial Board, and the signatory of this Editorial welcome the reader to the multidisciplinary journey of Regional Science that the current issue of RSIJ promises to conduct on its following pages.

In brief, the first paper entitled “LABOR TAXATION AND INVESTMENT IN DEVELOPED COUNTRIES: THE IMPACT ON EMPLOYMENT”, authored by Michael MITSOPOULOS and Theodore PELAGIDIS, study the impact of taxation on labor and exactly how taxation influences growth, the choice between work and leisure, and share of income attributed to labor or participation in different job market segments. The analysis builds on data concerning employment levels using the results of the World Economic Forum (WEF) executive opinion survey (EOS), between 2013-2017, and provides insights into the impact of taxation on labor and employment.

The second paper entitled “MACROECONOMIC EFFECTS OF TELEWORKING IN EU27: STOCHASTIC FRONTIER APPROACH”, by Lena MALEŠEVIĆ PEROVIĆ, investigates the macroeconomic effects of teleworking during the COVID-19 pandemic, using an atypical approach. The analysis concludes that increasing the percentage of jobs that can be done at home reduces the level of technical inefficiency. Additionally, by using a unique e-survey, the paper studies the share of people who started working from home due to COVID-19 in conjunction with the teleworkability variable, and unveils that the more developed EU countries have a higher share of teleworkable jobs.

The third paper entitled “TOOLS AND TESTING OF THE ASSESSMENT OF BUDGET CAPACITY OF THE MUNICIPAL LEVEL (CASE STUDY OF THE RUSSIAN FEDERATION)”, by Mariya PECHENSKAYA-POLISHCHUK, develops an integral index for assessing the budget capacity level of municipalities, facilitating to substantiate the choice of a model of financial support for the functioning of local budgets. The results show that the budget capacity of most municipalities in the period 2006-2018 was at the average and below-average level and revealed the prevalence of the fourth-type model of financial support for the settlement network, i.e. a differentiated approach depending on the indicator of budgetary provision of settlements.

The fourth paper entitled “INSURANCE-ECONOMIC GROWTH NEXUS – EVIDENCE FROM SELECTED WESTERN BALKAN’S COUNTRIES”, authored by Gentiana SHARKU and Etleva BAJRAMI, examines, through the use of indicators and multiple regression analysis, the impact of the insurance industry on the economic growth of emerging countries, focusing on the case of the Western Balkan’s countries. The analysis explores first whether the insurance market has a positive or negative effect on the economic growth of developing countries; secondly which of the insurance indicators explains better the impact – insurance penetration or density indicator; and lastly which of insurance activities has the largest effect on economic development: total, life or non-life insurance.

The fifth paper entitled “THE EUROPEAN RESPONSE TO OPEN SHIP REGISTRIES AND FLAGS OF CONVENIENCE THROUGH THE CREATION OF OFFSHORE AND INTERNATIONAL SHIP REGISTRIES”, authored by Panagiotis SAVIOLAKIS and Michalis PAZARZIS, applies a multi-layered assessment of the key features of the Offshore and International Ship Registers to study the different forms of the European response to the challenge of the Open Ship Registries and the Flags of Convenience. The study provides insights into the specialization in the shipping policies implemented by the European countries and their comparison, concerning important business characteristics, such as the type of vessel, the geographical area of business activity, and the tax regime.

The sixth paper entitled “STRATEGIC PRIORITIES OF THE NATIONAL POLICY OF THE REPUBLIC OF KAZAKHSTAN ON THE DEVELOPMENT OF REGIONS”, authored by Toleu PANIYAZ, Kargash ZHANPEISSOVA, Oralbay KABUL, and Aigul AMANTAYEVA identifies strategic priorities for the regional development of the Republic of Kazakhstan on the example of the Kostanay region and verifies the connection between regional development within the country and world geopolitics, demonstrates the main issues and opportunities of economic development in various regions of Kazakhstan and proposes measures for the labor market modernization as the main priority of effective economic development.

The seventh paper entitled “TRENDS, PROBLEMS, AND MECHANISMS OF THE DEVELOPMENT OF NORTHERN RURAL TERRITORIES IN THE EUROPEAN RUSSIA”, authored by Nikolai VOROSHILOV, studies the socioeconomic development of the Russian Federation’s rural territories and subjects, situated in Russia’s European North. The analysis reveals that the key problems of territorial development are unfavorable demographics, proposes a typology of rural territories according to rural population size, periphery, and their economic specialization, and reveals that the territories adjacent to large and major towns, as well as ones having agro-industrial and extractive specialization, are developed the most.

The eighth paper entitled “EFFECTS OF CLIMATIC FACTORS ON THE PRODUCTIVITY OF SMALLHOLDER RUBBER PLANTATIONS IN SOUTH SUMATRA, INDONESIA”, authored by Imade Yoga PRASADA, Aura DHAMIRA, and Agus Dwi NUGROHO, studies the climatic factors that affect the productivity of smallholder rubber plantations in South Sumatra, on data from January 2006 to December 2019, by using a quadratic regression model. The results show that maximum temperature, mean temperature, minimum temperature, and rainfall, affect the productivity of smallholder rubber plantations.

The ninth paper entitled “ASSESSMENT OF THE INTERCONNECTEDNESS OF CITIES IN THE RUSSIAN FAR EAST”, by Inna MANAEVA, Anna TKACHEVA, Elena CHENTSOVA, and Elena ILYICHEVA, determines the features of the interconnectedness of cities in the Russian Far East using the Moran index. The analysis allows determining the type (direct and reverse) and the strength of inter-territorial relations according to the considered parameters, develops theoretical and methodological provisions concerning the assessment of spatial inter-territorial relations, and provides addresses of further research towards the direction of studying autocorrelation in dynamics, expanding the analyzed indicators, and identifying spatial and temporal shifts, for a deeper understanding of the patterns of the spatial development of the city.

The tenth paper entitled “PRODUCTION AND MARKETING EFFICIENCY OF PATCHOULI OIL INDUSTRY IN INDONESIA”, authored by E. ERNAWATI, Raja MASBAR, and M. Shabri Abd. MAJID empirically measures and analyses, by using the Data Envelopment Analysis (DEA) approach, the production, and marketing efficiency of the patchouli oil industry in Aceh, Indonesia. The study uses primary data collected from 120 patchouli farmers and shows that, on average, the patchouli oil production and marketing efficiency levels were in the moderate-efficient and the low-efficient categories, respectively, and reveals the opportunities of the patchouli farmers to improve their production and marketing efficiency by optimizing the use of proper inputs' combinations and agricultural intensification technologies.

The eleventh paper entitled “DIVERSIFICATION OF STRUCTURAL AND CRISIS RISKS IN THE ENERGY SECTOR OF THE ASEAN MEMBER COUNTRIES”, authored by Oleg ANDREEV, Oksana LOMAKINA, and Ariadna ALEKSANDROVA, assesses the alternatives to the diversification of energy carriers in the ASEAN member countries, in the context of minimizing the risks associated with the creation of an energy portfolio. The analysis shows that Indonesia is the leader in the production of energy from traditional energy sources, while Thailand has the most developed energy production from renewable energy sources. It also shows an increase in the level of diversification of the energy sector in all countries being under consideration.

The twelfth paper entitled “BALI AND THE NEXT PROPOSED TOURISM DEVELOPMENT MODEL IN INDONESIA”, by Setiawan PRIATMOKO, Moaaz KABIL, habil. Róbert MAGDA, Edit PALLAS, and Lóránt Dénes DAVID, examines the macro-environmental factors of tourism in Indonesia related to Bali as a development model. The study provides insights into tourism planning and development issues and proposes a mixed-method analysis as a tool for future tourism development planning.

The thirteenth paper entitled “COULD A NEW AGRICULTURAL AUCTION MARKET IMPLEMENT A GOOD MARKETING MIX?”, authored by Siti Afni ANISAH, Lestari Rahayu WALUYATI, and Agus Dwi NUGROHO, examines the implementation framework of the marketing mix in the Sleman auction market, for the period from January to March 2020. The study builds on primary data from interviews with all auction market traders and uses a questionnaire-based analysis to show that implementing the marketing mix in the Sleman auction market is high, highlighting the necessity to increase the promotion using social media, improve auction market service training,

increase the number of contract workers, transparent when delivering information to traders, and fix the Standard Operating Procedure.

The fourteenth paper entitled “INTEGRATION PROCESSES IN THE ECONOMIC SPACE OF RUSSIA’S NORTHERN REGIONS”, authored by Sergey KOZHEVNIKOV, studies the spatial integration of regional economies based on a critical analysis of the scientific literature. The paper studies the features of integration/disintegration processes in the economic space of Russia's European North in the post-Soviet period, showing that cooperative relations of the region with other entities of the Russian Federation can become an objective basis for the development of integration processes. However, the study also reveals constraints in the export orientation of the Northern region's economy, negative demographic and migration processes limiting the integration developed in the region's labor market, and a decline in the level of spatial transport connectivity. The paper substantiates conceptual areas, priorities, and tools for ensuring the spatial integration of the Northern region's economy at the intra- and interregional levels.

The fifteenth paper entitled “DIGITALIZATION OF TERRITORIAL AND ECONOMIC SYSTEMS AT THE REGIONAL LEVEL”, by Vita HAVRYLIUK, Andrii HROMYK, Ivan SEMENETS, Tetiana PYLYPIUK, Rostislav MOTSYK, and Anna KOSTYAKOVA studies the features, trends, and patterns of the development of digitalization of territorial and economic systems. It analyzes the development of the Internet trade market in Ukraine, determines the volume of production (services) by types of economic activity in the field of digital territorial and economic systems, highlights the dynamics of the trend of financial results of enterprises in the field of telecommunications, computer programming, consulting and information services, and forecasts indicators of the development of digitalization of territorial and economic systems.

The sixteenth paper entitled “SUSTAINABILITY ANALYSIS OF GREECE’S PROMOTION AS A TOURISM DESTINATION”, authored by Christos AMOIRADIS, Mariya STANKOVA, Efstathios VELISSARIOU, and Christos Ap. LADIAS, reveals the degree to which the promotion of Greece, as a tourist destination, is based on sustainable principles, through an empirical analysis applied to the 13 regions of Greece, on data of the year 2020. The results provide useful insights and propose strategies for sustainable tourism management and marketing within the context of regional policy.

The seventeenth paper entitled “SPATIAL LINKAGE BETWEEN QUALITY OF INSTITUTION, NATURAL RESOURCES MANAGEMENT WITH GDP PER CAPITA IN D8 COUNTRIES”, authored Farzaneh KHALILI, Majid AFSHARIRAD, Abdolrahim HASHEMI DIZAJ, and Mehdi YAZDANSHENAS BAHOGHOGH investigates the effect of institutions and management of natural economic resources on GDP per capita, as a proxy for economic growth, by applying spatial regression models and the Durbin model in the D8 countries, from 1996 to 2019. The results show a positive and significant effect of natural resource management on economic growth, along with a positive and significant effect of physical capital, human capital, foreign investment accumulation, and natural resources on economic growth.

The eighteenth paper entitled “TERRITORIAL DISTRIBUTION OF LAND RESOURCE POTENTIAL OF AGRICULTURAL USE IN WORLD COUNTRIES”, authored by Natalia TRUSOVA, Sergey KALCHENKO, Nataliia POCHERNINA, Oleg KRAVETS, and Yurii HURBYK, applies a methodological approach to the monetary valuation of agricultural land to study the territorial distribution of agricultural land and resource potential. The analysis uncovers dynamics of agricultural land areas by regions of the world and their reserve volume suitable for the development in the world.

The nineteenth paper entitled “THE CONTRIBUTION OF COHESION POLICY TO THE DEVELOPMENT AND CONVERGENCE OF THE REGIONS OF THE EUROPEAN UNION”, authored by Panagiotis KOUDOUMAKIS, George BOTZORIS, and Angelos PROTOPAPAS, examines the contribution of Cohesion Policy's (CP) to the development and convergence of EU regions, through the implementation of a neoclassical econometric model. The results show that the contribution of the secondary sector is emerging as the most critical factor and the provision of reliable data of the CP implementation contributes decisively towards reducing the complexity and heterogeneity of results, and also increases their potential to be utilized in assessment and design programs.

The twentieth paper entitled “A MODEL FOR THE JOB DEMAND FORECASTING IN THE ARCTIC ZONE OF THE RUSSIAN FEDERATION BASED ON TIME SERIE”, authored by Zhanna PETUKHOVA, Mikhail PETUKHOV, Igor BELYAEV, and Lyudmila BODRYAKOVA, builds on regression models for predicting the time series of the number of jobs in the labor market of the Russian Federation, to examine the possibilities of predicting the situation in the labor market of the Arctic Zone of the Russian Federation and the demand for specialists in various industries.

The twenty-first paper entitled “DEMOGRAPHIC, GEOGRAPHICAL, AND ECONOMIC ASPECTS AMONG THE GREEK JEWRY, 1919-2019”, authored by Nikola YOZGOF-ORBACH, discusses demographic, spatial, and economic aspects of Greek Jewry in Israel, from 1919 to 2019, focusing on its spatial distribution and its demographic processes over the years. Based on historicist

and interpretive content analysis, the paper provides useful insights into immigration, education, demography, income, and other geographical and socioeconomic characteristics of the Greek Jewry in the past century.

The twenty-second paper entitled “ADDRESSING SPATIAL JUSTICE AT LOWER TERRITORIAL LEVELS. SOME INSIGHTS FROM THE CENTRAL AND EAST EUROPEAN”, authored by Daniela- Luminița CONSTANTIN, proposes an overarching review of selected relevant studies undertaken in Central and Eastern Europe to highlight significant aspects of deeper territorial inequalities, as useful hints for the prioritization of the EU funds allocation to less developed areas, and for laying good foundations for the regional policies in these countries. The paper brings about a twofold contribution, namely a discussion of the difficulties that have to be faced for the construction of appropriate databases and proper methodologies as well as the emphasis on those territorial inequalities that are better captured at deeper disaggregation levels.

The twenty-third paper entitled “MEASURING REGIONAL DEVELOPMENT DISPARITIES: SOME METHODOLOGICAL CONTRIBUTIONS AND EVIDENCE FROM ARMENIA AND SERBIA”, authored by Tigran MNATSAKANYAN, Ruben HAYRAPETYAN, and Dejan MOLNAR discusses regional disparity measurement tools and focuses on the development of a tool appropriate not only for accurate measurements but also for serving as a motivational tool for authorities. The study focuses on Armenia and Serbia, taking into consideration several key similarities of economic, social, and cultural nature, which have significantly influenced the perception of local governance and the role of communities, as well as the mindset toward socioeconomic processes in general.

All these interesting works are available in the next pages of the RSIJ intending to promote the academic dialogue in Regional Science.

On behalf of the Editor-in-Chief and the Editorial Board
Dimitrios Tsiotas, Ph.D. – RSI J.

Articles

LABOR TAXATION AND INVESTMENT IN DEVELOPED COUNTRIES. THE IMPACT ON EMPLOYMENT¹

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Abstract

One of the main topics highlighted in the field of economic policy applications is the impact of taxation on labor. In an era in which macroeconomic stability, technological change and globalization pressure the job market, there exists no strong consensus in the literature on how exactly taxation influences growth, choice between work and leisure, share of income attributed to labor or participation in different job market segments. Focusing on employment levels and using the results of the World Economic Forum (WEF) executive opinion survey (EOS) between 2013-2017 we bypass several challenges often faced in the literature. By doing so, we complement the insights of the existing literature by establishing that, in institutionally mature countries, taxation that is deemed by a survey of business executives to pose a disincentive to work, reduces employment. At the same time, such countries can also rely on the taxation of investment and the flexibility of wages to influence employment levels, unlike less competitive countries.

Keywords: Employment, Taxation of Labor, Non-wage Labor Costs, Executive Opinion Survey

JEL classification: J21, H24, J32, M52

1. Introduction

Important questions regarding the impact of taxation on employment and on its share of income remain unanswered. In an era of rapid technological and geopolitical disruption, that distributes unevenly negative shocks even while it creates seemingly unbounded opportunities for those individuals and regions that are appropriately placed to grasp them, the stakes have increased significantly (Karras, 2010). In the aftermath of the global financial crisis of 2008, many countries are continuing to face insufficient employment performance especially for the young and less skilled while governments' interventions increased debt levels and high tax burdens overall and on labor. These legacies shape a challenging environment in which the forces of disruption will have an impact on employment, income distribution and the ability of the bulk of society to access jobs which not only contribute to production but, ultimately, also the maintenance of social coherence (eg, de Vries et al. 2020; Cortes et al. 2020; Adams 2018 and Goos, 2018). Furthermore, establishing a path of professional success and personal fulfillment especially for the younger generations also crucially depends on the availability of sufficient new high-quality jobs (eg. Nikolova and Cnossen, 2020). To face off these challenges one surely needs to take into account the literature that, for example, tracks the evolution, anticipation and matching of skills demand and supply (e.g., Acemoglou 2002; Acemoglou and Autor, 2011). However, one needs also to take note of the ongoing debate regarding the level of taxation and its impact across various economic sectors, different types of income and consumption. Indeed, authors such as Piketty (2014) argue for even more taxation while others such as Gates (2017) contemplate a direct taxation of the digital economy in the form of a "Gates tax" on machines, despite the high and very progressive tax

¹ Data used can be requested from authors. No competing interests are at hand and no funding was received by the authors. Errors and omissions are ours

wedge already imposed on labor in many countries and the subsequent formulation of counter-arguments (Auerbach, and Hassett 2015). Therefore, the question regarding the tax impact on employment and the labor share is more topical than ever.

Against this background, three main goals of this study emerge. First, is to review the relevant literature, which includes taxation metrics in order to identify the incidence on employment and the labor share of income. Then the data challenges, the advantages and the limitations of the applied methodological approaches are discussed demonstrating how the literature manages the limitations posed, as it strives to gain further insights in the topic. These limitations, in turn, are used to select a dependent variable and independent variables from a business executives' opinion survey that appear to bypass these limitation. Acknowledging the limitations, in turn, of the used data we look for the most appropriate approach, finally settling for random effects for one part of the sample and fixed effects for another part. While the use of survey data cannot substitute hard data nor provide elasticities, our approach provides confidence in the results of certain parts of the literature and provides an overview of challenges that can assist further research that uses hard data to ensure increased robustness.

Regarding, first, the related literature, it is focusing on both the impact of taxation on employment, be it jobs, or hours worked, and the share of income allocated to labor, with the latter receiving more prominence in work published since the development of national accounts databases that made such analysis possible for a larger number of countries. The identification in such datasets, during the past decades, of an alleged downward trend has further increased interest in the study of the labor share of income. As will be argued in Section 2, the work focusing on employment levels (or hours worked) does manage to bypass many of the limitations and challenges posed, at the cost though of limiting the analysis to certain parts of the income distribution and within group or country variation. Thus, it often sacrifices possibly relevant information that can be found beyond these limitations. On the other hand, the work focusing on the labor share of income, that may be considered a more complete measure of the labor market in the sense that the remuneration of labor also reflects qualitative aspects of employment rather than simply a quantitative measure of the number of jobs, appears to face identification and endogeneity challenges in the way of establishing accurate and robust results regarding the reaction of labor to taxation that may not be rectifiable with the use of existing datasets.

In this paper, we take advantage of the availability of a particular question included in the executive opinion survey (EOS) of the World Economic Forum (WEF) used for the construction of its Global Competitiveness Index (GCI). This question asks for the perception of the businesses executives that receive this questionnaire on the degree to which taxation is a disincentive to work and we perceive in it an opportunity to bypass some of these challenges as long as we focus on the study of employment levels, given that the responses to this survey appear largely free from the challenges that usually affect the independent variables used in the literature.

Using such a survey response as a proxy for taxation comes itself with a number of shortcomings, and the main one is that we cannot estimate elasticities and that we will not be able to draw conclusions from the magnitude of coefficients beyond relative comparisons between the coefficients estimated for other variables included in the executive opinion survey.

On the other hand, it allows us to have an analysis that includes both between and within country variation that is we are not forced to adopt a model that removes country specific attributes. The contribution of this work therefore is the ability to suggest what has been taken out of existing analysis in order to achieve some robust results, thus providing a motivation to persist with the development of datasets and methodologies that will make it possible to analyze both within and between country variation during the study of the impact of taxation on employment and, hopefully at some point, the labor share of income.

It should be added here that the opinion of executives does not necessarily coincide with the opinion employees themselves would have, and thus the responses are not necessarily related to employment levels in a direct way. Still, the use of such executive opinion survey data has been used previously, to establish results (Friedmann, 2003) that were then verified

with the use of hard data, once the sufficiently detailed datasets were developed (e.g., OECD, 2004 and subsequent OECD research).

Furthermore, datasets of household surveys, national accounts and the tax wedge that are sufficiently comprehensive to be applied in the said analysis is usually available for a small number of developed countries. Therefore insights that include developing countries or that can compare groups of countries, according to their development level, remain mostly elusive. The use of the simple employment to population ratio and the availability of the WEF GCI EOS for a large number of both developed and developing countries allows such investigation. This is taken advantage of here, while we also focus on a subgroup of developed countries that include most of OECD and EU members thus also treading the path of work that focuses on groups of developed countries.

The remainder of this study is organized as follows. Section 2 summarizes in more detail some of the key attempts to grapple with these questions over the past century, emphasizing the challenges faced with data and methodology. The challenges faced especially by work attempting to estimate an impact of taxation on the labor share are summarized, as are the challenges faced by work examining the reaction to taxation of employment among specific population groups and at an aggregate scale. While not attempting to provide a complete overview of a very extensive and important literature, this section provides the groundwork to describe subsequently the advantages and limitations of the used data, as well as to place this work in context with the literature. Section 3 elaborates these challenges to assess the benefits of the dataset we use to examine the impact of taxation on aggregate employment levels, while also describing its own limitations. This is done along with the description of the available dataset and an a priori explanation of the rationale to use the, ultimately applied for a group of developed countries, random effects approach and the use of fixed effects approach for developing countries in Sections 4 and 5. Section 6 presents the quantitative analysis and its results. Section 7 concludes and presents remarks on possible future extensions.

2. The impact of taxes on employment and the labor share

The question regarding the impact of taxes on labor and, in particular, on employment, has received attention in seminal works like Ramsey (1927), Mirrlees (1971), Hall (1973), Rosen (1979), Hausman (1980, 1981), Stern (1986), Hausman and Poterba (1987), Triest (1990), Blundell (1995), Feldstein (1995) and Diamond (1998). Limitations posed by data availability and methodological challenges often led to varying results, in spite of continuing progress as the literature matured. Meghir and Phillips (2010) as well as Mankiw et al. (2009), indicatively, summarized the key insights of the existing literature as it grappled with the challenges that, in turn, reflected the simple reality that both the income and substitution effects are at work as individuals decide between work and leisure, as already written down by Robbins (1930). Manski (2012a; 2012b) is not alone when arguing that there is no certain answer to the question of what impact a tax increase has on labor, even as empirical work starts to take the lead over theory (e.g., Auerbach and Hines 2001). In addition, of course, an extensive theoretical and empirical literature has spawned around the search for optimal taxation of capital, consumption and labor.

In spite of the controversies found in the literature, there exists sufficient empirical evidence to suggest that tax increases lead to growth slowdown and employment decline, as well as an encouragement of undeclared work (e.g. Davis and Henrekson, 2004; Frederiksen et al., 2005). This appears to be true at least for high-tax Europe and OECD countries (e.g. Planas et al., 2003; Seward, 2008; Nickell, 2004; Pissarides, 1998; Sinko, 2004; Kilponen and Sinko, 2005; Garcia and Sala, 2006; Carone et al., 2003; Bassanini and Duval, 2006; Pelagidis and Mitsopoulos, 2018) and for more vulnerable population groups (e.g. Blundell 2012 & 2014; Blundell et al. 2013; Bassanini and Duval, 2006; Neumark and Shirley, 2020), even though there is no solid consensus on the issue regarding the optimal employment income tax scheme. This holds especially if one does not take into account reciprocating services offered by the state in return for taxation (e.g. Jäntti et al., 2015).

As shown in Meghir and Phillips (2010), who offer a review of the ‘New Tax Responsiveness’ literature, one approach is to focus on the elasticity of after-tax income with respect to variables that range from job market participation to hours worked. Based on the

insights of an extensive literature, they examine the role of variables such as education, income from other sources of family members, gender, marital status, the existence of dependent family members and unobservable skill. These variables appear to affect the results in directions that have converged to a broad consensus despite of the wide range of available results regarding the estimated impact. Higher elasticities, it is argued, will imply a stronger reaction to tax reductions, or increases, among women, single mothers, low income, and low education or otherwise disadvantaged groups, but the results vary widely depending on the study, the income group examined and many other factors like the time and place of the study.

The aforementioned studies often use household survey data which is available for net earnings, and thus are able to focus directly on the impact of changes in net income on labor supply or equilibrium outcomes. That way they can avoid problems faced when using the macro data for the compensation of employees that include all taxes and social security contributions. Other problems, such as the endogeneity of the earners' distribution across income brackets, common to approaches based on survey data and national accounts data, remain though. This fact is acknowledged by the existing literature, which therefore often examines changes at certain local areas of the distribution of income or other aspects. In almost all countries, peaks in the distribution of employment are observed at kinks of the, usually progressive, personal income tax schedule and the, usually regressive, social security contribution schedule. Furthermore, researchers have tried to avoid the econometric pitfalls at hand. Indicative examples include the use of various selections of estimators, dummies, fixed effects approaches (e.g. Bassanini and Duval 2006, & 2009 that examine in an exhaustive way the impact of the OECD average wage tax wedge on both unemployment and employment), annual log changes (e.g. Autor and Salomons, 2018) or taking advantage of occurrences like Iceland's tax holiday (Bianchi et al. 2001), UK tax reforms (Blundell et al. 1998), California's marginal tax increase (Rauh and Shyu, 2019), group specific tax cuts (Saez and Seim, 2019 or Egebarka and Kaunitzbov, 2018) or by focusing on impulse responses (e.g. de Serres and Murtin, 2014; Duval and Furceri, 2018), while Chetty (2012) includes a comprehensive list of related studies with data from numerous countries. These approaches do come at the cost of focusing on within group variation, eliminating between group or country variation, or focusing on specific parts of the distribution of employees and incomes while in other cases household survey data is combined with a reconstruction of the tax schedule of the examined countries (Jäntti et al., 2015). One should also take note of the results presented by Chetty et al. (2011) that use changes in taxation and kinks in the Danish non-linear tax system to show how the size of kinks and the mass of the wage earners distribution at the kinks affect elasticities. In addition, the literature identifies a number of factors that can lead to differences in the estimates in elasticities obtained from micro and macro approaches, which include market frictions and constraints on hours worked (eg. Chetty et al., 2011; Chetty, 2012) and the reciprocity of services offered by the state (eg. Jäntti et al., 2015) and fundamental factors ranging from human capital to social norms. Finally, the behavior of certain age groups that are particularly prone to early retirement appears to be important, with the potential to influence outcomes at the macro level even when other factors emerge as important and compatible in numerous countries, which usually include selected developed countries (eg. Blundell et al., 2013).

Still, within these limitations they do establish, in some cases in very robust ways, that taxation appears to harm employment or raise unemployment and one could dare to state that under such circumstances the wide array of obtained results should almost be expected and seen as representative of the time, location and circumstances, broad and detailed, at hand reflected in the data used by these approaches to estimate the elasticity of employment or hours worked.

In recent decades, research has also focused increasingly on the development of the labor share of income, which possibly could offer a macroeconomic perspective on the taxation impact on employment. A stability of the labor share of income, formerly considered as a stylized fact has, according to a large part of the literature, been replaced by a declining trend. As datasets and research become more elaborate, the analysis of the investigated intricate relationships becomes ever more granular, revealing many interesting aspects during the attempt of the literature to explain the root causes of this claimed decline.

Overall, a consensus appears to be building around the negative influence of technological change and, to a lesser extent, certain aspects of globalization (IMF WEO 2017; Chi Dao et al. 2019; Abdi and Danninger, 2018; Arpaia et al., 2009; Estrada and Valdeolivas, 2012; Elsby et al., 2013; Doan and Wann, 2017; Young and Tackett, 2018; Guerrier and Sen, 2012; OECD, 2012; EC, 2007, ch. 5). In this literature, as well, some differentiation appears according to country groups, time and the specifications of each analysis. For example, Stockhammer (2017) argues about the negative effect of globalization and financialization on the labor share of income and offers an interesting hint for different effects in different country groups as globalization impacts workers in developed and developing countries, to the detriment of the latter. Moreover, these trends are found to harm in particular lower and middle skilled labor or jobs that are easy to routinize (Chi Dao et al., 2019; Abdi and Danninger, 2018; Arpaia et al. 2009, for example), but there exists no definite consensus (e.g., Elsby et al., 2013, OECD & WB 2015, EC 2007), a result that echoes the estimate of labor supply elasticity of various workforce subgroups. Most also appear to agree that an increase in the supply of skills, for example through education, is found to have a positive impact (e.g., Guerrier and Sen, 2012; OECD, 2012), as is also the case in unemployment (e.g., Obiols-Homs and Sánchez-Marcos, 2018). Still, there also exists evidence suggesting that education alone cannot ensure progress and growth or, turning the argument around, an increase in growth and employment does not always need a spectacular improvement in education to happen at least in developing regions (Hausmann, 2015), an observation that may also be influenced by the fact that the type of education and the broader institutional setting in which it takes place do appear to matter (Natkho and Polishchuk, 2019).

In the quest to identify the factors influencing the labor share of income, the literature also investigates policies ranging from the minimum wage and unemployment benefit policies on the income and income share of certain groups, to the relocation of production to sectors, companies or plants (Autor et al., 2017; Autor and Salomons, 2018; Kehrig and Vincent, 2017; OECD, 2012 MIT Future of Work). The framework of employment protection and industrial relations parameters also has drawn the interest of researchers, with some reasonable conclusions but again with often mixed results (Chi Dao et al., 2019; Abdi and Danninger, 2018; Guerrier and Sen, 2012). Cetté et al. (2016) and Autor et al. (2017) also find that an increase in Employment Protection Legislation (EPL) strictness is similar to a raise in labor costs, impacting in particular on lower skilled employment. In addition, Cingano et al. (2016), Cingano et al. (2010), Calcagnini et al. (2014) and Cetté et al. (2016) find broadly similar results, always with caveats related to data and methodology. Product market regulation (PMR) is also included by some of the studies among the independent variables, but the relationships at hand are complex and difficult to study, as admitted by OECD (2012), EC (2007) and Stockhammer (2013).

Last, but not least, a number of researchers that investigate the labor share of income decide to add metrics of taxation, something that the researcher has to actively choose, unlike the case of the analysis that examines the response of labor supply to changes in net income. For example, Chi Dao et al. (2019) included corporate taxation, and Estrada and Valdeolivas (2012) tested the impact of the tax wedge but found a non-significant impact rationalizing this by the fact that the non-wage cost is included in the total compensation of employees. Abeler and Jäger (2015) suggest that people underreact to tax changes as the tax system is complex, leading to a stronger status quo bias and OECD (2012) argues that the rich have now a higher capacity to pay taxes albeit without providing a robust analysis. Stockhammer (2013) includes the tax wedge but fails to find a significant impact on the labor share, which has as a denominator GDP (that is GVA plus all net taxes and subsidies). The same is the case in other research as EC (2007) tries to analyze the impact on specific sub-groups finding at least an impact on lower and upper-tier income employment groups.

Therefore, we can conclude, that the results regarding the taxation impact on employment and its share of income face challenges, that are acknowledged in the academic literature, which works around them in various ways, and that, can hint at a negative impact of taxation on the labor share of income or employment levels. However, comprehensively consistent broad statements along the lines of the comments made by Prescott (2004) and Laffer (2004), which offer counterarguments to continuous increases in the level and progressivity of the tax wedge on a macro scale, remain largely elusive, even though at least for OECD countries

work like Bassanini and Duval (2006) and work that examines the impact of taxation on aggregate employment and various employment groups offer very strong support in such a direction.

In a nutshell, the relevant literature has attempted quite persistently to include taxation metrics in its effort to identify the influencers of employment, hours worked and the labor share of income. Facing results that are not always conclusive or robust and possibly encouraged by the variety and frequent fragility of the results obtained by the extensive literature trying to estimate the elasticity of labor supply or hours worked, the literature has rationally emphasized the variables and models that ensure significance and robustness. Helped by work that incorporated decades of trial, like Bassanini and Duval (2006; 2009), a consensus though has formed over decades, based on evidence highlighting the importance of belonging to certain groups that emerge to leave the job market more easily and the skill set of employed persons but that in most cases focuses on the most developed countries and that cannot offer but localized insights.

Regarding corporate taxation, Chi Dao et al. (2019) included it as an independent variable on the labor share of income but assess its impact as not robust, while other parts of the literature attempt to quantify the impact of changes in corporate taxation on unemployment (eg, Ljungqvist and Smolyansky, 2014; Feldmann, 2011), but the literature still faces significant challenges (eg, Auerbach, 2018).

3. Data challenges related with the estimation of the labor share of income

As already mentioned in the literature, in national accounts, which are used to estimate the labor share of income, employees' compensation includes the, often sizeable, tax wedge. Therefore, an inevitable and non-trivial identification problem arises when using the tax wedge as an independent variable. However, even beyond this fundamental challenge, we should be aware that the use of national account data leads to the use of a dataset that is affected by the impact of the tax system of a country. This holds also for the average tax wedge, which is often used as an independent variable, as it is not exogenous given that the progressivity and level of the taxes affects the distribution of labor across income brackets (e.g., Li and Lin, 2016) and thus, among others, the average wage. This is the case even when the chosen dependent variable is not the labor share of income that is in addition, burdened by the identification problem, but employment numbers or hours worked. Focusing on household data and peaks in the distribution of employment, may allow to work around this problem in specific cases especially when differences are the focus of analysis, but doing so limits the scope of the analysis. If one desires to obtain a more complete picture about the macro impact of taxation on employment the challenge remains. In addition, even though analysis that is based on household survey data usually looks at elasticities with respect to net wage income, there exists no accepted practice in the relevant literature to handle the fact that the national account's labor share of income refers to gross and not net labor income.

Another methodological issue that emerges in the literature is the need to account for the income fairly attributed to self-employed labor but lumped with capital income by national accounts. A common correction is to consider the self-employed to earn the same income as wage earners, despite the acknowledged risks and potential assumption's inaccuracy (e.g. Arpaia et al., 2009; Estrada and Valdeolivas, 2012; Elsby et al., 2013; Doan and Wann, 2017; OECD, 2012; EC, 2007). Especially in countries that are institutionally weaker and in which the shadow economy and employment outside the official economy is more widespread (e.g., work on tax morale, OECD, 2019) this assumption could miss important information, as clandestine employment navigates around the tax wedge of official employment altering not only the distribution of officially employed wage earners across income brackets but also the whole structure of the economy. In such an environment the growth of companies into more productive entities is discouraged by the sudden increase of the effective tax wedge faced by an employer and employee as they undergo a transition phase from at least partly clandestine to fully declared employment which usually is a given in larger and better audited companies.

Furthermore, according to researchers like Cho et al. (2017), or Elsby et al. (2013), as capital stock becomes more important, depreciation also becomes more important and therefore inevitably labor income will decline relatively to gross income if this is not properly

considered. With an appropriate adjustment, evidence shows that the labor share does not seem any more to be declining. One should add here that according to the System of National Accounts agreed on by the international organizations (2008), depreciation poses significant challenges in its accurate valuation. Related, Karabarbounis and Neiman (2014) employ an adjustment that considers depreciation and that leads to a moderation, but not full elimination, of the decline of the labor share that is documented for recent decades by many researchers, while Cette et al. (2016) study a capital to labor use ratio, where capital per industry stems from undepreciated stocks.

In addition to these major concerns, there are numerous other potentially important issues raised in the literature, ranging from the separate handling of the non-market entities of the economy (Estrada and Valdeolivas, 2012; OECD, 2012) to the impact of imputed valuations (Elsby et al. 2013; OECD, 2012). However, in the end, the most significant challenges linked with the estimation of the taxation impact on the formation of the labor share of income are related with fundamental identification and endogeneity problems. Thus, the challenges at hand can only be partially alleviated with the proper adjustment of the gross labor share of income for both the income of self-employment and depreciation of capital. These challenges may well contribute to the inability of large parts of the literature to establish robust results regarding the impact of taxation on the labor share of income, and therefore the lack of focus on the topic as a factor that exerts major influence on employment.

4. Data description and justification

The present investigation was conducted using national accounts dataset from Eurostat for European countries, OECD datasets for the OECD member countries and a World Bank dataset for the employment to population share, and that is available for a larger number of countries that exceeds OECD and EU member countries. The econometric analysis ultimately reported here was performed using as a dependent variable the World Bank dataset for the employment to population share “Employment-to-population ratio by sex and age - ILO modelled estimates” and that is available on the world bank webpage.

For the independent variables we use data from the World Economic Forum Global Competitiveness Index (WEF GCI), including certain subseries, which are based on selected answers from the executive opinion, survey (EOS).

For the sake of consistency and to avoid mixing survey response data and quantitative data used in the literature, we follow Friedmann (2003) and all independent variables were selected from the WEF GCI, as described below, even when some of them measure metrics for which statistical data is available from other sources.

The World Economic Forum (WEF) for the last decades conducts an annual survey among businesses in most countries of the world, the executive opinion survey (EOS). A questionnaire is distributed by local partners to a sample of local businesses that has to meet certain criteria to ensure representativeness by size and sectors. Furthermore, a minimum of completed or largely completed surveys has to be received in order to ensure the inclusion of a country in the annual publication, with the WEF providing extensive details about the scope and technical execution of the survey (e.g. World Economic Forum, 2014). It should be noted that executive opinion surveys have received criticism in the past as a source of information for the construction of competitiveness indexes on the grounds that they do not accurately reflect the competitiveness of countries. According to the authors' point of view, these criticisms are misplaced, as all different indicators provide different aspects of the competitiveness of a country, offering results' comparison advantage as long as one accounts for the strengths and weaknesses of each indicator, as the balanced use of such survey answers to come to useful conclusions has already demonstrated in the past (e.g. Feldmann, 2003).

In the case of WEF survey, used in this study, the questionnaires tend to be completed more often by companies that are better organized, have a structure to deal with such questionnaires and, as a characteristic of these attributes, tend to be larger and therefore part of the official, rather than unofficial, economy. Therefore, it has to be noted that the answers provided is the view of the participating businesses that share certain attributes and may represent a different share of the total economic activity in each country, and this may for

example affect the extent to which the elasticity of income and employment are close to each other (Kaplow, 2007), a fact we need to take into account.

Having said all that, we are particularly interested in two of the questions included in the said survey. This first question asks executives to rank the “Effect of taxation on incentives to work” on a scale of 1-7 (where 7 is the best ranking) and the second question regards the “Effect of taxation on incentives to invest”. These questions were included in the survey run from 2013 (2013-2014 GCI index) till 2017 (for the 2017-2018 edition), at which time they were discontinued as part of an overhaul of the index to better reflect the digital challenges and to increase the share of data based sub-indexes. Still, even so, the provided dataset allows us to link variables related to the labor market with a metric that reflects the intensity of taxation and is not identified as a linear function of the gross income of labor even as it is strongly determined by the rest independent variables measuring dimensions usually examined by the relevant literature. Also, these questionnaires are filled out by executives, thus ensuring that they offer the employer’s point of view that determine labor demand, rather than an employee’s point of view, a fact that is of interest since we aim to examine the impact on the number of employed persons.

This potential advantage can be visualized by the available data. Using EU country national accounts data for the labor share of net value added and adjusted for both depreciation of capital and self-employment, it follows that the higher the tax wedge estimated by the OECD for an employee earning 100% (or 167% respectively) of the average wage, the higher is the labor share (gross, that is with taxes and SSCs), while for 67% of the average share this relationship is flat. Interestingly, the tax wedge at 167% of the average employees’ income of the labor share seems to exert a stronger influence on the gross labor share of income. This, in principle, counter-intuitive result may though simply reflect the fact that a higher and more progressive tax wedge adds an increased tax wedge on the labor share that overcompensates for any loss of the net labor share of income because of a stronger substitution effect. A simple deduction of the average wage tax wedge from the labor income that yields a net of average wage tax wedge share of labor of all income provides no reliable information pending a better attempt at identification and an appropriate treatment of the denominator but ensures now an intuitive slope of the adjusted “new” labor share to the tax wedge of the average wage earner. This can be explained by the fact that in high tax countries the net income remaining for employees is a smaller share of the total pie, including the share the state claims, and allows us to reflect on the size of the identification problem at hand and thus the need to take the issue seriously.

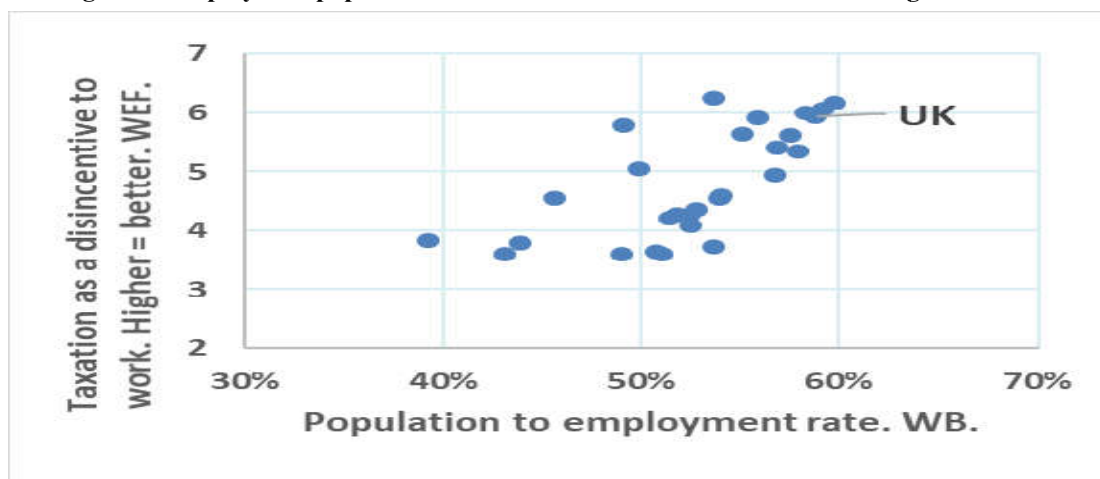
We now turn to the use of the data collected through the WEF Global Competitiveness Index executive opinion survey question “Effect of taxation on incentives to work”. We first look at the bivariate relationship between answers to the WEF GCI executive survey questions that form the variables “taxation as an incentive” to invest and to work, respectively and the adjusted (for depreciation and self-employment) labor share of gross income in the case of EU member countries. While the relationship is neither strong nor intuitive, it does not repeat the counter-intuitive result seen in the case of the average wage tax wedge.

We then proceed to use the large sample of World Bank data countries for the employment to population ratio and examine the bivariate relationship with the answers to the WEF GCI executive survey questions “taxation as an incentive” to invest and to work. The documented bivariate relationship is more intuitive, but it remains weak. However, if one focuses on sub-groups that include predominantly highly developed countries, like for example the European Union member states, the relationship becomes stronger while remaining intuitive. Indeed, taxation, deemed by business executives to be a disincentive to work and invest (Figure 1 & 2), appears to be compatible with a lower employment to population, or employee to population, ratio, but this relationship appears straightforward only in developed countries.

It should be noted that the formulation of the question allows, in practice, the respondents to also consider the reciprocal services received by the employees and employers because of this taxation. Thus, as mentioned in the literature review, for example high tax Nordic countries which offer mature institutions and helpful social services can get away with high taxes that are not considered as a disincentive, while this is not true for southern Europe high tax countries like Greece and Italy that cannot justify their high and very progressive taxes with reciprocal services.

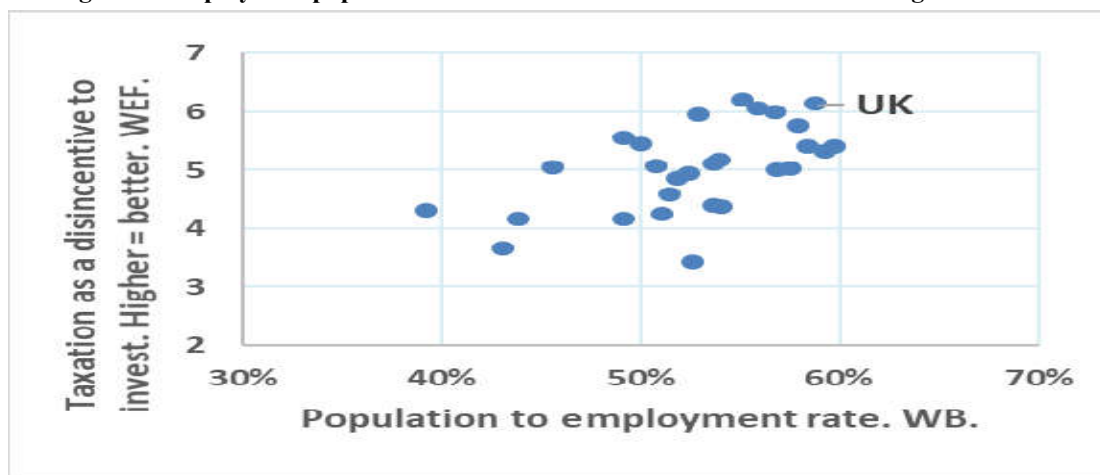
At this stage, it must be clarified that the EU includes a variety of members, which differ with respect to the density of their product space and the development of the production base as well as the level of institutional maturity. As a result, some EU member countries rank high among indexes that range from the World Bank Governance and Doing Business indexes, competitiveness indexes based at least partially on executive surveys like the WEF GCI and indexes that map the product space of a country into a metric of diversity like the Index of Economic Complexity (Hausmann et al., 2014).

Figure 1. Employee to population and taxation as an incentive to work – higher = better



Source: Eurostat for EU member states plus the UK, WEF GCI, 2012-2017. WEF GCI variables like “taxation variable incentive to work” – higher = better. Five year averages.

Figure 2. Employee to population and taxation as an incentive to invest – higher = better

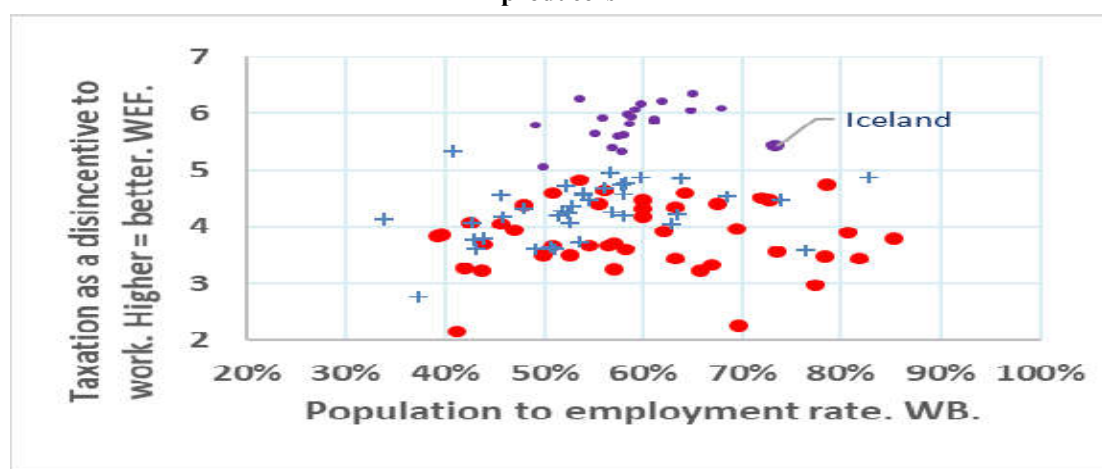


Source: Eurostat for EU member states plus the UK, WEF GCI, 2012-2017. WEF GCI variables like “taxation variable incentive to invest” – higher = better. Five year averages.

In view of all the above, we proceed with the use of the World Bank data for the employment to population ratio, as it will allow us to examine a broader set of countries beyond EU and OECD membership. As a first step, the inclusion of other OECD non-EU countries enhances the relationship between the perception of businesses in the WEF GCI executive survey regarding to the extent to which the taxation system is a disincentive to work and the level of employment in the country. Going, as a next step, beyond the EU and OECD, ranking countries along with their performance of indicatively the aggregate WEF GCI or the sub-index related with the quality of institutions, shows that for about the upper tier of developed countries -that includes but is not limited to the members of the EU and OECD - this bivariate relationship is further enhanced, as reflected by the 5-year averages of the available panel data for these countries (i.e. the between variation). At the same time, it is interesting to point out that for countries that rank lower, including also some EU members, the relationship is gradually weakened as we move further down the list. Citing also subsequent econometric analysis results, the negative impact of taxation on employment

appears to be clear in a 2-dimensional visualization, and robust in quantitative analysis, only in high-competitiveness countries (Figure 3). The deterioration of the results as countries ranked at lower competitiveness and institutional maturity are included in the sample is interesting, but not novel as shown by the abovementioned work of Stockhammer (2013) for example. Furthermore, the fact that work like Bassanini and Duval (2006; 2009) find a strong intuitive relationship between unemployment and the OECD tax wedge by focusing on averages in 20 OECD countries is in line with this observation. Even though the separation of a dataset in subgroups may be considered arbitrary, we proceed with such an approach motivated by the fact that most related studies that use data that permits the overcoming of the salient challenges mentioned focus only on highly developed economies, mostly as a result of the fact that for these countries data is available. The separation, therefore, and the insights it uses, can be of assistance to future research as it tries to handle comprehensive datasets.

Figure 3. Between variation by variable “institutions”, WEF GCI, with the exclusion of large oil producers



Source: WEF, World Bank for employment share of population. WEF GCI variables – higher = better. 2012-2017 averages. Top tier of most competitive countries, small blue dot. Intermediately ranked countries, cross. Less competitive countries, large red dot.

5. Limitations and strengths of the WEF GCI executive opinion survey

By its construction, the WEF GCI data at hand cannot be used for the estimation of employment elasticities, which implies that this work can only partly complement work like for example Bassanini and Duval (2006; 2009) and the relevant literature mentioned. In addition, the WEF survey included questions regarding the disincentive effect of taxation and investment on labor for only five years that coincide with the aftermath of the global financial crisis. The result is a short panel. The fact that our results remain robust only as long as the dataset includes a relatively small number of highly competitive countries further reduces our panel to an extent that can be considered to be at the limit of what is acceptable, but that remains similar in size to the sample used for example by Feldmann (2003). On the positive side, the use of the employment ratio as a dependent variable in combination with an independent variable stemming from a business survey allows us to bypass the endogeneity and identification problem without limiting the scope of the macroeconomic analysis. Specifically, the advantage of the first difference approach and fixed effects model, which has been applied extensively in the literature, is the latent heterogeneity elimination from the model, a feature that allows in many cases to solve the endogeneity problem at hand given the data used. However, these approaches remove at the same time any time-invariant variables from the model, which may be of importance for our estimation results. As a matter of fact, especially in our short panel, the time-invariant attributes between countries variation may emerge as particularly relevant and, the use of the business survey data offers us a dataset that allows us to retain the between group heterogeneity.

Under these circumstances, the use of a random effects approach promises a number of significant advantages, something that has not been possible in research that uses data that faces the abovementioned challenges. Regarding the evaluation of the merits and

shortcomings of the said model in our case, the assumption of equally correlated disturbances across periods is not a primary concern given the shortness of the panel. In addition, the shortness of the panel does not a priori compromise the properties of the given model. Furthermore, the reduction of the estimated parameters' number is helpful especially in the cases in which we limit our analysis to a smaller group of highly developed countries. Nevertheless, the main risk is the inappropriateness of a restrictive model that can lead to inconsistency and the fact that available tests can provide, at best, the lack of grave counter indications against its use, rather than a robust confirmation of the correctness of the used model and its stringent assumptions, including in particular the exogeneity assumptions.

Therefore, while the discussion regarding the appropriateness of the random effects model is long-standing in the fields of econometrics, following Greene (2011), we will emphasize the said ability of the model to weigh the two types of variation while applying the Hausman test in order to examine the lack of grave counter-indications for the implemented model. While the Hausman test is a useful device for determining the preferred specification, a known shortcoming is that it does not guarantee a positive test statistic. Therefore, a Breusch-Pagan LM (Lagrange multiplier) test was also performed.

Finally, as already mentioned, in countries in which a larger part of the economy is part of the unofficial economy and a larger number of companies do not have the profile that is compatible with the filling out of questionnaires like the WEF GCI a selection bias may emerge. While at this stage we acknowledge the possibility of this problem and focus on a subgroup of the country population that should not be burdened by this problem, a better identification and correction in the full sample remains as an exercise for future research.

6. Econometric analysis of the finalized dataset

We split the sample of 101 countries for which both WEF and World Bank data were available into three groups²: (1) 41 lower-ranking countries using the WEF GCI, generating 205 data points; (2) 41 middle-ranking countries with 205 data points for all five years covered by our data; and (3) the top-ranked 19 countries.³ The top group was selected with a threshold that marked a trend to reduce the robustness of the results once lower-ranking countries were included and Luxemburg and Malaysia were removed, as their attributes appeared to show performance not explained well by the independent variables.

Our independent variables are all selected from the WEF GCI subindexes. Numerous subindexes were tried in a way that gave precedence to variables that represent answers to EOS questions and that touch topics that are related with variables identified as relevant in the literature. Broader indexes of the WEF GCI that bundle a number of selected per case subindexes, and incorporate statistical data with results of the EOS, were also tried. In the end, some of the broadest so-called pillars of the WEF GCI were selected as they offered a consistent approach and the results obtained remained intuitively compatible. However, in order to ensure desired properties—such as exogeneity of the independent variables, reduced vector inflation factors, and increased relevance in certain country groups—some subindexes were selected. Thus, the pillar “goods market efficiency” was removed, the pillar on infrastructure was replaced by “quality of infrastructure,” and the subindexes on “foreign competition” and “domestic market size” were included as representative of the pressures of globalization and the ability to cater to a large non-tradables sector. Also, the pillar on “labor market efficiency” was replaced by either “hiring and firing practices” or “flexibility of wages,” because that pillar includes the tax wedge. Finally, measures of access to finance were not used given their correlation with the pillar for the macroeconomic environment.

² We removed China and major oil producers of intermediate competitiveness, like Saudi Arabia, UAE, Qatar, Kuwait, Oman, the Russian Federation, and Kazakhstan for which barrels per capita exceed U.S. production. We did so because employment in these countries may be strongly influenced by factors that we cannot properly identify through the data we use.

³ Top-ranking countries are Ireland, Israel, France, Australia, Austria, Belgium, New Zealand, Canada, Denmark, Norway, United Kingdom, Japan, Sweden, Finland, Netherlands, Germany, United States, Singapore, and Switzerland.

Regarding the endogeneity of the independent variable, the view of executives regarding “taxation as a disincentive” to work and invest, a two-stage least squares regression was performed adding the EOS answers on “government efficiency” and the “the existence of irregular payments” that were statistically significant in many iterations. For the group of middle-ranked countries, “domestic market size” was replaced by “burden of government regulation.” The latter, especially in the group of highly competitive countries, demonstrated high multicollinearity and endogeneity, reminding us of arguments that the relationship between taxation and regulation can be an influencing factor (Schoefer, 2010). The variables finally included, and the results obtained by the relevant least squares dummy variable (LSDV) and random effects approaches are shown in Tables 1 and 2.

Following a number of separate regressions, we split the sample in 3 groups. A first group of low ranking countries according to the WEF GCI including 44 countries and thus 220 data points, a middle group of 40 countries with 200 data points for all five years covered by our data and of course the top ranked 21 countries with 105 data points. The top group was selected with a threshold that marked a trend to reduce the robustness of the results once lower ranking countries were included and the remainder of the sample was split into half before the removal of the major oil producers with lower ranking GCI performance and China, as the inclusion of these countries appeared to reduce the significance of the obtained results and the inclusion of dummies did not add over their removal.

The data was once demeaned and tests for multi-collinearity and for endogeneity of the key independent variable, related with taxation, was performed in all regressions but did not reveal any related issues. Regarding the endogeneity of the main independent variable, the view of executives regarding “taxation as a disincentive to work”, a two stage least square regression was performed, regressing it first on the other independent variables used in each case plus the executive opinion survey answers on “pay and productivity”, the “effect of taxation on incentives to invest” and “professional management” that had emerged statistically significant. Subsequently, the obtained residuals from this OLS regression were included in the second stage regression and emerged as not significant at 10% or higher for all the cases performed thus providing the necessary clearing to proceed.

Separate regressions were performed for the pooled OLS (ordinary least squares) and LSDV (least-squares dummy variables), allowing us to analyze within-country variation based on the deviations from the averages for each country and for the between-country variation based on the 5-year time means for each country. An F-test in all cases clearly showed that the LSDV model is preferred over the pooled model, as expected from a visual inspection of the residuals in all cases in which country specific effects were clearly visible. In the random effects models, the variable “theta” (“ θ ”) determining the weight placed on the country averages was below or around 0.9 only in the group of highly competitive countries, while for the other groups a value of θ close to 0.95 implied results very close to the LSDV model. The Hausman test, while supportive of random effects in some cases predominantly took negative values suggesting effects that are correlated with the explanatory variables. Therefore, following Greene (2011), a Breush-Pagan LM (Lagrange multiplier) test was also performed, which supported the random effects approach in all cases presented. Still, the value of θ reasonably differed from one only in the case of the group of highly competitive countries. Hence, the random effects model is presented only for that group.

The results seems to reaffirm the reluctance of the literature to use the random effects model as long as country heterogeneity may remain and influence the independent variables. But for the small group of developed countries it appears that these considerations are largely put at rest, if not in principle at least with respect to the size of their influence, a result that is again compatible with the findings of Bassanini and Duval (2006).

Still, the random effects model is allowing for the between variation to be included with a weight exceeding 20%, and leads to a visible improvement of the characteristics of the obtained residuals and an equally visible increase in the significance of key independent variables that are already saliently identified by the literature to influence employment. The results of the pooled OLS, the LSDV and random effects model specifications were evaluated, and for the two lower ranked groups random effects was not found as an appropriate model, a result in line with the mentioned reluctance of the literature with respect to the use of this model. Therefore, the key results for the LSDV and random effects model

for highly competitive countries and LSDV for the remaining groups are presented in Tables 1-2 presented in Mitsopoulos & Pelagidis (2021).

Table 1 Highly competitive countries

	Highly competitive countries							
	LSDV	RE	LSDV	RE	LSDV	RE	LSDV	RE
Foreign competition	-0,002	-0,006	-0,001	-0,004	0,001	-0,005	-0,001	-0,004
Quality of infrastructure	-0,005	-0,004	0,001	0,002	-0,007 *	-0,006	0,001	0,001
Macroeconomic environment	0,011 ***	0,015 ***	0,015 ***	0,017 ***	0,012 ***	0,015 ***	0,015 ***	0,017 ***
Quality of education	0,001	-0,003	-0,001	-0,003	0,004	0,001	-0,001	-0,002
Domestic market size	0,026 *	0,000	-0,005	-0,009 x	0,022 *	0,002	-0,006	-0,009
Hiring and Firing practices	0,003	0,005 x			0,002	0,005 x		
Wage flexibility			0,014 ***	0,013 ***			0,014 ***	0,014 ***
Taxation as a disincentive to work	0,011 *	0,015 *	0,003	0,006 *				
Taxation as a disincentive to invest					0,012 ***	0,016 *	0,004 x	0,007 **
n	95	95	95	95	95	95	95	95
R2	0,67	0,62	0,76	0,70	0,66	0,60	0,76	0,70
θ		0,87		0,90		0,88		0,90

NOTES: Dependent variable is employment to population ratio. *** = significant at 1 percent level or better; ** = significant at 3 percent level; * = significant at 5 percent level; x= significant at 10 percent level. LSDV: Least squares dummy variables model. ; RE: random effects model.

SOURCES: World Economic Forum, GCI; World Bank.

Table 2 Country groups of medium and lower competitiveness

	Group of medium competitiveness				Group of lower competitiveness			
	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV	LSDV
Foreign competition	0,035 ***	0,032 ***	0,031 ***	0,029 ***	0,011 **	0,008	0,010 *	0,007
Quality of infrastructure	-0,009 **	-0,007 x	-0,008 **	-0,007 x	0,000	0,000	-0,002	-0,002
Macroeconomic environment	0,010 ***	0,010 ***	0,008 ***	0,008 ***	0,011 ***	0,011 ***	0,011 ***	0,011 ***
Quality of education	-0,008	-0,010 **	-0,007	-0,008 x	0,005	0,005	0,008 **	0,008 **
Burden of government regulation	0,014 ***	0,015 ***	0,008	0,010 x				
Size of domestic market					-0,011 **	-0,010 *	-0,010 *	-0,009 x
Hiring and Firing practices	0,000		0,000		-0,004		-0,005 x	
Wage flexibility		0,007 x		0,007 x		0,005 x		0,004
Taxation as a disincentive to work	0,001	0,001			0,004 x	0,004 *		
Taxation as a disincentive to invest			0,008 *	0,008 *			-0,005 x	-0,004
n	205	205	205	205	205	205	205	205
R2	0,29	0,30	0,31	0,32	0,27	0,27	0,27	0,26

NOTES: Dependent variable is employment to population ratio. *** = significant at 1 percent level or better; ** = significant at 3 percent level; * = significant at 5 percent level; x= significant at 10 percent level. LSDV: Least squares dummy variables model. ; RE: random effects model.

Sources: World Economic Forum, GCI; World Bank.

One can see the overreaching importance of the macroeconomic environment in all country groups and for all examined types of variation. We also note that foreign competition tends to enter with a negative sign in highly competitive countries, albeit without significance in the specifications used here. It also has a relatively large, positive, and significant sign for the group of countries with medium competitiveness until their domestic market size is added. The controversy about both the positive and negative effects of globalization in developed and developing countries seem to be present here as well.

It is also interesting that the burden of government regulation, which along with other variables like goods market efficiency were not significant and usually endogenous for the group of highly competitive countries, turns out to be important (i.e., positive, with a relatively high value) in iterations that examine the impact of taxation on labor in countries of medium competitiveness, possibly as it is not a given in this group. Moreover, the existence of a large domestic market seems to be a burden for employment for less competitive countries. This surprising finding merits further investigation and may be related to the positive effect of foreign competition, suggesting that large domestic markets isolated from international markets may struggle to create jobs in less competitive countries. Regarding education, our quantitative measure of labor market performance appears not to be affected by its quality. This result appears in line with the literature and arguments that education is not a necessary condition to increase jobs (Hausmann, 2015), but more likely a condition to

improve job and life quality. The results regarding the quality of infrastructure may hint either toward the inefficient use of government or toward capital-labor substitution.

Regarding taxation, the main focus of our analysis, we find that taxation as a disincentive to work is important for highly competitive countries, with the expected sign, in both LSDV and random effects models—provided the measure of labor market regulation does not include the flexibility of wages. Once that variable is included, only the random effects model assigns significance to taxation as a disincentive to work, albeit with a coefficient that is approximately halved.

As an order of magnitude, taxation as a disincentive to invest and work without hiring and firing practices, the latter when included and the macroeconomic environment are broadly comparable for the group of highly competitive countries. That said, an evaluation of the absolute coefficients is hard to justify, since we compare a scaled index including responses to opinion surveys with a quantitative measure, that is the employment to population ratio, and therefore our approach pays the price of taking a shortcut around the challenges the extensive literature faced head-on.

When looking at taxation as a disincentive to investment the results are similar for the group of highly competitive countries. In the group of countries with medium competitiveness, the appropriate LSDV effects model assigns significance only to the taxation as a disincentive to invest, while the taxation as a disincentive to work reappears with some significance in the group of countries with lower competitiveness. In the case of the latter groups of countries, the between-country variation model, not reported here, does not reveal any significance of taxation.

It appears therefore that for highly competitive countries, in which survey responders also may be a more representative sample of the average employer, taxation as a disincentive to invest and to work are important determinants of employment levels, even though the flexibility of wages emerges both as a more significant variable that has a higher coefficient. On the other hand, countries of intermediate competitiveness appear to rely mainly on the taxation as a disincentive to invest as a coefficient that can influence employment levels.

It is also noteworthy that, while Bassanini and Duval (2006; 2009) include country LSDV effects, which remove between-country variation, and use the tax wedge on the average wage earned by a single earner couple with two children, which may suffer from endogeneity issues, their focus on employment rates of OECD member countries removes the most serious identification concerns.

But the longer time dimension of their dataset likely provides enough within country variation for their analysis to be able to still establish the robust impact of taxation on employment, and in spite of the endogeneity issue that may in practice emerge as too weak to impact the results. It is also noteworthy that when they apply random effects analysis for the impact of the tax wedge on employment levels they obtain robust and similar to ours results and that their focus on about 20 OECD countries implies that they also focus on a small number of developed countries in which the unofficial economy has a relatively marginal presence.

Taken all the above into account, the work of Bassanini and Duval (2006 & 2009) provides, in effect, a robustness check of this investigation, reaffirming the emergence of taxation as important for employment in developed countries with small unofficial economies, as long as some of the major challenges at hand are addressed, if not entirely, at least to a large extent.

In the end, our findings show that highly competitive countries can reduce taxation on work and investment to influence employment. In addition, ensuring wage flexibility can lead to the retention of jobs; (Alexiadis and Ladias, 2011) albeit at presumably lower wages should policymakers decide for increased taxation. However, countries of medium competitiveness, may find it challenging to recoup employment losses induced by increased taxes on investment, especially if globalization is retrenching. These results may help especially countries of medium competitiveness that aspire to enter the group of highly developed countries navigate an environment of retrenching globalization in which highly competitive countries coordinate an agreement to tax corporate income at a minimum level.

Finally, the WEF GCI also includes a variable on the participation of women in the labor force. Analysis based on this variable leads to intuitive results and reaffirms the extensive

literature demonstrating that disincentives to work like taxation first drive out of the labor market more vulnerable groups like women, given the still prevalent tradition in most countries of men being the primary earners in families.

It is also worth commenting on some of the results not presented here and that relate to the fact that education appears not to be a significant factor in all cases. In other variations of the performed regressions, the variables regarding all of the education system or the school system were included and rarely emerged as significant. The extent of staff training appears significant in certain specifications, but with the inclusion of other variables lost its significance. In addition, in some cases the university-business cooperation in R&D does have some significance. This shows that the education system per se does not contribute to the level of employment in a way, say macroeconomic stability does. A caveat here, of course, is that this result does not tell us anything about the importance of education to advance civic society and the quality of jobs, which goes without saying is very important and is not measured in our metric of employment to population ratio.

The major departure of our findings from the literature thus is the ability to examine a comprehensive data set with large number of countries and the finding that taxation deemed as excessive seems to robustly discourage employment in highly competitive countries. Bypassing the challenges that compromise approaches that use traditional datasets, the executive opinion survey allows us to confirm that taxation matters for employment at the macro level, at least under the caveats raised by our approach, thus encouraging a persistence of research on the matter and with the aim to overcome the challenges posed by traditional datasets for developed countries and to expand datasets to developing countries as well. Our results are flanked by the importance of labor market efficiency, foreign competition and macroeconomic stability for employment.

7. Concluding remarks

Among developed countries, which rank high in competitiveness and institutional maturity and that share common key attributes, it is argued that when taxation is considered by business executives to be a disincentive to work, lower levels of employment for a given population are observed. Highly competitive countries can use both the flexibility of wages and taxation on investment to influence the level of employment, while less competitive countries apparently have to rely mainly on the taxation of investment as a variable that can influence employment levels in their jurisdiction.

These results are based on responses to an executive opinion survey that offers us the opportunity to bypass a number of challenges that have restrained other research from examining both within and between variation among countries and are in line with the results of research that overcomes these challenges at the micro and macro level. Our results offer an encouragement for such research to persist and overcome these challenges with decreasing compromises, as in our case the bypassing of the challenges comes at the cost of not being able to estimate elasticities and to extend detailed research to developing countries, taking into account factors like informality. Our results also shows the concurrence of business executive assessments with the results of other research, emphasizing the importance of country group heterogeneity and, among others, the taxation of labor.

This result has heightened importance for policy makers in this current conjecture due to the disruption of the technological innovation on the economy as a whole and the labor force in particular. The stakes are defined by the need to maximize the benefits of exponential developments in the digital age that offer opportunities and risks for growth and employment, in parallel with the challenges that arise from economic stagnation, social and economic exclusion of the less advantaged society members and the still recent global pandemic crisis. Surely, one needs to view these results not only by contemplating equalizing taxes on machines, also, by carefully contemplating a reduction in the tax wedge especially in cases where non-reciprocated over-taxation exists and would be compatible with an inversion of the Laffer curve. The pressures exerted on employment by the forces of globalization and the need for a favorable macroeconomic environment, both of which are posing challenges in the post financial crisis and post pandemic era, implies that the important impact of taxation on employment needs to be taken into account by policymakers. At the same time, the tax system

should not be considered a disincentive for investment and the negative impact of globalization on affected groups should be the focus of targeted policies.

Regarding future research and the handling of the measurement, identification and endogeneity problems without compromising the information data contains, and with respect to the use of the income share of labor, especially with respect to the resolution of identification and endogeneity problems, more detailed data on the parameters of the tax system beyond the medium and median tax wedge will be needed. In addition, there is a need to handle the fact that national accounts include taxes on employment, product and production. Such detailed data, once collected, should be used, among others, to test if the acceleration of the tax schedule's progressiveness becomes a ceiling that discourages the growth of wages thus placing an upper limit on the country's potential growth. It could also be used to persist with the question of how taxation affects employment beyond the opinion of business executives.

Finally, an agenda for further research needs to include an elaboration of the reasons that explain the fact that the established relationship breaks down in less competitive countries. Especially it is of interest if this is affected by the size of the unofficial economy and employment that is compatible with such activities or if the general deterioration of some indexes in these countries means that at the end taxation becomes less important as a determinant of the level of employment.

8. References

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MACROECONOMIC EFFECTS OF TELEWORKING IN EU27: STOCHASTIC FRONTIER APPROACH

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Abstract

The main aim of this paper is to investigate macroeconomic effects of teleworking during the COVID-19 pandemic, using an atypical approach. We apply stochastic frontier analysis to a Cobb-Douglas production function broadened with teleworkability variable, and analyse the level of (in)efficiency of EU27 countries in producing their GDPs. We find that increasing the percentage of jobs that can be done at home by 1 percentage point reduces the level of technical inefficiency by 3.5%. Additionally, we use a unique e-survey conducted in April and May of 2020, which provides the data on the share of people who started working from home as a results of a COVID-19 situation, and combine it with the teleworkability variable. Overall, our findings suggest that more developed EU countries have a higher share of teleworkable jobs, which in turn reduces their inefficiencies, and furthermore results in more people beginning to work from home in the pandemic.

Keywords: teleworking, production function, stochastic frontier analysis, EU, COVID-19

JEL classification: C21, O4, O33, O52

1. Introduction

The unanticipated spread of the global pandemic caused by COVID-19 has dramatically changed the classic workplace, forcing many organisations to shift to remote work. In such a specific situation, research on teleworking becomes increasingly important. As noted by ILO (2020), working from a distance and working at home are not new phenomena, but the relevance of measuring them has increased.

Admittedly, this sort of research has existed before, but the focus has been on its advantages and disadvantages (Baruch, 2000; Morgan, 2004), its impact on commuting (Kane and Tomer, 2015), improving organizational outcomes (Bloom et al., 2015; Martin and MacDonnell, 2012), productivity (Bloom et al., 2015); firm performance (Martínez Sánchez et al., 2007), local income (Gallardo and Whitacre, 2018), its psychological impact (Mann and Holdsworth, 2003), etc. The new situation caused by COVID-19 offers a unique opportunity to investigate the effects of teleworking, from a national – macroeconomic – perspective.

Teleworking can influence GDP – key macroeconomic indicator - through influencing productivity. Teleworking affects productivity via two main channels: worker efficiency and cost reduction. By enabling better work-life balance, less commuting and fewer distractions, teleworking may lead to more focused work and less absenteeism, thus resulting in worker satisfaction. The opposite happens when due to solitude, hidden overtime, fusing of private and work time, reduced number of in-person interactions, decreasing knowledge flows among employees and inappropriate working environment, telework results in worker dissatisfaction. On the cost reduction side, telework can lower capital costs by reducing office space and equipment required by the firm, by enlarging the pool of workers available to the firm as well as by increasing the skill supply and improving the match between jobs and hires. Additionally, hiring costs may decrease if higher worker satisfaction reduces voluntary quits and turnover. Overall, worker efficiency seems to improve with low levels of telework, but decrease as telework becomes the dominant mode of work (OECD, 2020).

This paper investigates the impact teleworking has on the reduction of inefficiencies in the production process. This issue is analysed from a macroeconomic i.e. national standpoint. A starting point is the classical Cobb-Douglas production function with two inputs: labour and capital. A stochastic frontier analysis is then applied, which relies on the estimation of technical efficiency measured as the ratio of observed output to the corresponding stochastic frontier output for each country. Additionally, we introduce an exogenous variable –

teleworkability - in the inefficiency model, which enables us to assess whether this helps to reduce the level of technical inefficiency.

Furthermore, we plot the data on the share of jobs that can be done at home against the share of people that started working from home as a result of COVID-19 situation, and observe whether the countries with higher share of teleworkable jobs have experienced correspondingly higher teleworking during the pandemic. For this, we use a unique e-survey conducted in April/May 2020 by the Eurofound (2020).

The contributions of this paper are as follows. Firstly, the effects of telework from a macroeconomic perspective have so far been under investigated, so this paper attempts to fill in that gap. Additionally, we use an idiosyncratic database on the share of jobs that can be done at home (teleworkability), and combine this data with the standard macroeconomic production function, thus analysing whether teleworkability helps reduce inefficiencies in the production. This approach has not been used before, to the best of our knowledge. We, furthermore use another unique database, which provides the data on the percentage of people that started working from home with the start of the pandemic, and draw conclusions regarding the macroeconomic impact of the actual level of teleworking that took place in April/May of 2020.

This paper is organised as follows. Section 1 gives stylised facts regarding teleworking in Europe in the pre- and mid-COVID-19 period; Section 2 explains research methodology – stochastic frontier analysis and the data used in the empirical approach, while Section 3 discusses the Results and its implications. Conclusions are given in the final section.

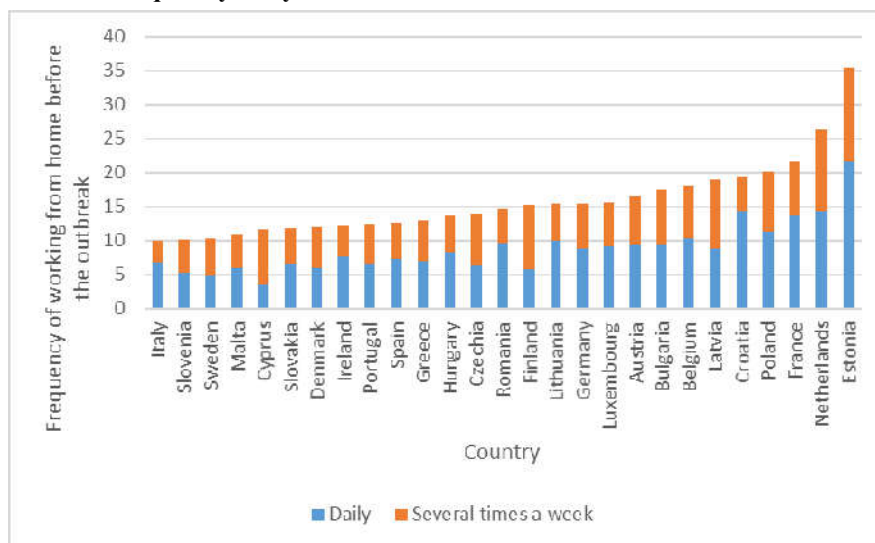
2. Stylised facts about teleworking in EU27

In this section, we look at some stylised facts in the pre- and mid-COVID-19 period, to observe changes that COVID pandemic induced in teleworking in Europe.

Macroeconomic effects of shocks such as pandemics are usually measured with aggregate time-series data, such as industrial production, GDP (growth) and/or unemployment rate. These datasets, however, are typically available with a time lag even in ‘normal’ times; moreover, the data from 2020 on any series is still unavailable, so the full impact of COVID-19 pandemic will have to be analysed in years to come.

What we can do is to use various sources that have managed to collect some real-time data, and observe the changes that pandemic has caused. One of these unique sources is Eurofound (2020), which conducted an e-survey called Living, working and COVID-19 , which provides a snapshot of the impact of the pandemic on certain aspects of people’s lives.

Figure 1: Data on answers: 'daily' and 'several times a week' for respondents in the EU27 when asked: How frequently did you work from home before the outbreak of COVID-19?



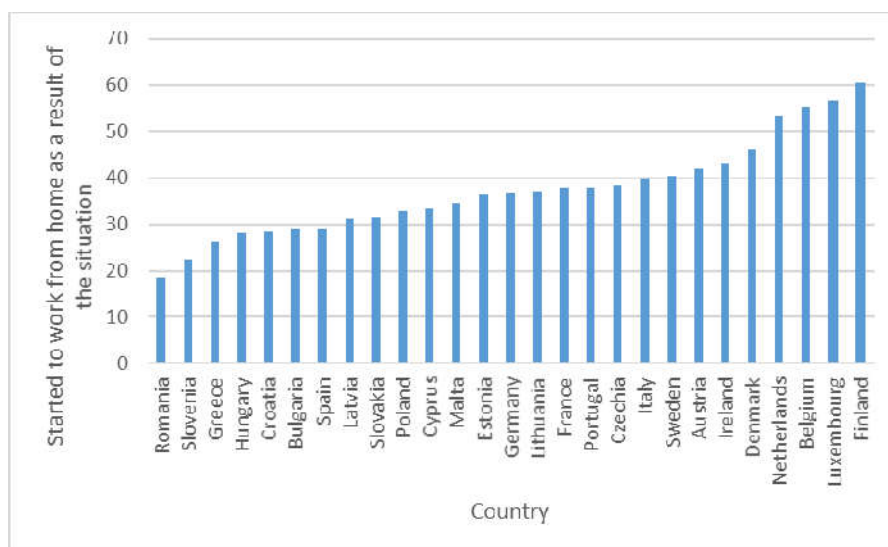
Source: Eurofound (2020) and author's calculations

Figure no. 1 gives the data on frequency of people who worked from home before the pandemic. On average, 15.7% of all respondents in EU27 worked from home on daily or weekly basis. This percentage was the highest in the Estonia (35.4%), followed by

Netherlands (26.4%) and France (21.7%). Italy and Slovenia, on the other hand, had the lowest percentage – only 10 percent of people working regularly from home.

Figure no. 2 shows what happened after the pandemic, where, on average, 37.28% of EU27 residents started working from home in this new situation. Finland, Luxembourg and Belgium exhibited highest percentages of teleworkers and these were 60.5%, 56.6% and 55.1%, respectively. In Romania and Slovenia, on the other hand, the number of people that started working from home during the initial stages of pandemic was below 25%.

Figure 2: Data on answers 'Yes' for respondents in the EU27 when asked: Have you started to work from home as a result of the COVID-19 situation?

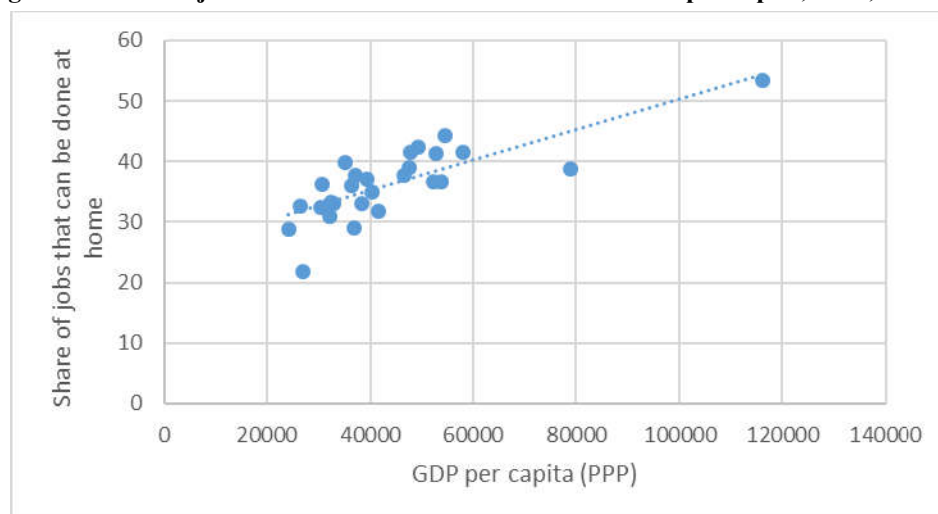


Source: Eurofound (2020) and author's calculations

Overall, the pandemic, expectedly, seems to have contributed to a large increase in teleworking. It should be stressed, however, that not all jobs are teleworkable. Some jobs simply cannot be done remotely. Most low- and middle- skilled occupations, for example, are not teleworkable. Another unique database which turns out to be very useful in current situation is the one constructed by Dingel and Neiman (2020), which lists the percentage of jobs in each country that can be done at home, or teleworkable jobs (teleworkability). In Section 2 we use this variable as an input into the quantitative analysis investigating the (in)efficiency of production in EU27 countries.

Figure no. 3 plots this idiosyncratic variable - the share of jobs that can be done at home - against GDP per capita for each of the EU27 countries.

Figure 3: Share of jobs that can be done at home versus GDP per capita, 2018, in EU27



Source: Dingel and Neiman (2020) and author's calculations

A clear positive relationship is visible between income levels and teleworkable jobs, meaning that in more developed countries the share of teleworkable jobs is higher. It is possible, therefore, that the higher share of teleworkable jobs “greases the wheels” of an economy, by helping it become more efficient in its production. We investigate next this issue in more detail.

3. Methodological approach and data

As indicated in the Introduction, teleworking influences GDP via influencing productivity, and this impact takes place through two main channels: worker efficiency and cost reduction.

Productivity and efficiency are often used interchangeably, although they refer to somewhat different notions. Namely, productivity is the ratio of output to input(s), while efficiency refers to the achieved level of output, in relation to the maximum that can be produced, given the inputs, various restrictions and existing technology. Efficiency, therefore, takes into account constraints that prevent increases in productivity. To the extent that efficiency is a more comprehensive concept than productivity, in this paper we investigate technical efficiency of countries in achieving their respective GDPs, accounting for the impact of teleworking.

Farrell (1957) was the first one to lay foundations of the theory of efficiency and its measurement, where he differentiated between three key measures of efficiency: overall, technical and price efficiency. Technical efficiency, which we focus on in this paper, can be defined as the ability of a unit (be it firm, country or something else) to achieve maximum output from a given set of inputs. Put differently, technical inefficiency exists when a higher level of output can technically be attainable from the given inputs. This is a so-called output oriented measure of technical inefficiency. In this case, inefficient units are located below the production frontier (Kumbhakar et al., 2015).

There are nowadays two dominant approaches to estimating technical efficiency and these are Data envelopment analysis (DEA) and Stochastic frontier analysis (SFA). Both approaches rely on the estimation of a frontier whereby the efficiency in the production of output is measured relative to a frontier (potential or maximum output) for each unit/country. This efficient frontier is not some absolute standard; rather it is derived from the best practices contained in the sample under consideration. Therefore, all the (in)efficiencies are only relative (in)efficiencies, given the observed data. Since the true frontier is unknown, an empirical approximation is needed, which is frequently labelled a “best practice” frontier.

Two main differences exist between these two approaches: while DEA is a non-parametric approach, SFA is a parametric approach. This means that many a priori assumptions about the structure of the production possibility set and the data generating process have to be made in SFA. Even though this seems to be a rather large drawback of SFA, its advantage stems from the fact that it allows us to assume a stochastic relationship between inputs and outputs, i.e. to assume that deviations from the frontier reflect not only inefficiencies but also noise in the data.

Our model is a standard Cobb-Douglas production function with two inputs: labour and capital, and one output – production (GDP). A general formulation of the simple multi-input single-output stochastic frontier model for cross-sectional data is given as:

$$\begin{aligned}
 y_i &= \alpha + x_i' \beta + \varepsilon_i, \quad i = 2, \dots, N & (1) \\
 \varepsilon_i &= v_i - u_i \\
 v_i &\sim \mathcal{N}(0, \sigma_v^2) \\
 u_i &\sim \mathcal{N}^+(\mu, \sigma_u^2) \\
 \mu_i &= z_i' \psi
 \end{aligned}$$

where y_i is the logarithm of GDP of the i -th unit (country in our case), x_i is a vector of inputs (labour and capital) and β is the vector of technology parameters. The composed error term, ε_i , is the difference between a normally distributed disturbance, v_i , representing measurement and specification error, and a one-side disturbance, u_i , representing inefficiency, z_i is a vector of exogenous variables (including a constant term), and ψ is the vector of unknown parameters to be estimated (the so-called inefficiency effects). In addition, u_i , and v_i are assumed to be independent of each other and independently and identically distributed across observations. In this approach, distribution has to be assumed, and frequent choices include half-normal, exponential, or truncated normal distribution (Belotti et al., 2013). We

use the latter, whereby the notation $\mathcal{N}^+(\mu, \sigma_v^2)$ indicates a truncation of the normal distribution at 0 from above, with μ representing the pre-truncation mean parameter. Maximum likelihood (ML) technique is used for estimation (Kumbhakar et al., 2015).

Table 1. Data sources and definitions

Variable	Indicator(s)	Source
y	Output-side real GDP at chained PPPs (in mil. 2017US\$)	Feenstra, Inklaar and Timmer (2015)
k	Capital stock at constant 2017 national prices (in mil. 2017US\$)	Feenstra, Inklaar and Timmer (2015)
l	Number of persons engaged (in millions)	Feenstra, Inklaar and Timmer (2015)
<i>telework</i>	Share of jobs that can be done at home – teleworkability (in %)	Dingel and Neiman (2020)

4. Results and discussion

We use cross-sectional data since the data on teleworkability is available only for one period i.e. year, namely 2018. All variables (except telework) are in logarithms. Countries under investigation comprise of EU27.

An important issue in this sort of analysis is the insertion of exogenous variables in the model, which are supposed to affect the distribution of inefficiency. This is also one of the reasons we opted for truncated normal distribution, as this option is available only under such an assumption. These variables are typically neither inputs nor outputs; rather they are factors that affect the unit/country performance (Belotti et al., 2013). We use our variable on teleworkability (*telework*) as this exogenous variable.

Table no. 2 gives the results of the truncated-normal model as given by equation no. 1, with exogenous determinants in μ (*mu*) and σ_u^2 (*Usigma*). Following Wang (2002), μ and σ_u^2 are parametrised by the same vector of variables, in our case teleworkability (*telework*). This parametrisation of *mu* means that the mean of the truncated normal distribution is a linear function of *telework*, while *Usigma* specifies that the technical inefficiency component is heteroskedastic, with the variance expressed as a function of *telework*.

Table 2 Results of SFA for Cobb-Douglas production function with truncated-normal distribution for inefficiency term

	(1) lny	(2) lny
Frontier		
lnl	0.777*** (0.115)	0.825*** (0.0839)
lnk	0.292*** (0.0997)	0.261*** (0.0712)
_cons	7.968*** (1.395)	8.614*** (0.958)
Mu		
telework	-0.0277*** (0.00860)	-0.0385*** (0.00935)
_cons	1.558*** (0.459)	2.220*** (0.350)
Usigma		
telework	0.0152 (0.133)	0.158* (0.0877)
_cons	-4.889 (5.137)	-9.385*** (3.228)
Vsigma		
_cons	-3.934*** (1.036)	-31.06 (708.2)
N	27	26

Standard errors in parentheses

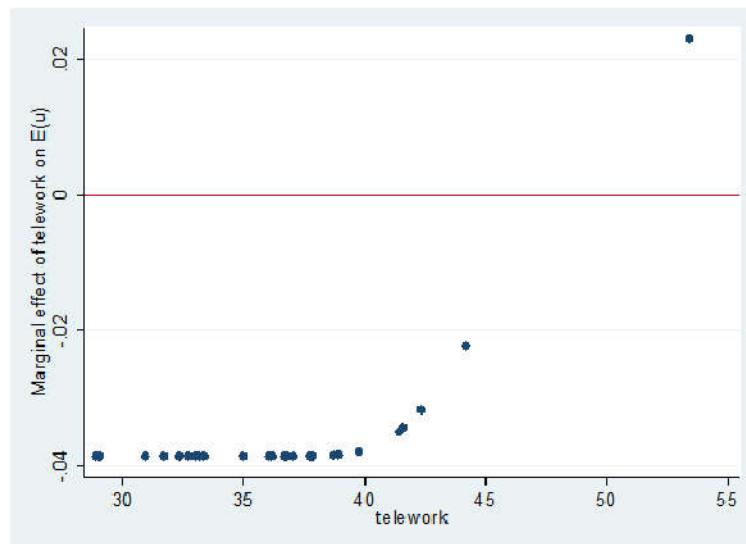
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Model given in column (1) presents the results for the full sample (EU27), while the results in column (2) exclude Romania. Namely, the results in column (1) - insignificance of the coefficient of telework for Usigma - urged us to undertake sensitivity analysis by excluding extreme observations. Romania was chosen as it had the lowest value of telework in the sample. At the other extreme was Luxembourg with the largest value of telework, an issue that is discussed lower in the text. The log-likelihood value of models (1) and (2) are 7.96 and 9.97, respectively, which is higher than log-likelihood value of the half-normal specification (not reported, but available upon request) of 2.44. The LR test, therefore, clearly supports the truncated-normal specification with determinants of inefficiency, over the half-normal specification. Additionally, larger LR value, and the significance of the coefficient of telework for Usigma both speak in favour of model (2). We, hence, proceed with this model.

The coefficients on capital and labour are both positive and statistically significant, in line with expectations. The significant coefficient on telework in μ implies that the inclusion of telework in this model is supported by the data. The negative sign on telework means that increasing the percentage of teleworkability i.e. of teleworkable jobs in an economy, reduces, on average, the level of technical inefficiency. The estimated coefficients on telework on μ and Usigma in table no. 2 are not directly interpretable due to the non-linearity of the model; hence marginal effects of the technical inefficiency should be computed. Average marginal effect of -0.035 in our sample suggests that an increase in the share of jobs that can be done at home (teleworkability) by 1 percentage point reduces the level of technical inefficiency by 3.5%.

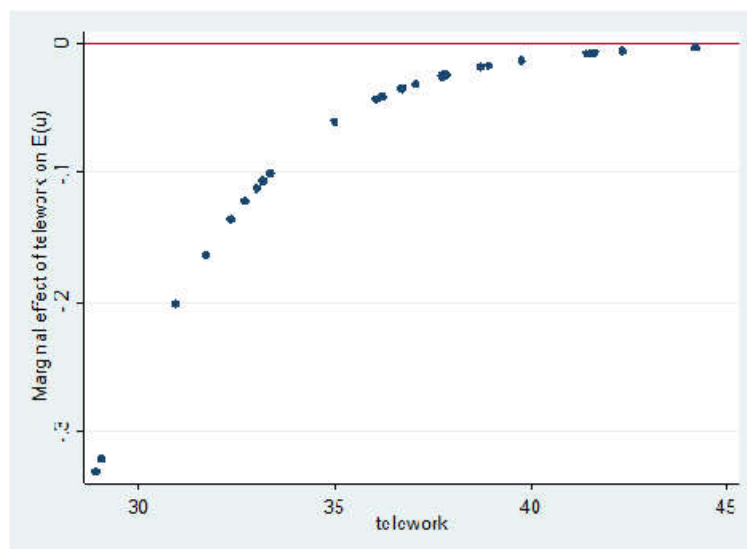
As noted by Kumbhakar et al. (2015), an advantage of Wang (2002) model, applied here, is the accommodation of nonmonotonic efficiency effects, which means that the marginal effect of telework on inefficiency can alternate in terms of the sign, depending on the value or the percentage of telework (and the values of other variables). To check for this we draw a scatterplot (figure no. 4) of marginal effects against values of telework.

Figure 4: Marginal effect of telework on inefficiency in EU26



Source: author's calculations

The graph given in figure no. 4 indicates that for majority of observations the marginal effect is negative, and that the size of the negative effect is larger when the value of telework is smaller. As the percentage of jobs that are teleworkable rises, the marginal effect moves towards zero, and eventually becomes positive. This result indicates that there exists an optimal level of teleworkability in an economy with regard to technical efficiency improvement. In our data, that optimal percentage is around 48.5%. Expanding the share of teleworkability above this does not improve technical efficiency. The one positive value pertains to Luxembourg, which seems to be an outlier in the sample. As a robustness check we, therefore, repeat the procedure just described, leaving out Luxembourg this time, in which case the scattergram of marginal effects exerts the shape given in figure no. 5

Figure 5: Marginal effect of telework on inefficiency in EU25

Source: author's calculations

Figure no. 5 indicates, again, that the marginal effects are negative, but approaching zero, and optimum seems to be somewhere above 45% of telework, which is in line with our previous conclusions.

It should be stressed at this point that the data on the percentage of people that occasionally teleworked before the pandemic (as presented in figure no. 1) differs from the data of the scope of jobs that can be done via telework (as given in figure no. 3 and used in the empirical part of the paper). Namely, jobs that tolerate doing some tasks from home may not be apt to be done completely from home. As an example consider Sweden, where 57.2% people in 2015 reported that they did some telework at home, while only 30.7% of jobs could actually be done completely remotely after the outbreak of the crisis (OECD, 2020). Our finding that the optimal share of teleworkable jobs in an economy is below 50%, speaks in favour of this argument.

Finally, one of the key reasons for applying SFA is to obtain the technical efficiency, i.e. the ratio of observed output to the corresponding stochastic frontier output. This measure takes a value between zero and one hundred and measures the output of the i -th country relative to the output that could be produced by a fully-efficient country using the same input vector. In our sample the average technical efficiency is 46.33%. Individual technical efficiencies are given in table no. 3.

Table no. 1 Technical efficiency scores for individual countries

Country	Technical efficiency	Rank
<i>Austria</i>	51.4	6
<i>Belgium</i>	49.5	8
<i>Bulgaria</i>	32.5	25
<i>Croatia</i>	36.4	21
<i>Cyprus</i>	46.5	10
<i>Czech Republic</i>	38.2	19
<i>Denmark</i>	53.8	4
<i>Estonia</i>	44.2	11
<i>Finland</i>	51.1	7
<i>France</i>	43.1	12
<i>Germany</i>	41.9	15
<i>Greece</i>	33.3	24
<i>Hungary</i>	34.6	23
<i>Ireland</i>	100.0	1

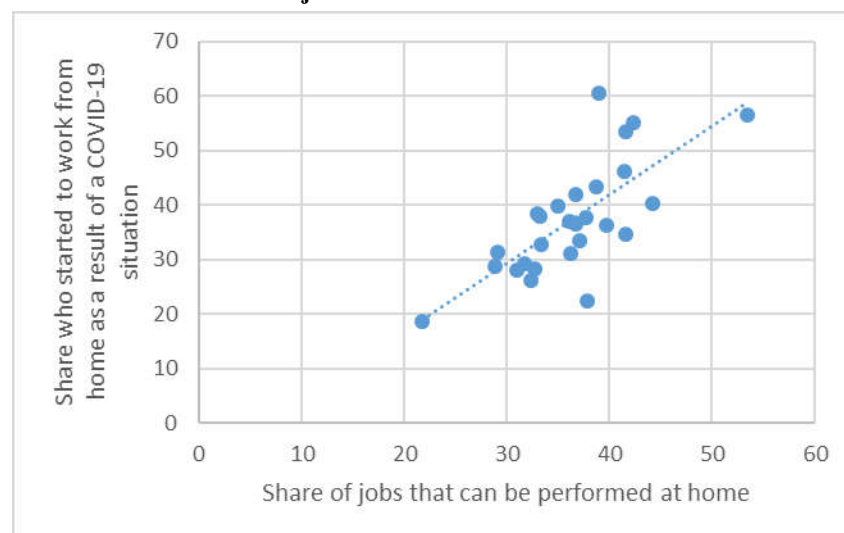
<i>Italy</i>	39.2	18
<i>Latvia</i>	36.3	22
<i>Lithuania</i>	42.5	14
<i>Luxembourg</i>	72.4	2
<i>Malta</i>	62.6	3
<i>Netherlands</i>	49.2	9
<i>Poland</i>	43.0	13
<i>Portugal</i>	31.9	26
<i>Slovakia</i>	37.1	20
<i>Slovenia</i>	40.6	17
<i>Spain</i>	41.6	16
<i>Sweden</i>	52.1	5

As can be seen from table no. 3, Ireland is the most efficient country in the sample, followed by Luxembourg and Malta. At the other side of the spectrum, the most inefficient countries are Greece, Bulgaria, and Portugal, technical efficiency of Portugal being only 31%. There is, therefore, room for improvement in majority of countries, with inefficiencies reaching above 50%.

After having established that the pre-COVID data (year 2018) suggests that increasing the percentage of teleworkable jobs in an economy helps reduce the level of technical inefficiency, i.e. that those countries that have a larger percentage of teleworkable jobs have higher GDPs, we next look at the connection between teleworkability and the actual level of teleworking that took place in April/May of 2020.

Figure no. 6 compares the share of jobs that can be done at home and the share of people that started working from home as a result of the pandemic.

Figure 6: Share of people who started working from home as a result of COVID-19 situation versus share of jobs that can be done at home in EU27



Source: Eurofound (2020) and Dingel and Neiman (2020) and author's calculations

The two observed variables show a very close correspondence, the slope of the trend line being 1.26. This result suggests that in those countries with the higher share of jobs that are teleworkable, a larger number of people started working from home as a result of COVID-19 situation. Overall, our results indicate that the structure of the economies of the more advanced countries is such that they have more teleworkable jobs, and furthermore in these economies more people started working from home after the pandemic started, thus adjusting better to the new situation. Less developed EU27 countries, therefore, might face more challenges than more developed ones in continuing to work remotely.

Furthermore, dividing the results according to sex and age (not reported but available upon request), enables us to reach the following conclusions:

The share of males who started working from home as a result of the pandemic is positively related to the share of jobs that can be done at home, and the slope of the trend line is even steeper in this case, amounting to 1.91;

The share of females who started working from home as a result of the pandemic is positively related to the share of jobs that can be done at home, but with the slighter slope of the trend line of 0.98, suggesting that this relationship is somewhat weaker for women than men;

As for the division by age groups, in all three groups analysed (18-34, 35-49, and over 50 years of age), share of people who started working from home as a result of the pandemic is positively related to the share of jobs that can be done at home. The slope of the trend line is 0.71, 1.26 and 0.34, respectively. This suggests that, expectedly, this relationship is the weakest for the age group of those above 50 years of age, as the adjustment to new technologies and trends is more challenging for this group. The relationship is the strongest for those aged 35-49.

5. Conclusion

The main aim of this paper is to investigate macroeconomic effects of teleworking during the COVID-19 pandemic. Since the pandemic is still ongoing and macroeconomic data is published with a delay, it is practically impossible to undertake a standard panel data approach to analysing the effects of the pandemic on key macroeconomic variables. The approach we adopt, therefore, is somewhat atypical. Firstly, we make use of the data published by Dingel and Neiman (2020) on the share of jobs that can be performed at home, i.e. that are teleworkable. Dingel and Neiman (2020) is a sole source of such data, and they have provided the data for 2018 only, so our first part of the analysis is restricted to this year. We apply stochastic frontier analysis to a typical Cobb-Douglas production function, and analyse the level of (in)efficiency of EU27 countries in producing their GDPs. A specificity of our approach lies in the fact that we broaden the model by including the teleworkability variable, which, we hypothesise, affects the distribution of found inefficiencies. Indeed, our results indicate that increasing the percentage of jobs that can be done at home reduces the level of technical inefficiency by 3.5%. Moreover, we find that the optimal percentage of teleworkable jobs in an economy is just below 50%. This result, which refers to year 2018, thus establishes the situation in the pre-COVID-19 period. In the next step, we make use of a unique e-survey conducted in April and May of 2020, which provides the data on the share of people who started working from home as a results of a COVID-19 situation, and combine it with aforementioned teleworkability variable. Overall, our findings suggest that more developed EU-27 countries have an edge in the pandemic on the less developed ones. In other words, their economies have a higher share of teleworkable jobs, which in turn, reduces their inefficiencies, and furthermore results in more people beginning to work from home in the pandemic. Additionally, we find this relationship to be stronger for men than women and for the age group of 35-49, compared to those younger than 35 and older than 49 years.

Admittedly, a drawback of our research refers to the fact that we investigate a cross-section of countries during only one year (2018), due to data unavailability for other years. One of potential extensions of our research, therefore, would be the inclusion of more years in the future, as the data on teleworkability becomes available. Additionally, the data on the share of people who started working from home with the start of the pandemic was available only for the period April/May 2020, so future research could benefit from a longer series on this variable and panel-type investigation of the macroeconomic effects of the pandemic. Finally, it should be emphasised that we have assessed relative, not absolute efficiencies, meaning that they refer only to the countries in our sample. On the other hand, since all EU27 countries are included in the analysis, population can be considered to be sampled exhaustively, so the fact that we cannot extend our conclusions outside our sample becomes irrelevant.

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TOOLS AND TESTING OF THE ASSESSMENT OF BUDGET CAPACITY OF THE MUNICIPAL LEVEL (CASE STUDY OF THE RUSSIAN FEDERATION)

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Abstract

Purpose: To detail the system of indicators and, on their basis, develop an integral index for assessing municipalities' budget capacity level, which makes it possible to substantiate the choice of a model of financial support for the functioning of local budgets.

Design / methodology / approach: The information base includes works of leading Russian and foreign scientists on the issues under study, reports issued by the Federal Treasury of Russia and the Federal Tax Service of Russia, statistical data from the Federal State Statistics Service and the International Monetary Fund. The research is of complex nature, as it involves a set of fundamental general scientific and special methods, in particular, dialectical and logical methods, horizontal and vertical analysis of financial ratios, statistical and cluster analysis, etc.

Findings: The article presents a system of groups, indicators and author's method for a comprehensive multidimensional assessment of the municipalities' budget capacity level. On its basis it is possible to choose an optimal financial support model to support local budget functioning, worked out for municipal districts. The results of integral assessment of the data on the Vologda Oblast taken as a model region, indicate that budget capacity of most municipalities in 2006-2018 was at the average and below average level. Thus, the region misses certain opportunities for development of its budget capacity. At the same time, the conducted calculations show the prevalence of the fourth-type model of financial support for the settlement network, i.e. a differentiated approach depending on the indicator of budgetary provision of settlements.

Research / practical implications: The results obtained contribute to the development of theoretical science and form the foundation for applied use by state authorities and local governments in the implementation of methodological approaches, assessment methods, methodological tools for substantiating budget policy decisions, and can also be used in the scientific activity and educational process.

Originality / value: The scientific value of the research lies in the development of methodological tools for assessing the level of municipalities' budget capacity when determining the model for financing settlements.

Keywords: Russian Federation, region, budget capacity, municipalities, local government, local budget, assessment

JEL classification: H77, G18, H61

1. Introduction

In the context of world economy globalization and spatial transformations of social relations, the achievement of economic growth is directly linked to the effectiveness of internal sources formation. In world science and practice, sustainable municipal development is one of the most important drivers of national growth (Kratke, 2002; Lockner, 2013; Silem, Fontanel, Pecqueur, Bensahel-Perrin, 2014; Azoulay, Cote, 2017; Aliasuddin, Dawood, Rahmi, 2021). The high relevance of local economy and municipal finance development in the unprecedented era of rapid urbanization was highlighted in the Territorial Agenda of the European Union 2020 (Territorial Agenda of the European Union 2011) and the New Urban Agenda adopted by the UN General Assembly up to 2030 (New Urban Agenda, 2017).

As noted by RAS Academician A.D. Nekipelov, it is necessary to push economic development by restructuring all mechanisms of its functioning (Nekipelov, 2009). At the same time, in the studies of many Russian and foreign scientists, the role of the micro-level is assigned to municipalities as a fundamental link in the administrative-territorial system of the state (Maslikhina, 2018; Belyakova, Vorobyeva, 2018; Tatarkin, Gershanok, 2006; Manaeva, Kanishteva, 2017; Odintsova, 2011; Friederich, Kaltschütz, Nam, 2004; Slack, 2009; Perekrestova, Kharitonov, 2016; Fedotova, Zhiglyayeva, Stolyarova, 2018; Kozhevnikov, 2019). The reasons for that are the following: first, a local self-government helps the population to adapt to changing political, economic, social and other living conditions, and, second, according to the principle of subsidiarity, it takes into account resources, conditions, specifics of territories, needs and population's interests when elaborating adequate solutions of state problems.

It is no coincidence that the municipal level is responsible for creating and maintaining conditions for human capital reproduction. Local budgets of the Russian Federation concentrate more than 60% of the expenditure on the social sphere, including preschool and general education, physical culture and mass sport, and social security of the population. At the same time, the conducted studies of the state of local budgets in Russia indicate that local governments do not have the revenue base sufficient to solve local issues (Pechenskaya, 2019; Pechenskaya-Polishchuk, 2020; Rastvortseva, 2017; Belyakova, Vorobyeva, 2018; Rastvortseva, Manaeva, 2016). Up to date there is no mechanism for generating local budgets' revenue that creates a stimulating effect for local administrators and boosts the volume and improves the quality of municipal services to the population. In turn, this creates a discrepancy between the need for long-term municipal development and the availability of effective tools for its financial support, and, therefore, does not allow for the full correlation of fiscal policy tools with the task of economic growth. It is quite obvious that municipal development should be based on the growth of financial resources and expansion of territory's budget capacity, which predetermines such growth. It is important that financial mechanisms act as a means of solving problems of municipal development, and not their cause.

The formation of an optimal model of inter-budgetary relations is a critical condition for developing budget capacity of a region in the federal state. We agree with the researchers' opinion (Bukhvald, Beskultanov, 2008) that the formation of an effective, that is economically justified, network of municipalities of various types, especially budgets of the settlement level, has a significant role in this case, as their creation is often isolated from the financial and economic base. At the same time, scientists (Bukhvald, Beskultanov, 2008) consider an effective network of settlements as the network that meets real socio-economic conditions and budgetary possibilities of territories; correlates benefits and costs of introducing settlement budgets; has prerequisites for the long term development of settlements; helps enhance an intra-regional financial equalization system; and takes into account risks from the inefficient use of budgetary funds. Moreover, it is statutorily prescribed that the budgetary provision of settlements is equalized on the district level, therefore a significant part of the allocated budgetary funds passes through municipal districts and ends up in the settlement budgets. This means that monitoring assessment of the municipalities' budget capacity level can be considered as a tool for determining the type of financing the settlement network of the region.

At the same time, even taking into account many studies of municipal problems, methodological issues of assessing the current level of budget capacity of municipalities remain an urgent scientific task.

2. Research methods

The analysis of Russian and foreign scientific works on budget capacity assessment shows that the existing tools can be combined into two broad groups, the advantages and disadvantages of which are actively discussed in scientific circles (Table 1).

Table 1: Comparative analysis of some methods for assessing budget (tax) capacity of a region (municipality)

Method	Revealed advantages	Revealed disadvantages
<i>Group 1: Methodological tools for assessing budget capacity of a region</i>		
Method for municipalities' budget capacity sustainability (authors S.N. Yashin, N.I. Yashina)	<ul style="list-style-type: none"> - Possibility of application when comparing budget capacity of different territories at different time intervals. - Selection of a base indicator and on its basis construction of the rating assessment of budget capacity of municipalities. 	<ul style="list-style-type: none"> - Presence of negative / close to zero values that distort the result. - Use of correlation coefficients as weights in calculating the rating assessment of budget capacity of municipalities. The correlation coefficient value is in the range from -1 to 1. Then, when multiplied by the coefficient as a weight, in case it is close to zero, the value of this aggregated indicator will be leveled.
Method for calculating budget capacity of a region (author Zh.G. Golodova)	<ul style="list-style-type: none"> - Possibility to compare potential of different territories. - Relative simplicity of calculations. 	<ul style="list-style-type: none"> - Insufficient objectivity of the calculation due to the use of a small number (4) coefficients.
Method for calculating budget capacity of a region (author S.V. Zenchenko)	<ul style="list-style-type: none"> - Calculation of the budget capacity value with regard to the likelihood of fulfilling tax and non-tax obligations, which makes it possible to determine the level of real and latent tax and non-tax potential. 	<ul style="list-style-type: none"> - Calculation of indicators only in absolute terms, which makes it difficult to compare the indicator value both in terms of different territories and dynamics.
<i>Group 2: Methodological tools for assessing tax potential of a region / municipality</i>		
Assessment of tax potential using a total taxable resources indicator	<ul style="list-style-type: none"> - The TTR indicator as a measure of fiscal potential reflects the actual volume of tax resources available to a region more accurately than GRP. 	<ul style="list-style-type: none"> - Laboriousness of calculating the TTR indicator due to the need to collect a large amount of retrospective information
Method for assessing tax potential based on actual data	<ul style="list-style-type: none"> - Use of ready-made data from the consolidated reporting of tax authorities, which simplifies the calculation of potential 	<ul style="list-style-type: none"> - Complexity of planning indicators, since the calculation does not use the tax base - The only use of actual tax revenues does not stimulate self-government bodies to increase tax collection.
Tax potential regression analysis method	<ul style="list-style-type: none"> - Possibility to quantitatively describe the relationship between tax potential and its factors. 	<ul style="list-style-type: none"> - Subjectivity due to ambiguity of the choice of factorial features for analysis
Representative tax system method	<ul style="list-style-type: none"> - Inclusion of key taxes in the calculation and reflection of income opportunities, which are taken into account when distributing funds in the framework of inter-budgetary regulation. 	<ul style="list-style-type: none"> - Need for a significant amount of data on collected taxes.
Method for assessing tax potential through gross local product	<ul style="list-style-type: none"> - It takes into account income of residents and non-residents 	<ul style="list-style-type: none"> - Lack of a number of indicators in the Russian municipal statistics.
Method for assessing tax potential based on average per capita income of the population	<ul style="list-style-type: none"> - Availability of data used in the calculation. - It reflects the receipts from the federal budget. 	<ul style="list-style-type: none"> - Applicable only for the territories where personal income tax accounts for the majority of tax revenues.
Direct counting method	<ul style="list-style-type: none"> - Possibility of coordinating budget planning in terms of determining tax revenues of municipalities, taking into account economic policy priorities. - Possibility to determine losses that affect the amount of tax potential. 	<ul style="list-style-type: none"> - Lack of objectivity due to insufficient reliability of statistical information on the size of tax bases. - Laboriousness, since the indicator calculation involves collection of a large amount of data.

Compiled by the author.

The first group includes methods focused on a region and, respectively, inter-regional comparisons. However, the proposed data have an element of error at the municipal level; therefore, the methods of this group cannot fully satisfy the need for assessing budget capacity of municipalities. In the second group the subject of assessment is limited to tax potential.

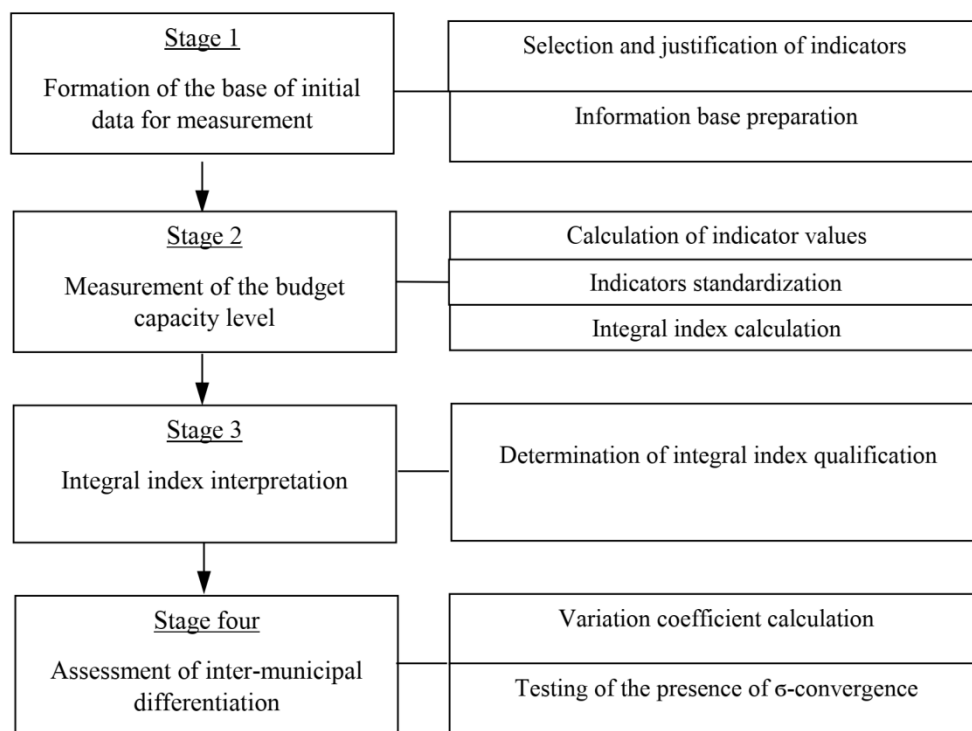
The choice of one group or another is largely due to specifics of the tasks being solved, volume and reliability of the information under study, a degree of complexity and laboriousness of data processing methods and approaches to the interpretation of assessment results.

It should be emphasized that the methodology for analyzing budget capacity of territories mainly studies only tax potential as the research subject and a region as the research object. Not enough attention is paid to determining a level of municipalities' budget capacity as the basis of the budgetary system.

Taking into account specifics of the studied groups of methodological tools, we believe that for objective assessment of the municipalities' budget capacity level it is necessary to consider municipal statistics maintenance and acute problems of studied territories. At the same time, the set of indicators proposed by various authors can become a methodological basis for substantiating the list of indicators and developing the methodology to assess the effectiveness of using municipalities' budget capacity.

According to our position, it is most acceptable to assess the level of budget capacity according to a certain algorithm, the linear block diagram of which is shown in Figure 1.

Figure: 1. Stages of assessing the municipalities' budget capacity level



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At the first stage the base of initial data for measurement is formed. At the same time, an important place is given to the choice and justification of indicators for assessment. The list of indicators of the municipalities' budget capacity level, conditionally divided into six groups, includes those that:

- are selected on the basis of critical analysis of expert opinions and conducted studies (Gubanova, Voroshilov, 2019; Maltseva, Veselov, Bukhvald, 2019; Zenchenko, 2009; Tkacheva, 2014; Myakshin, Petrov, 2019; Golodova, 2009; Yashin, Yashina, 2003; Baburin, Tikunov, Badina, Cheresnia, 2018; Suglovov, Cherkasova, 2009; Bochko, 2017; Pechenskaya, 2019; Butorina, Oborin, Kutergina, Osipova, 2018; Chistnikova, Yakimchuk, Glotova, Dynnikov, Antonova, 2017) and requirements of Russian legislation;
- are published annually in the RF official statistical reports in the public domain, which ensures the reliability and simplicity of methodology calculations;
- consider specifics of municipal statistics and provide the opportunity to compare estimated data in the context of municipalities;
- make it possible to fully take into account the integrative approach to the essence of budget capacity in accordance with the theoretical principles substantiated in the research;
- possess the property of dynamism and flexibility, thus reflecting the changes occurring in the budgetary sphere of a region;
- disclose not only the achieved level, but also the scale of the increase in budget capacity;
- characterize the stage of formation and use of budget capacity, a certain structural component and their interaction, which together creates the basis for comprehensive characterization of budget capacity in the context of municipalities.

These arguments give grounds for characterizing the list of indicators proposed in Table 2 as universal.

Table 2: System of groups and indicators for assessing the level of municipalities' budget capacity

Group	Indicator
Socio-economic development of a territory	- ratio of average monthly accrued wages to minimum wage; - industrial production index; - agricultural production index; - retail trade turnover index.
2. Formation of budget revenues	- ratio of total expenses coverage to total income; - ratio of total expenses provision to own income; - ratio of tax coverage to total expenses; - ratio of non-tax coverage to total expenses.
3. Budget balance	- own budget balance ratio; - budget deficit coverage ratio; - additional budget funds availability ratio.
4. Financial autonomy of the budget	- budget income autonomy coefficient; - coefficient of tax autonomy of the budget for budget-forming tax; - coefficient of net tax autonomy of the budget.
5. Budgetary provision of the population	- coefficient of population's provision with own income; - coefficient of population's provision with tax revenues; - coefficient of population's provision with non-tax income.
6. Transfer dependence of the budget	- ratio of own budget revenues to gratuitous receipts; - coefficient of dependence of the budget on gratuitous receipts.

Compiled by the author.

The information base of measurements comprises budget execution reports of the RF Federal Treasury, a database of indicators of municipalities of the RF Federal State Statistics Service, and reports of local governments.

At the second stage, the level of budget capacity of municipalities is measured. It is proposed to carry out sequential settlement operations to standardize indicators characterizing budget capacity of municipalities (Table 3).

Table 3: Sequence and content of mathematical calculations used at the second stage of assessing the municipalities' budget capacity level

Name	Function
1. Calculation of the indicator value (I_{ij})	There are two thresholds for each indicator. If the indicator value is outside the minimum, then the indicator score is 0, outside the maximum – 1. If the indicator value lies in the interval between two threshold intervals, the score is calculated by the formula: $I_{ij} = \frac{x_{ij} - x_{min}}{x_{max} - x_{min}}$ Where: I_{ij} – estimate of the i -coefficient; i – estimated coefficient; j – municipality; x_{ij} – actual coefficient value; x_{min} – minimum coefficient value; x_{max} – maximum coefficient value.
2. Standardizing of coefficients characterizing the group (P_{ij})	$P_{ij} = \frac{\sum_{i=1}^n I_{ij}}{m_j}$ where P_{ij} – summary estimate obtained within the group; m_j – number of indicators characterizing the group.
3. Calculation of the index of budget capacity (IBC)	$IBC = \frac{\sum_{i=1}^n P_{ij}}{n}$ where IBC – integral value of the index of budget capacity; n – number of groups.

Compiled by the author.

The integral assessment is interpreted at the third stage. At the same time, we choose the methodology based on calculation of relative indicators and their combination into the integral index, as it can give an idea of the scale of increment in the municipalities' budget capacity level in dynamics, as well as the ability to compare budget capacities of different territories. Various methods are used to combine all indicators in economic methodologies. Believing that opportunities should be uniformly distributed among territories, we consider it correct to take the average indicator value as an optimal standard. The arithmetic mean or geometric mean are most common and convenient for interpretation. At the same time, the arithmetic method reveals increment dynamics best, while the geometric method – differences between study objects in the static state. Taking into account the purpose of the methodology for assessing budget capacity, it is reasonable to use the arithmetic mean for calculating the integral index.

To determine the level in accordance with the multiplicative integral index values, we propose a scale of equal-size intervals from zero to one, which makes it possible to single out five levels of budget capacity of municipalities (Table 4).

Table 4: Interpretation of threshold values of the integral assessment of the municipalities' budget capacity level

Budget capacity level	Boundaries of the integral index interval	Characteristics of the ability to develop budget capacity of q municipality
High level	$0.80 \leq IBC \leq 1.00$	Municipality of growth
Above average	$0.60 \leq IBC < 0.80$	Municipality of realizable opportunities
Average level	$0.40 \leq IBC < 0.60$	Municipality of potential growth
Below average	$0.20 \leq IBC < 0.40$	Municipality of underutilized opportunities
Low level	$0.00 \leq IBC < 0.20$	Municipality of weak opportunities

Compiled by the author.

3. Key research results

In order to test the methodological tools developed in the study, the first stage of monitoring was carried out on the example of municipalities of the model region of the Russian Federation – the Vologda Oblast. The Vologda Oblast is a typical Russian region in terms of most socio-economic development indicators; it became a pilot region and in 2006 started implementing the reform of local self-government. At the same time, this methodological toolkit can be also used in other regions. Monitoring covered the period from 2006 to 2018. The year of 2006 was chosen as the starting point; since that time Russian municipalities have entered a new legal framework dictated by Federal Law No. 131-FZ “On General Principles of Organization of Local Self-Government in the Russian Federation”. The results of the integral assessment are presented in Table 5.

Table 5: Distribution of municipal districts and urban districts of the Vologda Oblast by budget capacity level, in % to the total number of municipalities

Level	2006	2009	2012	2015	2018
High (from 0.80 inclusive and above)	0	0	0	0	3.57
Above average (from 0.60 inclusive and up to 0.80)	7.14	0	3.57	0	14.29
Average (from 0.40 inclusive and up to 0.60)	3.57	7.14	35.71	35.71	46.43
Below average (from 0.20 inclusive and up to 0.40)	89.29	64.29	60.72	64.29	35.71
Low (less than 0.20)	0	28.57	0	0	0

Calculated by the author.

The dynamics of integral assessment of the municipalities' budget capacity level according to the developed methodological tools allows us to draw a number of fundamental conclusions.

1. Budget capacity of most municipalities in the model region was average and below average in 2006-2018.

2. There is positive dynamics in the transition of the budget capacity level from the category “below average” to “average”. If in 2006 the “below average” level was characteristic of 25 municipalities, then in 2018 – only of 10. Moreover, for the first time a high level of efficiency in the formation of budget capacity was recorded (in the city of Cherepovets).

3. The growth in the integral index was observed in 2012. If in 2009 the budget capacity level ranged from low to medium, then since 2012 the low level has not been typical for any municipality of the region. The average level in 2012 was observed in 10 districts compared to 1 district in 2006.

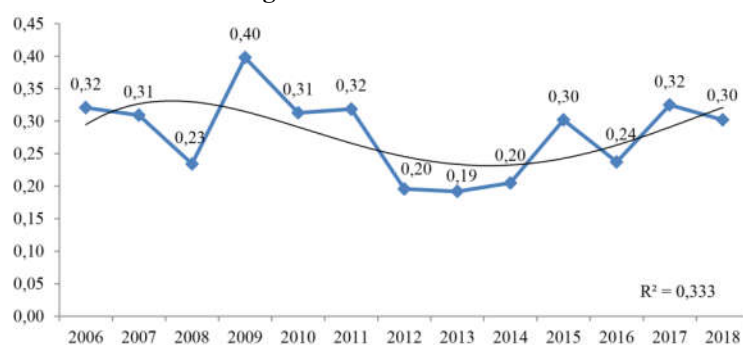
The fourth stage involves assessment of inter-municipal differentiation by budget capacity on the basis of econometric convergence models.

To measure the size of the gap in the level of budget capacity among municipalities, as well as trends in municipal inequality, the methodology uses:

- first, calculation of the variation coefficient;
- second, testing of the presence of σ -convergence.

Figure 2 reveals a wave-like trend in the inequality of municipalities in the Vologda Oblast in terms of the budget capacity level within 0.19–0.40. In the 2009–2015 there was a decrease in the value of the variation coefficient, which indicated the process of convergence. Since 2016 there has been an unstable growth in municipal differentiation.

Figure 2. Dynamics of the variation coefficient in the municipalities' budget capacity level in the Vologda Oblast in 2006–2018.

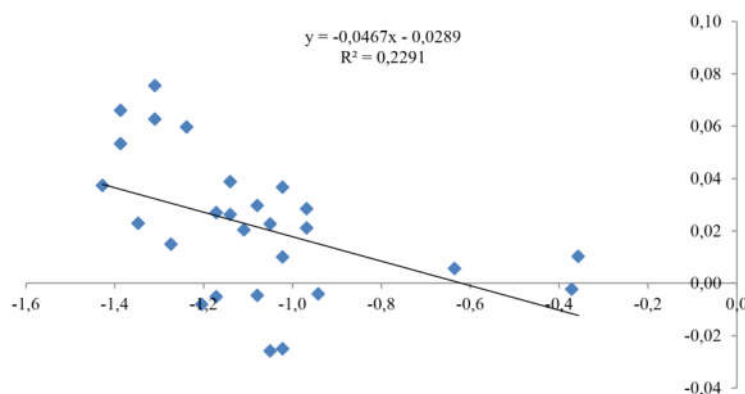


Calculated by the author.

We get a similar result by testing the presence of σ -convergence on the basis of construction of the regression equation for the dependence of average annual growth rates of municipalities' budget capacity in 2006–2018 on the logarithm of the value of budget capacity of the regional municipalities in 2006

($y = -0.0755x - 0.0828$) (Figure 3).

Figure: 3. Dynamics in dispersion of average growth rates of Vologda Oblast municipalities' budget capacity in 2006–2018 depending on the logarithm of the initial value of budget capacity in 2006



Calculated by the author.

At the same time, the study shows that the equalization of budget capacity occurred not due to its growth in all municipalities, but due to the increase among the lagging behind and the decrease among the leaders. This indicates that the potential of local budgets was not influenced by the pace of socio-economic development of territories, but by the mechanism of inter-budgetary relations between the region and municipalities.

This situation undermines the municipalities' incentives to boost their own income base and provokes the growth of dependent sentiments. In this case, it is necessary to shift the emphasis of the inter-budgetary relations system towards a stimulating function, focused on encouraging local governments to mobilize profitable resources. Consequently, the tools of tax and transfer policy should take into account the results achieved in increasing the rates of municipalities' socio-economic development and prevent "dependent" sentiments of local self-government bodies. Gradual decentralization of revenue sources is required, based on joint decisions and concerted actions of all government levels.

Thus, monitoring of the municipalities' budget capacity level for the period under study, using the example of the Vologda Oblast, indicates a clear trend towards their leveling. At the same time, there is an increase in the level of budget capacity in the municipalities with an initially low level and a decrease in the indicator in the municipalities with an initially higher level of budget capacity. Consequently, it is quite reasonable to say that budget capacity of less wealthy municipalities in the region has grown not so much due to a rise in their own income base, but due to the regional policy of equalization. This conclusion is also justified by the fact that the burden of regional budgets associated with the need to provide financial

assistance to local budgets amounted to over 30% of the total expenditures of the regional budget¹ in the period under study.

The results of assessing the level of budget capacity of municipalities can be used by public authorities in determining the model of financing the settlement network² of the region (Table 6).

Table 6. Comparison of the model for financial support of a settlement network with the level of budget capacity of municipal districts

Budget capacity level	Municipality characteristics	Settlement type	Financial support model characteristics
High (from 0.80 inclusive and above)	Municipality with a high and sufficiently high level of local budgets' potential and predominance of its own funds for exercise of powers	1	The district level provides financial support for settlements
Above average (from 0.60 inclusive and up to 0.80)	Municipal entity with a sufficiently high level of local budgets' potential and predominance of its own funds for exercise of powers	2	
Average (from 0.40 inclusive and up to 0.60)	Municipality, whose budget capacity is at the average level, the internal reserves for strengthening the income base are not fully used	3	Differentiated approach to financing by settlement type depending on the amount of budgetary provision
Below average (from 0.20 inclusive and up to 0.40)	Municipal formation, characterized by low utilization of budget capacity	4	
Low (less than 0.20)	Municipality characterized by low and extremely low utilization of budget capacity	5	Estimated financing

Compiled by the author.

Compiled by the author.

In case of types 1 and 2 (municipal districts with a “high” or “above average” budget capacity level), the network of settlement budgets should be retained, provided that all powers of their financial support are transferred to the district. In case of types 3 and 4 (municipal districts with “average” or “below average” budget capacity), a differentiated or selective network of settlement local budgets should be formed: a regional center and 3-4 financially strong settlements. The rest settlements are to be financed according to costs estimates. At the same time, a district is also eligible to financially support settlements, provided that the level of provision of the population with key types of budget expenditures and critical types of budget services with the estimated cost principle is equalized. Concerning Type 5 (municipal districts with a low level of budget capacity), the district budget should function, settlements should be financed on the basis of estimates. At the district level, a similar level of provision of the population with the main types of budgetary expenditures in settlements financed on the basis of estimates is maintained.

It is important to mention that the rejection of a certain share of settlement budgets does not mean automatic liquidation of the corresponding number of settlement municipalities themselves. In addition, the estimated costs principle does not exclude the functions of financial planning and control, which can be carried out by a representative body of local self-government. Undoubtedly, this model introduction will require changes to the budget legislation. So, in the Budget Code, it is advisable to replace the legal norm that “each municipality has its own budget” by the following one: “each municipality has its own budget or other source of financial coverage of the assigned expenditure powers established by the current legislation”. This interpretation, thus, will allow eliminating the existing contradictions between the formal approach to the formation of the institution of local self-government and the obvious idea of economic rationale in the choice of forms of organizing the budget process at the local level.

The model is tested on the Vologda Oblast municipal districts (Table 7). It shows that the fourth-type model will prevail in the region, i.e. a differentiated approach depending on the budgetary provision of a settlement.

¹ According to the reporting data of the Vologda Oblast Finance Department.

² Differentiation by municipal districts is justified by the fact that the consolidated budget of a district is a set of budgets of urban and rural settlements and reflects trends of their functioning quite objectively.

Table 7: Distribution of the Vologda Oblast municipal districts by type of settlement network financing with regard to the level of budget capacity of municipal districts

Settlement type	2006	2009	2012	2015	2018
1	0	0	0	0	0
2	0	0	3.8	0.0	11.5
3	3.8	0	34.6	34.6	50.0
4	96.2	69.2	61.5	65.4	38.5
5	0	30.8	0	0	0
Average value	0.5407	0.4002	0.4235	0.4205	0.4425

Compiled by the author.

Summing up, we note that the methodology developed in the research process provides an opportunity to obtain a relative assessment of the level of budget capacity of a municipality, reflecting the place of each municipality in the overall ranking. Considering the optimally small amount of information required for measurement, the integral index is characterized by a certain degree of information content and sensitivity. The composition of the indicators included in the integral index calculation makes it possible to estimate the level of municipalities' budget capacity with a sufficient degree of reliability. Elaboration of the measures to form an optimal model of inter-budgetary relations and their implementation with the help of the developed scientific and methodological support for monitoring the level of municipalities' budget capacity will enhance the efficiency of using budget capacity of the region and mitigate the negative impact of dynamism of the external and internal environment while achieving economic growth.

Acknowledgments

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INSURANCE-ECONOMIC GROWTH NEXUS – EVIDENCE FROM SELECTED WESTERN BALKAN'S COUNTRIES

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Abstract

The insurance-growth nexus has attracted the attention of many academics and researchers, due to the huge potential the insurance industry constitutes for the economic development of developed and developing countries as well. The purpose of this paper is to investigate the impact the insurance industry has on economic growth of emerging countries, such as the Western Balkan's countries. The impact is studied through two indicators of insurance industry: density and penetration, and for the total, life and non-life insurance market. The authors have applied a multiple regression analysis using annual data on insurance industry and GDP per capita from 2004 to 2019. This paper has contributed in the existing literature by exploring (i) whether insurance market has a positive or negative effect on economic growth of developing countries; (ii) which of the insurance indicators explains better the impact – insurance penetration or density indicator; and (iii) which of insurance activities has the largest effect on economic development: total, life or non-life insurance. The conclusions of this paper will serve to the public and private operators to evaluate the significance that each segment of insurance industry has on the economic development and to undertake the proper policies.

Keywords: Insurance penetration, insurance density, GDP per capita

JEL classification: G22, C23, O52

1. Introduction

The oldest law on insurance in the Western Balkan countries, is the Dubrovnik marine law of 1568. In the 19th century, the insurance was sold by foreign companies, mainly Italian ones. At the beginning of 20th century, the first domestic insurance companies were opened, mainly joint-venture ones. The insurance industry was concentrated in the main cities and the property fire insurance was the most underwritten insurance class. After the Second World War the insurance companies have been nationalized and almost all kinds and branches of domestic insurance became state monopoly. At the beginning of the 90s, the centralized economy of the Eastern Europe countries has been transformed to the open market economy. The transformation which involved the insurance industry as well, was not the same for all the Eastern Europe countries. While the major part of the Eastern Europe countries was successfully developed toward free market economy and joined to the EU, six countries - the so-called Western Balkan (Albania, Bosnia and Herzegovina, Kosovo, Montenegro, North Macedonia, and Serbia) – are still out of EU. The western Balkan countries are included in developing countries - the GDP per capita of Western Balkan countries is far away from the EU average. According to World Bank data, in 2020, Montenegro has the highest GDP per capita (USD 7,686) and Kosovo has the lowest (USD 4,287). The same figure for EU, in 2020 is USD 33,928. But in terms of GDP growth rate, the Western Balkan countries exceed the EU – while in 2019, GDP in EU grew on average by 1.54%, in Serbia it grew by 4.25% and in Albania by 2.17%. Such growth shows the potential the Western Balkan countries has for growth in the future. A bunch of theoretical and empirical literature supports the thesis that the financial system has a crucial role in promoting the economic development. Regarding, the western Balkan's countries, a special attention has been given to the development of the banking sector, and less to the financial market and institutions, owing to the fact that the

banking sector accounts the major part of the financial systems total assets, as described in the Section II. Due to the scarce empirical studies in the region of Western Balkan's countries, this paper is focused on a specific sector of the financial system - the insurance market. Insurance companies foster a more efficient capital allocation. They are potential institutional investors in financial markets, because a great deal of the premium volume is invested in local and international capital markets. This paper investigates the impact the insurance industry has on the economic development of the Western Balkan countries, aiming to answer the following questions:

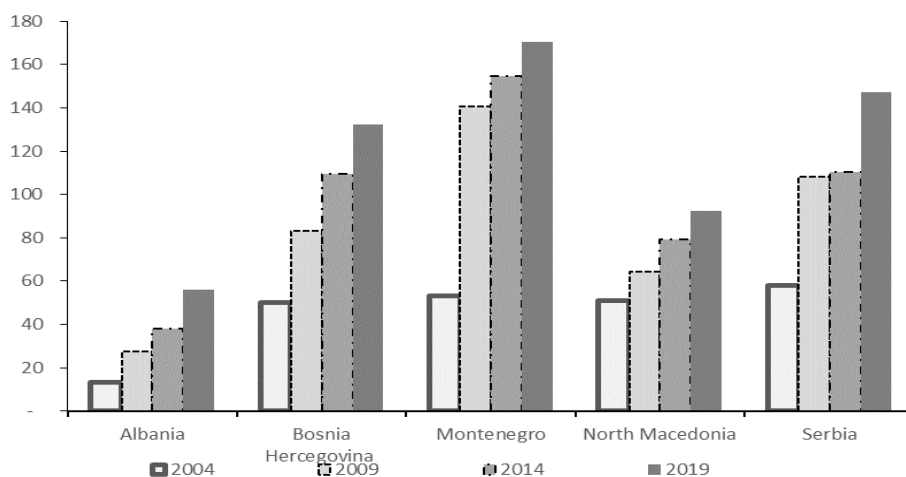
- Does the insurance industry have an impact on Western Balkan's economic growth?
- Which of the insurance indicators has the greatest impact on economic growth?
- Which of the insurance segments has the greatest impact on economic growth?

The analysis is performed by a multiple regression analysis, including data of five Western Balkan's countries – Albania, Bosnia and Herzegovina, Montenegro, North Macedonia and Serbia. After the introduction, the second section describes the present conditions of insurance market in each of the Western Balkan countries, in order to provide a framework of similar characteristics of insurance sector in this region. The literature review regarding the impact of insurance market in economic development is summarized in the Section III. The next section explains methodology and data base used in the paper. The section 5 contains the model findings and the results interpretation. The conclusions are presented in the final section of the paper.

2. Actual conditions of the insurance market in Western Balkan countries

This section presents a short overview of the insurance market in each of the Western Balkan countries. The data are retrieved from the annual reports and statistics of respective national supervisory entities. The evolution of insurance market indicators in Western Balkan's countries is illustrated by the Figure 1 and Figure 2.

Figure 1. Insurance density rates in Western Balkan's countries

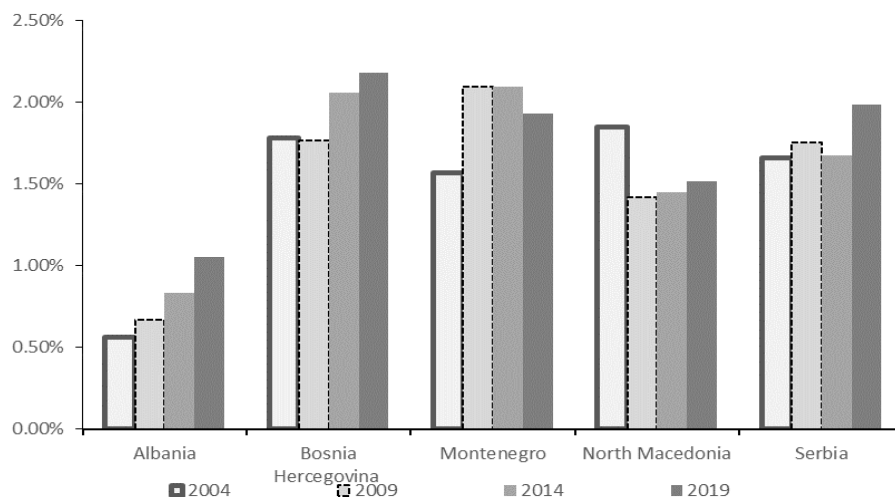


Source: Author's calculations

Financial system in Albania is supervised by Bank of Albania and Albanian Financial Supervisory Authority. The largest share was held by the commercial banks (89%), followed by the investment funds and the insurance companies which shared respectively 4.3 and 2.2% of financial system's total assets. At the end of 2019, eight and four insurance companies operated respectively in non-life and life insurance market. During 2019 insurance companies have collected USD 160 million, increasing by approximately 4.1% compared to 2018. Such increase is due to the increase of the gross written premiums volume by 3.91% and 6.33% respectively in the non-life insurance and life insurance segments. Premium per capita was USD 56 and the ratio of gross written premiums to GDP was 1.05 %. At end of 2019, foreign-owned capital in insurance industry amounted about 51.51%. Regarding to its structure, the market continued to be oriented towards non-life insurance, which accounts for 93.1% of the total volume of gross written premiums in this market. In 2019, the "Motor third party liability" insurance class kept the leading share in gross written insurance premium

(64%), followed by the “Fire and other property damages” (7,86%). With regard to the life insurance, the largest share is held by the “Debtor Life” insurance line (4.39% of total premium volume). In terms of total gross written insurance premium, the top five insurance companies shared about 73.95%, 79,44% and 100% respectively in total, non-life and life insurance activity.

Figure 2. Insurance penetration rates in Western Balkan's countries



Source: Author's calculations

According to the Annual Report of Insurance Supervisory Agency of Bosnia and Herzegovina, banks play the central role in financial intermediation as their assets make up 88,7% of total assets of the financial sector. Insurance and reinsurance companies participate with 5.37% in the total financial sector assets. The insurance business operation was conducted by 16 non-life insurance companies, 10 composite insurance companies and one reinsurance company. In 2019, gross written premium in Bosnia and Herzegovina were about USD 437 million, increased by 7,01% comparing to 2018. The insurance sector is dominated by non-life insurance sector which accounts about 79,23% of the total insurance business. During 2019, the non-life insurance sector recorded an increase of 6,12% in comparison to 2018 and the life insurance sector recorded an increase of 10,55% when compared to 2018. Companies with majority foreign capital, participated with 56,43% in the gross written premium. The most significant share in the total gross written premiums was written by the “Motor vehicle” insurance class with 49,73%, followed by life insurance (20.77%). The market share of the five largest companies was 41.43%, 44.72% and 87.29% respectively in total, non-life and life insurance markets.

According to the National Bank of Kosovo, the value of financial system assets amounted to EUR 7.26 billion, corresponding to an annual growth of 14.9 percent. The banking sector assets shares 65.6% of the total financial system assets, followed by pension sector with a share of 27.2%. Insurance is the fourth largest financial institution with a share of 2,7% in financial system's total assets. At the end of 2019, insurance penetration rate and density rate were respectively 1.4% and Eur 54.8. Insurance activity was performed by 11 non-life insurance companies and two life insurance companies. Non-life insurance activity represents 91.0% of the insurance market assets and the share of assets managed by foreign-owned insurance companies was 50.1 percent. The top five insurance companies collected 54.7% of the total gross written premium. Due to the lack of the data on Kosovo insurance market for the whole period taken into consideration for the model, Kosovo data are not included in the model statistics.

According to the Montenegro Insurance Agency at the end of 2019, of the total financial sector balance-sheet, the banks shared the highest part of 92.3%. In terms of importance, insurance companies accounted for 4.7% of total assets of the financial sector. During 2019, the insurance activity was performed by five non-life insurance companies and four life insurance companies. Total premium volume in 2019 was Eur 94.73 million, increased by 9.1% in respect to 2018. Non-life insurance sector accounts about 81.92% of gross written

premiums in total insurance activity. In term of gross written premiums, motor vehicle liability insurance accounts about 40.13% of the total insurance, followed by life insurance (16.23%) and accident insurance (12.09%). The top five insurance undertakings shared 82.42% of the total premium insurance market, while for both non-life and life insurance activity the share was 100%.

The banking system in North Macedonia shared the highest part (70.8%) of the total financial system assets, followed by the fully funded pension funds (17.8%). Insurance sector was the third largest segment in the financial system (with a share of 3.5% in the financial system's total assets), but they do not lead much with their absolute growth, which is relatively similar to that registered in the open-end investment funds. During 2019, eleven insurance companies operated in non-life insurance and five companies operated in life insurance segment. The foreign capital in insurance market constituted about 79.51% of the insurance market. In 2019, gross written premium (about USD 193 million) increased by 6.61% compared to 2018. Non-life insurance premiums share 82.70% of the total gross written premiums. Non-life sector is increased by 5.99%, while life sector is increased by 9.69%. Motor third-party liability insurance constitute the dominant insurance with 43.25% of total gross written premium, followed by life insurance (17.30%) and property insurance (16.75%). The top five insurance undertakings share 47.8%, 57.99% and 100% of the gross written premium respectively in total, non-life and life insurance segment.

According to the National bank of Serbia, at end of 2019, the bank sector reported the highest share in the financial system assets (90.1%), followed by (re)insurance undertakings (6.6%) ranking the first among the non-banking financial institutions. In 2019, total gross written premiums were about USD 1,024 million, which is an increase of 7.5% in nominal and 5.5% in real terms in respect to 2018. The insurance sector comprised six undertakings in non-life insurance, four in life insurance, six in both life and non-life insurance and four in reinsurance. The insurance premiums account 2.0% of the GDP of Serbia. Measured by the 2019 premium per capita of USD 147, Serbia was the 65th in the world. The non-life insurance accounted for 76.7% of the total insurance premiums. At end of 2019, foreign-owned insurance undertakings shared 89.5% of the life insurance premium and 63.6% of the non-life insurance premium. Motor third party liability occupied 32.9% of the total insurance premiums, followed by life insurance (23.3%) and property insurance (18.7%). The top five insurance undertakings share 77.8% 80.1% and 83.3% of the premium respectively in total, non-life and life insurance market.

The Western Balkan countries financial system features the characteristics of bank-based system. The banking sector reported the highest share in the financial system assets and contribute the most to its absolute economic growth. The insurance sector shares a maximum of 6.6% (in Serbia) which is a small share given the importance of the insurance sector as an institutional investor. The insurance sector is oriented toward the non-life insurance market and motor third party liability constitutes the most significant insurance type. However in terms of growth, the insurance market in Western Balkan's countries has made good progress.

3. Introduction

The insurance companies are intermediaries whose primary function is to allow households and business to transfer the pure risks by paying a price called "premium" under which the insurance company promises to reimburse the insured in case of an insured's accidental loss. According to Outreville (1998), the influence of the insurance industry on the macroeconomic activity can be manifested by: (i) its role in providing security and indemnification; and (ii) its role as an institutional investor. Insurance companies foster a more efficient capital allocation. They are a potential institutional investor in financial markets, because a great deal of the premium volume is invested in local and international capital markets. The insurance industry contributes to the formation of national income by creating value added. Das et al. (2003) specifies the following ways in which insurance services contribute to economic development: by promoting financial stability; by mobilizing and channeling the savings; by relieving the pressure on the government budget; by supporting trade, commerce and entrepreneurial activity; by lowering the total risk faced by the economy; and by improving individuals' quality of life and increasing social stability.

Due to the significance the insurance industry has on economic development, many researchers have investigated the casual relationship between insurance market and economic growth. According to Patrick (1966) there are two, possibly coexisting, relationships between the financial sector and economic growth. The first is the case where the financial sector has a supply-leading relationship with growth, which means that the financial services induce the economic growth. The second is a demand-following relationship, which means that due to economy growth, the demand for financial services can induce the development of financial institutions. Many studies have concluded that developing countries have supply-leading casual relationships of development (Jung 1986, Dean 1986) and have considered locally incorporated insurance institutions or state-owned monopolies an essential element of economic development (Outreville 1996).

Table 1 lists in chronologic order, a number of empirical studies which have explored the supply-leading pattern of relationship between insurance and economic development. The results of their research works have been diverse due to the several factors taken into consideration such as the development level of the studied country/region, the statistical model used to explore the relationship, and the indicators used to measure the economic development and the insurance industry as well. Also, a part of the studies has taken in consideration other variables, besides the insurance market, such as financial development, interest rate, inflation rate, trade, foreign direct investments etc., whose interaction may influence the results.

Table 1. Literature review summary

Research's Author	Country/Region	Period	Effect of insurance on economic growth
Ward and Zubberg (2000)	nine OECD countries	1961-1996	The relationship holds only for some countries.
Sawadogo, (2001)	86 developing countries	1996 - 2011	Greater effect of life insurance in low and middle-income countries than in upper- middle income countries.
Webb et al., (2002)	55 developed and developing countries,	1980-1996	Life insurance penetration indicators are robustly predictive of increased economic growth, but these measures are not significant in the presence of interaction among bank and insurance.
Curak et al., (2009)	10 transition EU countries	1992 - 2007	Life and non-life insurance, as well as, total insurance sector development positively and significantly affects economic growth.
Kugler et al., (2005)	UK	1996-2003 1971-2003	For most of variables and for at least at 5% level of significance, co integration tests confirmed long run relationship between development in insurance market size and economic growth.
Haiss et al. (2008)	29 European countries	1992 - 2005	Positive impact of life insurance on GDP growth in the EU-15 countries. Short term connection of non-life insurance and GDP in emerging countries.
Arena, M. (2008)	55 countries	1976 – 2004 Penetration	Both life and non-life insurance have a positive and significant effect on economic growth. In case of life insurance, high-income countries drive the results. Non-life insurance has a larger effect in high-income countries than in developing ones.
Njegomir V. et al., (2010)	Ex-yugoslavia region	2004 - 2008	A positive effect of insurance on economic growth.
Han, L. et al., (2010)	77 developed and developing countries	1994 - 2005.	Insurance density is positively correlated with economic growth- greater effect in the developing countries than in developed ones.
Omoke P. (2011)	Nigeria	1970 - 2008	No positive and significant impact of insurance on economic growth
Ege at al. (2011)	29 developed countries	1999 - 2008	Positive relationship between insurance and economic growth
Kalaja et al., (2017)	Albania	2006-2015	Both life and non-life insurance penetration have positive effect on GDP per capita. Non-

Research's Author	Country/Region	Period	Effect of insurance on economic growth
			life insurance penetration has larger impact on GDP than life insurance penetration.
Kjojevski et al., (2012)	Macedonia	1995 - 2010	Non-life insurance and total insurance penetration positively and significantly affects economic growth. Life insurance negatively affect economic growth.
Akinlo et al., (2014)	Sub-Saharan Africa	1986 - 2011	Positive and significance impact on economic growth.
Cristea et al., (2014)	Romania	1997 - 2012	Greater influence of the life insurance (measured by density and penetration index) than that of the non-life insurance on GDP.
Concha et al., (2014)	Eleven Latin American countries	1980 - 2009	Positive relationship between insurance and economic growth. This relationship is statistically significant when insurance density is considered as the measure of insurance.
Jahromi (2014)	Iran	1981 - 2011	Unidirectional causal relationship from the insurance penetration ratio to the gross domestic product (GDP)
Yildirim I., (2015)	Turkey	2006 - 2014	Positive relationship is determined between economic development and insurance sector.
Alhassan, A.L. (2016),	Eight African countries	1990 - 2010	Uni-directional causality from insurance penetration to economic growth except for Morocco where there is evidence of a bi-directional causality.
Olayungbo, D.O. et al., (2016)	Eight African countries	1970 - 2013.	Non-uniform results.
Ouedraogo, I. et al. (2016)	86 developing countries	1996 - 2011	Positive effect of life insurance on economic growth, but the effect depends on the structural characteristics of countries.
Padhram et al., (2017)	19 Eurozone countries	1980 - 2014.	Non-uniform results
Din at al., (2017)	USA, UK, China, India, Malaysia and Pakistan	2006 - 2015	Significance of insurance market depends on the proxy used for insurance and the role of non-life insurance is more significant for developing countries as compared to developed countries.
Peleckienė et al., (2019)	European Union countries	2004 - 2015	Non-uniform results.
Kukaj et al., (2019)	Western Balkan	2007 - 2017	Both life and non-life insurance have positive effect in GDP growth.
Balcilar et al., (2020)	11 African countries	1995 - 2016	Total, life and non-life insurance penetration has a long-term impact on economic growth. Non-life insurance has larger effect than life insurance.
Bayar, Y., et al., (2021)	14 Central and Eastern European (CEE)	1998 - 2016	Life insurance has no significant effect on economic growth and non-life insurance positively affects economic growth

Based on the results of the previous researches regarding especially the developing countries, we expect a positive and significant effect of insurance market in economic growth of Western Balkan's countries, but we are uncertain about which of the indicators of insurance market would be more significant to the economic development and which of the insurance segments would have the largest impact on economic growth.

4. Data and Methodology

The purpose of this paper is to investigate the supply leading relationship between insurance industry and economic development - if there is any impact of insurance industry in the economic development of five countries of the Western Balkans (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia and Serbia) for the period 2004-2019. The data are of secondary type. The economic development is measured by GDP per capita, which is retrieved from World Bank Development indicators. The data on insurance market are

retrieved from national supervisory entities and Sigma issues published by Swisse Re. They are converted in USD for purpose of comparison.

In order to measure the effect of insurance market in economic development, we used the linear regression analysis which is a basic and commonly used type of predictive analysis. The regression estimates are used to explain the relationship between one dependent variable and one or more independent variables. The overall idea of regression is to answer to the following questions:

- Does a set of predictor variables can be used to predict an outcome (dependent) variable?
- Which variables in particular are significant predictors of the outcome variable, and in what way do they—indicated by the magnitude and sign of the beta estimates—impact the outcome variable?

As we are going to explore the impact of insurance on economy development, the dependent variable is the economic growth measured by GDP per capita and the independent variables are the insurance development indicators for total, non-life and life insurance segments. The aim of this paper is to measure the impact by two types of insurance indicators: insurance density rates and insurance penetration rates. Therefore, we have designed two linear regressions: the first one measures the impact of insurance on the GDP per capita through the density insurance indicators: total insurance density, life insurance density and non-life insurance density; and the second one measures the impact of insurance on the GDP per capita through the insurance penetration indicators: total insurance penetration, life insurance penetration and non-life insurance penetration.

Table 1. Variables Description

Variable Name	Definition of variables
GDP/cap	Economic growth (in USD per capita)
TIDR	Total insurance density rate – total insurance premium volume per capita (in USD per capita)
LIDR	Life insurance density rate – life insurance premium volume per capita (in USD per capita)
NIDR	Non-life insurance density rate – non-life insurance premium volume per capita (in USD per capita)
TIPR	Total insurance penetration rate – total insurance premium volume to GDP ratio (in percentage)
LIPR	Life insurance penetration rate – life insurance premium volume to GDP ratio (in percentage)
NIPR	Non-life insurance penetration rate – non-life insurance premium volume to GDP ratio (in percentage)

5. Model Results

The dependent variable is GDP per capita for both the models, and TIDR, LIDR and NIDR are the independent variables in the first model, and TIPR, LIPR and NIPR are the independent variables in the second model.

5.1. First Model – Insurance Density Rates as independent variables

The first model explores the impact of insurance market on economic development, where insurance market is measured through insurance density indicators. Table 2 shows the descriptive statistics of the variables considered in the model.

Table 2. Descriptive statistics

	Mean	Std. Deviation	N
GDP/cap	5303.353	1217.679	80
TIPR	86.443	40.561	80
LIPR	12.525	9.585	80
NIPR	73.917	32.151	80

As we observe from the Table 2, the life insurance density and the GDP per capita have respectively the lowest and the highest value of the mean and standard deviation among all the variables. First, we checked whether there is a linear relationship between the independent

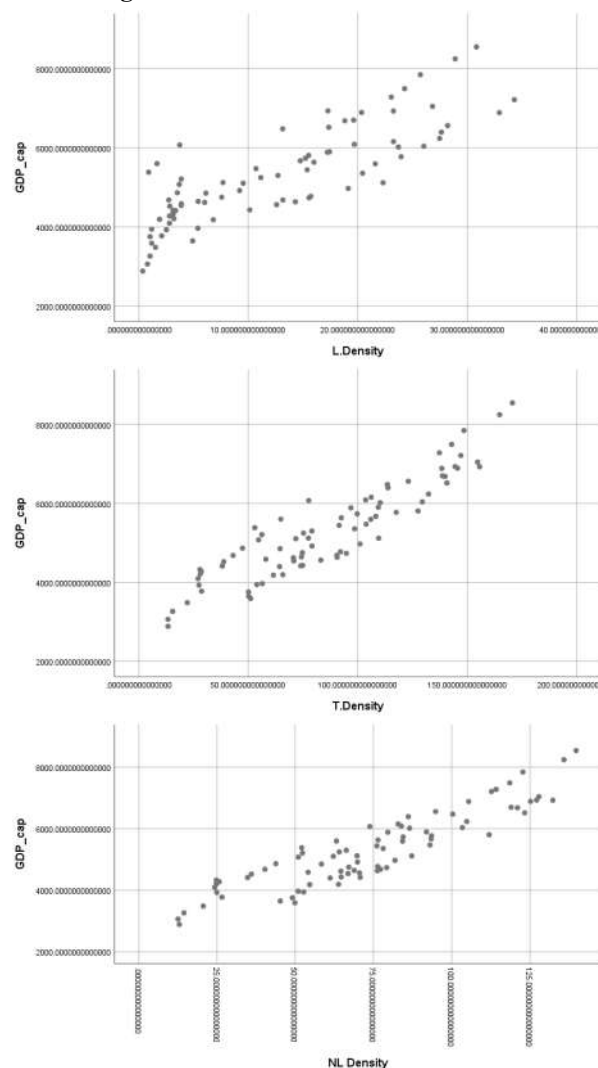
variables and the dependent variable in our multiple linear regression model, by calculating the Pearson Correlation Coefficients, as shown in the Table 3.

Table 3. Correlation coefficients

		GDP/cap	TIDR	LIDR	NIDR
Pearson Correlation	GDP/cap	1.000	.916	.837	.907
	TIDR	.916	1.000	.905	.992
	LIDR	.837	.905	1.000	.843
	NIDR	.907	.992	.843	1.000
Sig. (1-tailed)	GDP/cap	.	.000	.000	.000
	TIDR	.000	.	.000	.000
	LIDR	.000	.000	.	.000
	NIDR	.000	.000	.000	.
N	GDP/cap	80	80	80	80
	TIDR	80	80	80	80
	LIDR	80	80	80	80
	NIDR	80	80	80	80

Based on the Table 3, TIDR, LIDR and NLDR have the Pearson Correlation coefficient approximately +1 with the dependent variable - GDP per capita. As a result, there is a positive relationship between the dependent variable and independent variables. The scatter plots shown in the Figure 3, indicate a good positive linear relationship between all the independent variables with the dependent variable – GDP per capita.

Figure 3. First Model's Scatter Plots



Then we checked for multivariate normality. This can either be done with an 'eyeball' test on the Q-Q-Plots or by using the 1-Sample K-S test to test the null hypothesis that the variable approximates a normal distribution.

Table 4. One-Sample Kolmogorov-Smirnov Test

		GDP/cap	TIDR	LIDR	NIDR
N		80	80	80	80
Normal Parameters ^{a,b}	Mean	5303.3534	86.4433	12.5255	73.9177
	Std. Deviation	1217.6794	40.5618	9.5853	32.15142
Most Extreme Differences	Absolute	.081	.072	.154	.057
	Positive	.081	.072	.154	.055
	Negative	-.041	-.070	-.102	-.057
Test Statistic		.081	.072	.154	.057
Asymp. Sig. (2-tailed)		.200 ^{c,d}	.200 ^{c,d}	.000 ^c	.200 ^{c,d}

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

The K-S test, shown in the Table 4, is not significant for all variables, thus we can assume normality. The results of multiple regression analysis are summarized in the Tables 5 and 6.

As the Table 5 indicates, the total insurance density rate is excluded from the linear regression model. It does not mean that this variable is not correlated to the dependent variable GDP per capita, but when this variable is included as an independent variable in the model, it does not have any influence to the dependent variable GDP per capita. Therefore the regression coefficient β in this variable is = 0.

Table 5. One-Sample Kolmogorov-Smirnov Test

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.	Correlations		
	B	Std. Error				Zero-order	Partial	Part
1 (Constant)	2957.245	153.600		19.253	.000			
	LIDR	31.695	10.772	.249	2.942	.004	.837	.318
	NIDR	26.369	3.212	.696	8.211	.000	.907	.683

a. Dependent Variable: GDP/cap

Table 6: Excluded Variables^a

Model	Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1 TIDR	. ^b000

a. Dependent Variable: GDP/cap

b. Predictors in the Model: (Constant), NIDR, LIDR

Finally, we can write the linear regression as below:

$$GDP = 2957.245 + 31.695 * LIDR + 26.369 * NIDR$$

The Table 5 contains the p-values and the coefficients of our regression analysis. The coefficients describe the mathematical relationship between each independent variable and the dependent variable. The p-values for the coefficients indicate whether these relationships are statistically significant. If the p-value for a variable is less than the significance level ($\alpha=0.05$), the sample data we have gathered provide enough evidence to reject the null hypothesis for the entire population. If the p-value is greater than the significance level, it indicates that there is insufficient evidence in the sample to conclude that a non-zero correlation exists. Table 5 shows that LIDR variable has a p-value of 0.004 and the NIDR variable has a p-value of 0.000 - both of our independent variables have p-values smaller than 0.05. This means that we can reject the null hypothesis and we conclude that these variables are statistically significant and probably a worthwhile addition to our regression model.

5.1.1. Results Interpretation

The sign of a regression coefficient indicates whether there is a positive or negative correlation between each independent variable and the dependent variable. So, we conclude:

Holding NIDR constant, we observe that there is a positive correlation between the LIDR and the GDP. So, when the life Insurance density increases by one unit, the mean of GDP per capita tends to increase with $\beta = 31.695$ units.

Holding LIDR constant, we observe that there is a positive correlation between the NIDR and the GDP. So, when the non-life insurance density increases by 1 unit, the mean of GDP tends to increase with $\beta = 26.369$ units.

As we explained above, the independent variable TDIR is excluded from the model, as such we do not have any regression coefficient nor p-value for this variable.

Conclusion: The life insurance density rate has the highest influence in GDP per capita in Western Balkan Countries, in comparison to non-life insurance density rate, because it has a highest value of the regression coefficient.

At the end, we looked at the determination coefficient which also explains how well the regression model fits the observed data.

Table 7: Model summary statistics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.916 ^a	.840	.836	493.5020	.840	201.983	2	77	.000

Predictors: (Constant), NIDR, LIDR_a

Dependent Variable: GDP per capita_b

Table 7 shows a determination coefficient $R^2 = 0.84$ and an adjusted $R^2 = 0.836$. This means that approximately 84% of the data fit the regression model. It is considered to be a high coefficient which indicates that our multiple linear regression model fits very good the observed data.

5.2. Second Model – Insurance Density Rates as independent variables

The second model explores the impact of insurance market on economic development, where insurance market is measured through insurance penetration indicators. Table 8 shows the descriptive statistics of the variables considered in the model.

Table 8. Descriptive statistics

	Mean	Std. Deviation	N
GDP/cap	5303.353	1217.679	80
TIPR	1.5946%	0.47484%	80
LIPR	0.2151%	0.13833%	80
NIPR	1.3795%	0.38298%	80

We have followed the same steps as in the first model. Thus, we are briefly presenting the results. The descriptive statistics indicate that the LPR variable has the lowest values of mean and standard deviation from all the variables, while the GDP per capita has the highest values of the mean and standard deviation. We check whether there is a linear relationship between the independent variables and the dependent variable in our multiple linear regression model, by calculating the Pearson Correlation Coefficients.

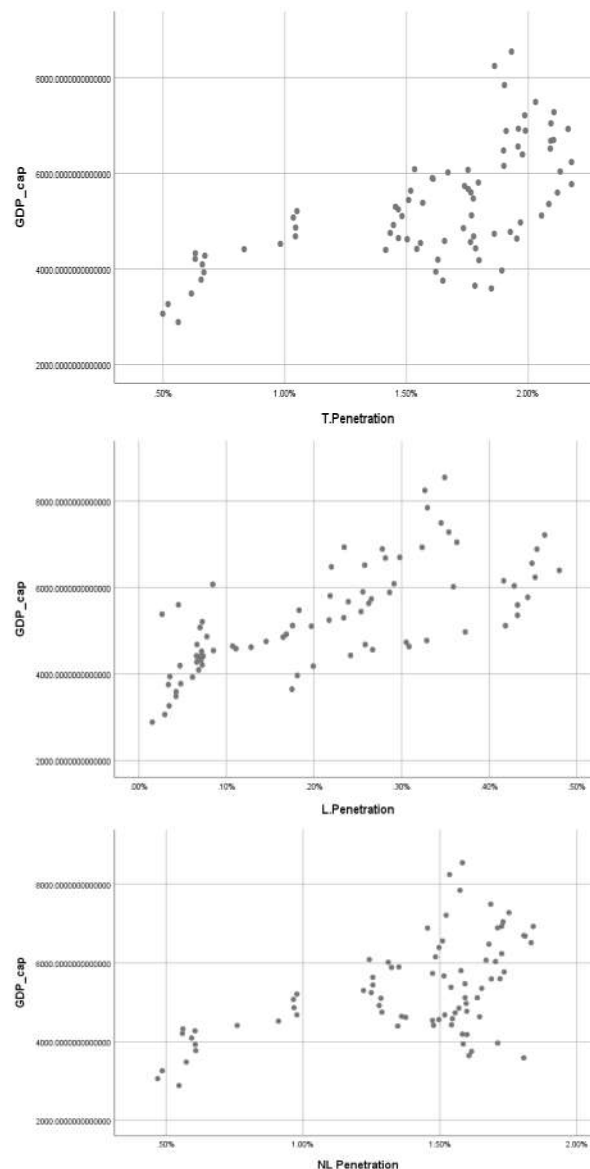
Table 9. Correlation coefficients

		GDP/cap	TIPR	LIPR	NIPR
Pearson Correlation	GDP/cap	1.000	.646	.697	.549
	TIPR	.646	1.000	.745	.971
	LIPR	.697	.745	1.000	.563
	NIPR	.549	.971	.563	1.000
Sig. (1-tailed)	GDP/cap	.	.000	.000	.000
	TIPR	.000	.	.000	.000
	LIPR	.000	.000	.	.000
	NIPR	.000	.000	.000	.
N	GDP/cap	80	80	80	80
	TIPR	80	80	80	80
	LIPR	80	80	80	80
	NIPR	80	80	80	80

From the Table 9, we observe that TIPR, LIPR and NIPR have the Pearson Correlation coefficient approximately +1 with the GDP per capita variable, which serves as the dependent variable in the multiple linear regression model. All the variables have a positive relationship

with the GDP per capita. But in comparison to the density insurance rates, these coefficients are lower, meaning that the penetration insurance variables have a smaller impact to the GDP, comparing to the density insurance variables. The scatter plots in Figure 4 indicate a good, but not as strong as in the first model, positive linear relationship between all the independent variables with the dependent variable GDP per capita.

Figure 4. Second Model's Scatter Plot



Secondly, we checked for multivariate normality. The result is the same as in the first model - since that the K-S test, shown in the Table 10, is not significant for all variables, thus we can assume normality.

Table 10. Correlation coefficients

N		80	80	80	80
Normal Parameters ^{a,b}	Mean	5303.353	1.5946%	0.2151%	1.3795%
	Std. Deviation	1217.679	0.47484%	0.13833%	0.38298%
Most Extreme Differences	Absolute	.081	.155	.151	.208
	Positive	.081	.110	.151	.114
	Negative	-.041	-.155	-.074	-.208
Test Statistic		.081	.155	.151	.208
Asymp. Sig. (2-tailed)		.200 ^{c,d}	.000 ^c	.000 ^c	.000 ^c

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

Also in the second model, as illustrated by the Table 11 and Table 12, TIPR is excluded from the linear regression model. It does not mean that this variable is not correlated to the dependent variable GDP per capita, because we tested that a positive relationship exists between these two variables, but when this variable is included as an independent variable in the model, it does not have any influence to the dependent variable GDP per capita. Thus, the regression coefficient β in this variable is = 0.

Table 11: Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
	B	Std. Error	Beta			Zero-order	Partial	Part
1 (Constant)	3222.223	362.870		8.880	.000			
LIPR	4996.325	839.691	.568	5.950	.000	.697	.561	.469
NIPR	729.624	303.290	.229	2.406	.019	.549	.264	.190

a. Dependent Variable: GDP/cap

Table 12. Excluded variables

Model	Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1 TIPR	. ^b000

a. Dependent Variable: GDP/cap

b. Predictors in the Model: (Constant), LIPR, NIPR

Therefore, the linear regression is written as follows:

$$GDP = 3222.223 + 4996.325 * LIPR + 729.624 * NIPR$$

The p-values of the coefficients in the Table 11, indicate whether these relationships are statistically significant. We observe that the LIPR has a p-value of 0.000, and the NIPR variable has a p-value of 0.019. As both our independent variables have p-values smaller than 0.05, we can reject the null hypothesis and conclude that these variables are statistically significant and probably a worthwhile addition to our regression model.

5.2.1. Results Interpretation

Holding NIPR constant, we found a positive correlation between the LIPR and the GDP per capita. So, when the life insurance penetration increases by 1 unit, the mean of GDP per capita tends to increase by $\beta = 4996.325$ units.

Holding LIPR constant, there is a positive correlation between the NIPR and the GDP per capita. So, when the non-life insurance penetration increases by 1 unit, the mean of GDP per capita tends to increase by $\beta = 729.624$ units.

As we explained above, the independent variable TIPR is excluded from the model, as such we do not have any regression coefficient nor p-value for this variable.

Conclusion: The life insurance penetration rate has the highest influence in GDP per capita in Western Balkan Countries, in comparison to non-life insurance penetration rate, because it has a highest value of the regression coefficient.

At the end, we looked at the determination coefficient which also explains how well the regression model fits the observed data.

Table 13. Model summary statistics

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	Change Statistics			
						F Change	df1	df2	Sig. F Change
1	.722 ^a	.522	.509	853.1826	.522	41.960	2	77	.000

a. Predictors: (Constant), LIPR, NIPR

b. Dependent Variable: GDP/cap

The Table 13 shows, the value the determination coefficient $R^2 = 0.522$ and an adjusted $R^2 = 0.509$. This means that approximately 50% of the data fit the regression model, which is not considered to be a high coefficient. Therefore, the multiple linear regression model in this case, fits not as good as the previous model, the observed data.

6. Conclusions

Financial institutions play a crucial role in the economic development of a country by mobilizing the savings of population and allocating the resources toward the deficit units. Their role is more evident especially in bank-based financial systems where the funds between the various players in the financial system flow mostly through financial intermediaries. For this reason, this paper is focused on the significance that one of the financial sectors – the insurance market – has on the economic development of some developing countries such as Western Balkan countries.

The banking sector in Western Balkan's countries has the highest share in the financial system assets and contribute the most to its absolute economic growth. The insurance sector is mainly ranked the second or the third, with a huge deference with bank sector in terms of total assets share. The insurance sector is oriented toward the non-life insurance market and motor third party liability constitutes the most part of the insurance policies.

Our regression analysis for the period from 2004 to 2019 concluded that regardless the insurance market in this region is still underdeveloped, it has a positive influence on GDP per capita, when it is measured by insurance density and penetration indicators for life and non-life insurance sectors. These results are partially consistent with previous research (Kalaja et.al., 2017).

When the insurance market is measured by density rates, the impact on GDP per capita is greater then when insurance market is measured by penetration rates. Meanwhile, when the insurance market is measured by total indicators (total insurance density and total insurance penetration), it resulted to be insignificant to GDP per capita.

Finally, as a surprise, the analysis showed that life insurance segment has the largest impact on economic growth, despite the fact that insurance market in Western Balkan's countries is oriented toward non-life insurance market.

The findings of the paper will be useful to insurance operators and authorities in order to stimulate the demand for insurance products, especially for the life insurance ones, which resulted to contribute more on economic growth comparing with non-life insurance products. Taking into consideration that life insurance is still very underdeveloped in respect to the indicators of developed countries, this sector offers a great potential for growth in Western Balkan's countries.

7. References

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THE EUROPEAN RESPONSE TO OPEN SHIP REGISTRIES AND FLAGS OF CONVENIENCE THROUGH THE CREATION OF OFFSHORE AND INTERNATIONAL SHIP REGISTRIES

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Abstract

The main objective of this essay is to access the different forms of the European response to the challenge of the Open Ship Registries and the Flags of Convenience. The policies concerning the maritime sector adopted by the various European Countries differ significantly. The method followed to support this essay is based mainly on the in-depth research in the regulatory framework established in the respective States as well as the European Institutions themselves. The analysis includes a multi-layered assessment of the key features of the Offshore and International Ship Registers. The findings of the current essay extend beyond the obligatory compliance to the legal restrictions posed by the Flag's Authorities. They include important business characteristics such as the type of vessel, the geographical area of business activity and the tax regime. The novelty of this essay lies in the specialization in the shipping policies that were implemented by the European countries and the comparison among them.

Keywords: Open Ship Registry, Flags of Convenience, Second Ship Registry, Offshore Ship Registry, International Ship Registry

JEL classification: F13, L92, O31, O38

1. Introduction

Both Offshore and International Ship Registries incorporate European efforts for the containment of the phenomenon of flagging out towards the Open Ship Registries and Flags of Convenience. They combine features from both Closed / National Ship Registries and Open Ship Registries (Watterson, Osborne and Grant 2020) and were established by countries with a long history in the shipping sector, that attempt to reverse the trend of ships abandoning Closed / National Ship Registries in favour of Open Ship Registries (Yin, Fan and Li 2018, 153). The occurrence of a state creating an Offshore or Open Ship Registry originally occurred in the European area and primarily affects European states, despite the fact that this institution has extended to countries outside of Europe. We can discern two obviously distinct types among the states that have chosen this method of pursuing a marine strategy, depending on the degree of correlation between the state that drives the creation of the Ship Registry and the area in which the Offshore or International Ship Registry is established. The degree of integration of the territory in which the Ship Registry is located in the state entity that led its creation is the main criterion for categorizing it in one of the two categories (European Union 2002). In practice, however, it is typical for Ship Registries from one category to be included in the other, and vice versa.

2. Offshore Ship Registries

Offshore Ship Registries are the outcome of certain states', that have Closed / National Ship Registries, reaction to Open Ship Registries. In recent decades, the diminishing size of conventional states' fleets in favour of Open Registries has prompted serious worries about the future of national shipping. According to calculations, in some situations, flagging-out of the Closed / National Registries would result in a significant devaluation of their fleets in a few of years. As a result, some traditional shipping States that possessed overseas territories

altered their shipping policies and established new Ship Registries in those territories with unique status.

The first step was taken by the United Kingdom, which took advantage of the British Empire's existence to allow the British Crown's Overseas Territories and Crown Dependencies to establish separate Ship Registries with privileged access to British shipping. The Bermuda and Gibraltar Registries were the first to allow shipowners from other countries, particularly the United Kingdom, to register their ships there without regard to the Genuine Link criteria of the shipowner's nationality. While ships owned by shipowners of any nationality can be registered, these Ship Registries were primarily created to entice British shipowners who, in their search for Ship Registries that are more competitive than the British Registry, would prioritize an Open Ship Registry. The Cayman Islands, Isle of Man, and British Virgin Islands are among the several Ship Registries available to British shipowners and may be included in this category.

Other European countries that had previously been colonial powers followed the United Kingdom's successful example. France has taken similar efforts, utilizing its location in the Indian Ocean's Kerguelen Islands. For its part, the Netherlands has established an Offshore Ship Registry in the Caribbean's Netherlands Antilles. In the same category of Ship Registries, we may include the Luxembourg Ship Register, which has been supporting Belgium's nautical interests since its inception (Vlachos 2000, 554).

The Offshore Ship Registries could include the Marshall Islands Ship Registry, according to the international literature (R. P. Carlisle 2017). This is backed by the fact that this Pacific archipelago was a US foreign territory until 1982, when it declared independence. In actuality, a transnational agreement with the United States was signed concurrently with the proclamation of independence, under which it gains the status of an affiliated state and, as a result, delegates its essential sovereign powers to the United States.

The Ship Registry of the Kerguelen Islands, founded at France's suggestion, is also among the first Offshore Ship Registries. While this Ship Registry had a major impact at first, particularly among shipowners in the maritime transport of bulk cargoes (tankers), it was eventually replaced by the International Ship Registry of France.

2.1. Basic features of Offshore Ship Registries

2.1.1. Genuine Link

The lack of the Genuine Link criteria for the Nationality of shipowners is one of the key aspects of the Offshore Ship Registries; however it is not relevant in all circumstances. These Ship Registries are set up in territories that are not under the jurisdiction of the states that created them, allowing people of those states to raise their flags on their ships. A good example is the Bermuda Ship Register, which allows a shipowner who does not have Bermuda nationality to register his ship there. The Offshore Ship Registries are clearly identical to the Open Ship Registries in this regard, as the Genuine Link between ship and shipowner is also absent.

The Netherlands, which benefited from its colonial position in the Caribbean, followed the United Kingdom's lead. In order to control the flagging-out of ships leaving the regular Dutch Register, he established the Offshore Ship Registry of the Netherlands Antilles in 1987. Similar to the United Kingdom, shipowners with nationalities from different nations were able to register their ships in this Ship Registry, and as a result, there was no Genuine Link between the ship's nationality and the shipowner. The collapse of the Netherlands Antilles in 2010 did not result in the Ship Registry's demise, since the Curacao Registry (Valsen Fiduciaries International 2017) was established, with the same operational requirements respecting the shipowner's nationality.

The Luxembourg Registry, which reflects the efforts of the Belgian shipping community to create more competitive operating conditions for the Ship Flag, was even more typical. Luxembourg developed a Ship Registry with specific favourable provisions in 1987 in conjunction with Belgian authorities and trade unions in order to attract Belgian shipowners (R. Carlisle 2009, 327). The fact that the ships chosen to be registered in the Luxembourg Register were also registered in the Belgian Ship Registry complicated the issue of nationality even further. As a result, we note that there was no Genuine Link with the Luxembourg Ship

Registry for these ships, although there was a Genuine Link with the Belgian Ship Registry. Belgian shipowners' ability to register their vessels in the Luxembourg Ship Registry ceased to exist in 2003 and is now considered extinct.

We cannot, however, say that the lack of the Genuine Link is detected in every situation. The Ship Registry of Kerguelen Islands can be used as a guide. Because these islands are a French Overseas Territory, the people who live there are French citizens. As a result, the ships registered in this Ship Registry satisfy the Genuine Link criteria, as the existence of French nationality is established in both the ship and the shipowner. However, the creation of the French International Ship Registry in 2005 resulted in the Ship Registry's reduction.

2.1.2. Geographical area where the Ship Registry is located

The major aspect of the Offshore Ship Registries is that they choose a territory as its seat, which is clearly distinct from the state's inland regions. It is generally an island that is not a part of the state that is responsible for the creation of the Ship Registry. The rule is to select a former colony with the status of an overseas territory or dependency with the old colonial power.

Following the collapse of the British Empire, the United Kingdom preferred to exploit the older colonial territories with which it had a privileged relationship. They are islands in this situation as well, although they are not part of the United Kingdom and have a variety of relationships with it. We have the case of the United Kingdom's Overseas Territories, which were chosen for the construction of the Offshore Ship Registry, in the instance of Bermuda and Gibraltar. In the case of the Isle of Man, which is a British Crown Dependency, a similar Ship Registry was established (Farthing and Brownrigg 1997, 191).

2.1.3. Jurisdiction of the State

There is a clear prevalent trend among the former colonial powers in terms of the applicable law that controls the operation of the Offshore Ship Registries. It refers to states that worked with an Overseas Territory or Dependency to establish the Offshore Ship Register. The geographical criterion for choosing the Ship Registry's registered office is directly tied to the state law that will be used in the aforesaid scenario.

If an Offshore Ship Registry is established outside of the state, as is the case, for example, in the United Kingdom, the Overseas Territory or Dependency Law that governs this Registry applies. This means that the Offshore Ship Registry of Bermuda, which is not a UK territory, operates in line with Bermuda's counterparts rather than UK law. The operation's overall control, as well as the registration requirements, is governed by Bermuda domestic law. The same can be said for applicable law and Ship Registries established on UK possessions, such as the Isle of Man. The Isle of Man's laws govern the operation of this Ship Registry.

It is important to highlight that, while the Ship Registry's functioning is governed by the domestic legislation of the Overseas Territory or the Dependency, practical challenges emerge that require the involvement of UK authorities. Because of the small size of the Overseas Territory or the Dependency, and as a result of the objective inability to fully meet the needs of the limited and inadequately trained human resources, as well as the insufficient material resources, issues concerning the final control of the safety rules and operations undertaken by the competent authorities of the United Kingdom itself have arisen (Farthing and Brownrigg 1997, 191). The same Principles dictate the type and quality of the rules that govern the functioning of this Offshore Ship Registry, respectively.

2.1.4. Vessel's Flag

The potential that the shipowner can raise the flag of the state that sponsored the founding of the specific Ship Registry is a typical feature of the Offshore Ship Registries. Even if this state does not recognize the ship's nationality and its laws do not apply to the ship's actions, we see that the ship has the ability to raise the flag of that state rather than the flag of the dependent Overseas Territory or the Dependency to which the Registry belongs. As a result, in the instance of the Netherlands Antilles Ship Registry, ships registered in this Ship Registry might raise the Dutch flag rather than the flag of the Netherlands Antilles, to which the Ship Registry belonged.

In any event, one of the primary aspects of this form of Ship Registry is the capacity of shipowners to raise the flag of the nation of origin. It is regarded as an important advantage

because it assures that the State that assigns its National Flag has administrative authority over the Authorities that have taken over the operation of the Ship Registry and may be located in territory that is not under that State's national sovereignty. It's also a criterion that's taken into account during on-board inspections, thus it carries a lot of weight in shipowners' decisions on the ship's nationality. As a result, it appears to be an element that lends glitz and opulence to the ship that hoists an internationally recognized flag.

2.1.5. Tax Regime

The fundamental feature of the Offshore Ship Registries is the established advantageous tax regime, which makes them more appealing than the respective Closed / National Ship Registries. It is frequently maintained that, in terms of tax treatment, they are quite comparable to the Open Ship Registries that are required to compete. The major tax instrument is determining the ship's annual financial burden based on the tonnage tax scheme. This means that the tonnage of the ship, not the turnover or profitability of the shipping company to which it belongs, will be used to determine whether the ship must pay the tax. Additional variables may be used in the final computation of the tax amount, depending on the Ship Registry. The category, to which the ship belongs, as well as its age, is examples of such criteria.

There are specific tax arrangements for the employees who work on the ship in addition to the benefits received by the shipping company. The rule is that seamen are exempt from paying taxes on their earnings from the sea. There are also particular provisions in place that reduce the costs associated with these personnel's social security benefits when compared to the costs associated with the ship's participation in the relevant Closed / National Ship Registry.

2.1.6. Seafarers

The flexibility that characterizes Offshore Ship Registries in terms of crew and officers is one of the primary factors that has aided their development. The Offshore Ship Registries have adopted relatively permissive laws controlling ship crewing in order to compete with the Open Ship Registries, which set virtually no limits on shipowners in the selection of employees to man their ships. The maritime company is entitled to hire crew members of whichever nationality it sees fit for business purposes (Farantouris 2003, 137). In other cases, officers can be selected regardless of nationality, allowing the shipping firm complete control over crew selection.

The level of their salaries is an interesting side effect of the ability to choose the composition of the marine workforce that is employed in the ship. The nationality of the crew has a significant impact on payroll expenditures. This is owing to the fact that the labor is accompanied by national employment contracts, which vary greatly from country to country. However, if the salaries are below the I.T.F.'s minimum, they are considered Flags of Convenience (Vlachos 2000, 482). There are certain Offshore Ship Registries that meet the I.T.F.'s (International Transport Federation) basic requirements, as well as some that fall short of the minimum allowable limits, resulting in their inclusion in the Flags of Convenience

2.2. Policy recommendations

The motivation behind the creation of Offshore Ship Registries is based on the need to react to the flagging-out of vessels. The continuous flow of ships towards more attractive Open Ship Registries or even Flags of Convenience threatened the very existence of the maritime sector in some States with long-lasting maritime tradition. Employment for the local seafarers was deteriorating, state revenues from the taxation of the maritime companies were continuously shrinking and maritime-related activity such as shipbuilding, shiprepairs, marine insurance, ship-broking and ship chandlers was facing the possibility of near extinction within the borders of the respective Closed / National Ship Registry (Alabanos and Theodoropoulos, Measurement of the Administrative burden for the establishment of shipping companies in Greece 2017, 86).

For all the above mentioned reasons, States with former colonial empires opted for the establishment of new Offshore Ship Registries based on the former colonies. With this method, Offshore Ship Registries could incorporate some of the characteristics of the Open

Ship Registries that otherwise could not be adopted in the traditional Closed / National Ship Registries. Areas of particular concern of the Offshore Ship Registries that enhance their competitiveness are the tax regime and the nationality of the seafarers. Both of them contribute significantly to the total cost of the shipping sector and are a decisive factor for the selection of the appropriate Flag on behalf of the maritime company.

2.2.1. Contribution to economic development

With the creation of an Offshore Ship Registry the economic development of the traditional State is preserved, since local shipowners and shipmanagers may swift to the Offshore Ship Registry of a former colonial territory instead of choosing an Open Ship Registry in another country. The greatest part of the activities of the shipping sector is expected to continue to be based on the traditional maritime State, since many of the functions of the Offshore Ship Registry depend on the cooperation with the Authorities of the traditional maritime State. Because of this reason, the economic development of the State is better preserved and a great part of the maritime and maritime-related activities continues to contribute to the economic development of the traditional maritime State that took the initiative to establish the Offshore Ship Registry in an overseas territory.

2.2.2. Importance in the regional development

Only part of the maritime and maritime-related activity, such as financial services, auditing and marine law, is normally transferred to the territory where the Offshore Ship Registry is based, mainly for reasons of compliance to the local legal system and cooperation with the local authorities. In this way, some of the economic activities that formerly took place within the territory of the Closed / National Ship Registry are now transferred to the country where the Offshore Ship Registry is based. Even with this heterogeneous distribution of economic activity, the creation of an Offshore Ship Registry has a positive impact on the regional development of usually remote island territories, such as Bermuda and Kerguelen.

The territories that are chosen for the establishment of an Offshore Ship Registry normally present insignificant former maritime activity and lack the necessary infrastructure to serve an important maritime sector. Quite often, the overall economic output of these overseas territories is restricted and focuses on specific sectors of the economic activity. Usually, tourism and fishery are the traditional sectors of the previous economic activities of these territories. The creation of a maritime sector contributes to the differentiation of their economies and has a positive impact on their regional development. Only the support of the respective State of the Closed / National Ship Registry, through the establishment of an Offshore Ship Registry, can lay the foundations for the creation of a vivid shipping sector and thus signal the flow of maritime-related activities to the ex-colony.

3. International Ship Registries

The majority of traditional European countries were concerned about the necessity to take action to reverse the deteriorating trend of Closed / National Registries. There were states that were not in possession of colonial territories while the former colonial powers sought solutions to their marine policy that previously entailed colonies. They faced the same issues of their national shipping in terms of survival, but lacked the ability or motivation to establish an Offshore Ship Registry in an Overseas Territory or Dependency. The solution was to create an International Ship Registry based in the territory of the State concerned with characteristics that are significantly similar to the Offshore Ship Registries, but without being identified with them.

Because of the significant similarities between Offshore Ship Registries and International Ship Registries, some Ship Registries have been classified in the first group and others in the second category. Such is the situation with Portugal's Madeira Island and Spain's Canary Islands. Both colonial powers, on the other hand, elected to establish the Ship Registry in their respective metropolitan areas, resulting in the majority of the literature being classified as International Ship Registries.

The subject of whether the International Ship Registries created by European Union member states are compatible with the Treaty on European Union and the Treaty establishing the European Community, particularly Article 87 addressing public aid, has been questioned

(European Union 2002, 67). In a relevant decision (European Union 2002) concerning the International Ship Registry of Germany, the Court of Justice of the European Union ruled that the International Ship Registry's operating status is not contrary to European Union regulatory rules and thus does not constitute a breach of European legislation on state aid.

3.1. Basic features of International Ship Registries

3.1.1. Genuine Link

The current trend in International Ship Registries is to have proof to establish the presence of the Genuine Link. However, as with Offshore Ship Registries, there is a distinction in this type of Ship Registries as to whether or not the Genuine Link exists. The Genuine Link was not considered a component of the link between the Ship Registry and the ship in Portugal's strategy to introducing the MAR Ship Registry to Madeira in 1990. Of course, the major goal of the MAR Registry's founding was to serve the interests of Portuguese shipping. However, citizens from other countries were granted the chance to register ships, and shipowners from a number of European countries worked with this Ship Registry in this fashion. The fact that more ships belonged to foreign shipowners in 2004 than ships belonged to Portuguese residents is evidence of the lack of the Genuine Link (R. Carlisle 2009, 333)

Norway has taken a similar approach to Genuine Link, establishing loose requirements and essentially enabling shipowners of all countries to register ships in the International Ship Registry (Norwegian Maritime Authority 2016). Norway was the first country to establish an International Ship Registry (Rosaeg 2020) which evolved to be greater than the Closed/National Ship Register (Aarstad 2017), and it served as a model for a number of countries that followed, including Denmark and others (Cusumano and Ruzza 2020).

On the other hand, there is the example of France, which formed the International Ship Registry in order to attract ships with French interests. As a result, the Genuine Link criterion is observed, with the possession of French nationality (France - Ministry of Ecological and Solidarity Transition 2016) as a prerequisite of ship ownership. States that restrict the opportunity to register ships to their International Ship Registries are in the minority, while the majority of International Ship Registries are available to shipowners from other countries.

3.1.2. Geographical area where the Ship Registry is located

Countries who wanted to improve their shipping business by reviewing their shipping policies formed the International Ship Registries. In order to achieve this, two main pathways were taken in terms of determining the geographical area where the International Ship Registry would be established. Allowing the shipowner to register the ship in the International Ship Register at any port in that State was one of the most important options. The International Ship Registry was established in a clearly defined geographical area of the given state as the second technique.

The shipowner has the option to choose the port of registration in any nations that have elected to create the International Ship Registry on a national level. This means that, in addition to the Closed / National Ship Registry, the International Ship Registry services are available in each port that supports Ship Registry services. The International Ship Registry of Germany is an example of this technique, since it allows the candidate ship to select the port of registration (Germany - Federal Ministry of Transport and Digital Infrastructure 2021) from among all possible ports in the country.

In the second situation, it is not uncommon for a portion of the island country to be chosen as the location of the International Ship Registry's establishment and seat. Portugal is an example of a state that chose a portion of its island territory for the construction of an International Ship Registry. The Portuguese government has picked Madeira, a Portuguese autonomous province in the Atlantic Ocean, as the site of this Ship Registry's headquarters. The people of Madeira are Portuguese citizens, and their rights and obligations are the same as those of any other Portuguese citizen. Similarly, Spain chose the Canary Islands, which are located in the Atlantic Ocean and are part of Spain's metropolitan region, for the development of the International Ship Registry. Finland took a same strategy when creating its own International Ship Registry, selecting the cluster of Aland Islands from all over the country.

On the other hand, several states have elected to form the International Ship Registry on a portion of their mainland. As an example, Norway has the International Ship Registry N.I.S.

(Norwegian International Ship Registry), which is based in the port of Bergen (Norwegian Maritime Authority), which also houses the country's Closed / National Ship Registry. Similarly, Marseille, a mainland port, was chosen for the establishment of the International Ship Registry in France (France - Ministry of Ecological and Solidarity Transition 2016).

3.1.3. Jurisdiction of the State

The full incorporation of the laws regulating their operation into the national law of the state in which they are headquartered is a feature of International Ship Registries. Because their registered office is located within that State's geographical region, their activities are assumed to be governed by the laws of that state, which has unrestricted national jurisdiction. It should be emphasized, however, that the extent of applicability of International Ship Registry's legislation has differed in two significant ways. Countries that elected to establish an International Ship Registry at the national level established a set of rules for the Ship Registry's operation, regardless of where the Ship Registry is situated geographically. On the contrary, several states have designated a certain area of their territory for the creation of such a Ship Registry.

The legislation was changed in order to cover the registration of ships throughout the national territory in the case of states that elected to create the International Ship Registry at the national level. In this sense, there is no preferential treatment for one section of the country over another, because the same International Ship Registry has branches in many parts of the country, all of which offer the same services.

The International Ship Registry of Germany (G.I.S.) is a unique case of an International Ship Registry that chose not to apply any geographical limits in terms of its headquarters. While there is no concept of geographical restriction, there is an institutional constraint on the state of the ship's registration prior to its arrival. Only ships registered in the German Closed / National Ship Registry are authorized to be registered in the German International Ship Registry at the same time (Mansell Springer Science & Business Media, 5). As a result, registration in the International Ship Registry of Germany is limited to ships flying the German flag, and ships from other Ship Registries are not permitted to register in this Ship Registry (Daniil and Saviolakis 2020, 955). It may be argued that the G.I.S. is designed primarily to assist ships currently flying the German flag and does not seek to attract ships from other Open or Second Ship Registries in the international competition between Ship Registries.

The states that have opted to form the International Ship Registry in a specified area of the territory within which they have complete sovereign rights are on the other side. The Canary Islands, which are an integral part of the Kingdom of Spain and where the domestic law of that country is completely enforced, were chosen for the founding of the Ship Registry in Spain. Of course, it should be noted that the legal status of operation of this type of International Ship Registries is unique. The legislation governing the operation of these Ship Registries is not applicable on a national level. That is, the Spanish International Ship Registry of the Canary Islands does not apply to the entire Spanish territory because it only provides special privileged privileges in the Canary Islands' geographical area.

The argument given by certain nations for enacting a special legislative regime that allows for the creation of an International Ship Registry in a certain geographical area, as opposed to the remainder of the national territory, where the current Closed / National Ship Registry continues to operate, has two components. One is the necessity to provide incentives to the domestic shipping community in order for them to be able to compete on more favorable terms while preserving their nationality and avoiding the use of an Open Ship Registry. The second reason has to do with the state's desire to promote growth in specific geographic areas. Because these places are typically located outside of the mainland, their business activities are subjected to more adverse economic conditions. As a result, in most cases, the establishment of an International Ship Registry is part of a larger set of development initiatives aimed at boosting commercial activity in these locations (Gobierno de Canarias 2021).

3.1.4. Vessel's Flag

The states formed the International Ship Registries in order to attract ships that would otherwise prefer to register in an Open Ship Registry. To achieve this purpose, it is critical to adopt not just a package of enticing incentives with financial impact, but also to provide the

option of selecting a high-quality Flag. As a result, the International Ship Registries allow shipowners who select them to fly the flag of the country that is responsible for the development of these Ship Registries.

Raising the national flag of a traditional maritime country with a long history is particularly essential in terms of ships flying its flag. The ability of a ship to hoist a high-quality flag that is not on an international organization's or M.O.U.'s black list is regarded as extremely important. A ship is subjected to a more favorable regime in terms of the controls and numerous inspections carried out in the ports it approaches by raising a quality Flag. Furthermore, it is possible to implement intergovernmental agreements between the Flag State and the port state to which the ship is approaching, resulting in potentially preferential treatment of port /harbor expenses and other fees, as well as priority entry into the port.

3.1.5. Tax Regime

A significant guide in the application of tax policy in the International Ship Registry is the requirement to attract ships from the reservoir of ships that are prone to registration in an Open Ship Registry. The tonnage tax scheme is a basic taxation instrument in which a shipping company's taxation consists of a fixed amount based on the tonnage of the ship multiplied by a varied rate depending on the Ship Registry. As a result, the determination of the basic taxation is not influenced by the year's financial results. It is worth mentioning that the tax resulting from the tonnage tax scheme is often lower than the tax coming from the application of the traditional profit taxation system (Germany - Federal Ministry of Transport and Digital Infrastructure 2021).

VAT is an important tax instrument, particularly in the European Union's region. It is, however, subject to specific constraints (France - Ministry of Ecological and Solidarity Transition 2016, 11). The most typical requirements are provided for the ship to conduct shipping or similar activities exclusively on the High Seas.

The outcome of the ship's financial activity is considered to have already been taxed under the tonnage tax scheme, which is a final tax and can thus be given to the ship-owning company's shareholders without extra tax charges (Norwegian Maritime Authority 2016). To avoid double taxation, special intergovernmental agreements may exist between the State that has established an International Ship Registry and the other States.

The usual guideline for seafaring employees employed on ships listed in the International Ship Registries is that the payroll should adhere to the requirements of the seafarers' home country. As a result, if the seamen hired are from the Philippines, they will be paid according to Philippine law. However, like in the instance of the French International Ship Registry, it is feasible that the State providing the International Ship Registry establishes a minimum threshold beyond which seafarers' pay are not allowed to fluctuate (France - Legifrance 2021).

There is a significant disparity in the social security of mariners amongst the numerous International Ship Registries that have been formed. While they tend to follow the general rule that employer contributions are not the same as those of ships registered in the Closed / National Ship Registry, there are several exceptions. The minimal level determined by the International Labor Organization is specified as a minimum in several International Ship Registries, such as the French (France - Ministry of Ecological and Solidarity Transition 2016). Furthermore, the State that formed the International Ship Registry may have entered into bilateral transnational agreements with a number of third countries (Germany - Federal Ministry of Transport and Digital Infrastructure 2021). It is feasible to identify details relevant to the social security of the hired personnel based on these contracts.

3.1.6 Seafarers

The selection of crews and officers of ships registered in the International Ship Registries vary significantly depending on the state and the maritime policies that it follows. The final mix of policy adopted is a combination of the necessity to offer enticing incentives, frequently comparable to those offered by an Open Ship Registry, as well as the satisfaction of each state's economic and social interests, particularly with regard to seafarer employment. As a result of these considerations, the available International Ship Registries have established varied criteria for the nationality of the crew members.

There are International Ship Registries that have an aggressive policy of faithfully copying the Open Ship Registries and allowing the shipping firm total freedom of movement. As a result, the shipowner has the freedom to choose any nationality for his Master, Officers, and crew. The Norwegian International Ship Register (N.I.S.) is a good example of such an International Ship Register, as it allows shipowners to choose the nationality of their crew almost entirely (Norwegian Maritime Authority 2016). Portugal (International Business Centre of Madeira n.d.) has taken a similar stance on the question of maritime personnel nationality. While it has set a requirement that at least 30% of the total number of staff on board originate from a European or Portuguese-speaking country, the ship-owning firm can seek for an exemption from this requirement in practice and Recruit personnel from all around the world, regardless of the seaman's nation of birth.

International Ship Registries, on the other hand, place tight restrictions on the nationality of the marine workers. It is noted that in the case of the Canary Islands Ship Registry, both the Captain and the Officers must be citizens of a European Union member state (International Ship's Register, S.L n.d.). Only 50% of the junior crew can be non-EU nationals. The Danish International Ship Registry, which has similarly tight standards that confine the Master's nationality to the European Economic Area (E.E.A.), has also been formed, but allows the remainder of the crew to be signed up from any country of the shipowner's choice (Danish Maritime Authority n.d.). This has resulted in lower crew cost of approximately 50% compare to the cost of vessels under the Closed/National Ship Registry (Sornn-Friese and Iversen 2014). The same restriction applies to only the shipowner's nationality in Germany's International Ship Registry, which accepts only European Economic Area nationalities (Germany - Federal Ministry of Transport and Digital Infrastructure 2021).

France has used a unique technique to determine the crew's nationality. Unlike some countries, which segregate the Master's nationality from that of the rest of the crew, the International Ship Registry of France takes a uniform approach to the topic of the workforce's nationality. More specifically, a single rate of 25% applies to the entire crew, all of whom must be from EEA nations (France - Ministry of Ecological and Solidarity Transition 2016). In fact, if the ship-owning company has received financial incentives for the purchase of the ship in issue, the aforementioned proportion may be increased to 35 percent.

3.2. Policy recommendations

The driving force behind the creation of an International Ship Registry is the need to respond to the threat of the Open Ship Registries and Flags of Convenience. The maritime sector of the European States faces the possibility of near extinction due to the continuous flagging-out of vessels towards the usually more cost-efficient and less restrictive Open Ship Registries or even Flags of Convenience. The positive experience of Great Britain, France and the Netherlands with the establishment of Offshore Ship Registries in former colonies encouraged the creation of Second Ship Registries under the form of an International Ship Registry by many European countries that lacked former colonial territories. Norway was the first State in the world that chose to lay the foundations of an International Ship Registry and many other European and non-European States followed.

The success of the institution of the International Ship Registry is based on its flexibility to adhere to the local needs and demands. Areas of concern such as the tax regime (Jolley, et al. 2017, 54), the nationality of seafarers, the genuine link between the shipowners and the International Ship Registry, the geographical area of trade where the vessels are permitted to operate, the types of cargo that the ships are allowed to transport might significantly differ among the various International Ship Registries under examination. International Ship Registries can be very flexible in the adoption of the proper set of rules that better serve the needs of the respective State and thus materialize the national maritime policy.

3.2.1. Contribution to economic development

International Ship Registries are an important tool for the preservation of the core of maritime activities within the borders of the traditional maritime State. The establishment of an International Ship Registry helps to maintain under the national Flag, although under a different set of rules, the tonnage that under other circumstances would have chosen to re-register under an Open Ship Registry or a Flag of Convenience. For this reason, economic

activities, associated with the maritime sector, are allured to continue to take place in the same economic environment with the Closed / National Ship Registry. Both the management of the maritime company which is shore-based and other maritime-related activities such as shipbuilding, ship repairs, ship finance, marine insurance and ship broking can contribute to a flourishing home-base maritime sector that is fueled by the operations of an International Ship Registry.

Additionally, to the preservation of the national fleet, which is better served with the establishment of an International Ship Registry, certain International Ship Registries also target the international market in order to attract foreign vessels (Alabanos and Theodoropoulos, A hybrid model proposal based on SCM and RCM administrative burden models (A.B.Ms) 2019, 96). This is the case of the MAR Portuguese International Ship Registry and the NIS Norwegian International Ship Registry that further contribute to the economic development of the respective countries by attracting foreign-flagged vessels.

3.2.2. Importance in the regional development

The creation of an International Ship Registry can boost the regional development of certain geographic areas and enhance the regionalization process (Belyakova and Vorobyeva, Opportunities and limitations of regional Authorities' use of public administration tools for economic development 2018, 144-145). In many cases, the traditional maritime States choose to establish the International Ship Registry in certain geographic areas thus encouraging the transfer of economic activities in these regions (Panagou, Kokkali and Stratigea 2018, 89). Interestingly, quite often these areas are islands, as is the case of Finland that has established its International Ship Registry in the Islands of Åland, or Spain with the Canary Islands.

The regional development can be further accelerated if the States opt for the establishment of special, business-friendly economic and fiscal regimes in parallel to the creation of an International Ship Registry (Korres and Tsamadias 2009). The creation of an International Ship Registry can be accompanied by tax incentives (Amri, et al. 2019, 73), social security allowances, free trade zone (Khan and Haasis 2020, 179-180) and simplified procedures that favor the creation of a Business Centre.

This is the case of Portugal with the establishment of the MAR International Ship Registry as part of the International Business Centre of Madeira in the isolated island of Madeira (Portugal - International Business Centre of Madeira 2021). The success of this initiative is apparent in the transformation of the formerly agricultural and rural economic character of Madeira into the dominant tertiary sector that contains not only shipping. Trade and financial services flourish and innovation is highly encouraged (Belyakova, Belyakov, et al. 2017, 123). Unemployment rate has well below the national levels (European Commission 2021) and it is estimated that the contribution of this specific Business Centre to the local economy in terms of Gross Value Added (GVA) surpasses 10% (Confraria 2019, 3).

4. Conclusion

Open Ship Registries and Flags of Convenience have resulted in a dramatic reduction in the capacity of European countries' fleets, including the traditional shipping states. The threat of European shipping disappearing has prompted European countries' and the European Union's maritime regulations to seek remedies. While the endeavor to establish the common European Registry, EURO, was unsuccessful, many alternatives have been offered at the national level, the most prominent of which is the development of Offshore Ship Registries and International Ship Registries. In a variety of areas of interest, they are unique forms of Ship Registry that include aspects from both Closed / National Ship Registries and Open Ship Registries.

The unique characteristics of Offshore Ship Registries and International Ship Registries are examined in detail, with a focus on issues such as the degree of compliance with the Genuine Link as a criterion for determining the ship's nationality and the applicable law in relation to the ship's right to raise the flag of a specific State. At the same time, the institutional framework that governs the operation of the Ship Registries shows significant variation between the solutions adopted by European states. In some cases metropolitan territories have been selected for the seat of the Ship Registry, while in other States overseas

territories have been selected. In the former case the legal framework of the metropolitan State applies, while in the latter case it doesn't.

At the same time, the establishment and operation of Offshore Ship Registries and International Ship Registries has important consequences for the tax treatment of shipping companies. Furthermore, the condition of the working circumstances is critical, depending on the Ship Registry regulations. Finally, the institutional structure that administers The Offshore and International Ship Registers has a considerable impact on the geographical region of activity of the ships, and it is worth noting that there are substantial variations between them.

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STRATEGIC PRIORITIES OF THE NATIONAL POLICY OF THE REPUBLIC OF KAZAKHSTAN ON THE DEVELOPMENT OF REGIONS

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Abstract

The state system of strategic forecasting and planning of the Republic of Kazakhstan is an important tool for the implementation of large-scale global tasks and the development of long-term priorities for the central and regional authorities. The purpose of the study is to identify strategic priorities for the regional development of the Republic of Kazakhstan on the example of the Kostanay region and to verify the connection between regional development within the country and world geopolitics. The study covers the main tasks and achievements of the regional economy development. The authors of the study disclose the main areas for improving monetary and fiscal policy, ensuring macroeconomic stabilisation. The study demonstrates the main issues and opportunities of economic development in various regions of Kazakhstan and proposes measures for the labour market modernisation as the main priority of effective economy development. Thus, the new course of national policy within global challenges requires improving the training of qualified personnel capable of providing labour resources. The main task of regional policy and state strategy is to preserve the country as a single unitary state. This specificity requires effective management of all internal structure elements of the Kazakh society, which is at the stage of systemic modification. The practical significance of the study is due to the visual demonstration of the effectiveness of various regional development theories, their place and role in science and politics.

Keywords: Regional policy, national economy, competitiveness, strategic priorities, concept, diversification

JEL classification: R10, R58, C53

1. Introduction

In the modern world, the importance of regional issues has increased considerably due to the need to strengthen the territorial approach to regulating and managing the development of market conditions to ensure economic relations between regions. The stage of the country's economic development is characterised by a rapidly growing interest in a complex of regional issues. For the effective development of the regions, it is impossible to consider one aspect of the issue. There is a need for an integrated approach to solving all the issues of regional development. The main priorities are the creation of new production complexes, equalising the development levels of individual regions, as well as solving regional issues at the expense of their own internal resources and reserves. The issue has become quite relevant, multi-sided,

and has taken an important position in society and politics. The regional development of various spheres requires applying new analysis methods and the integrated use of existing technologies.

The regional policy of Kazakhstan is an integral part of the general national policy aimed at the effective use of territorial factors of economic management and vital activity to achieve strategic objectives and purposes of sustainable socio-economic development of the country. In this regard, the implementation of an effective and correct regional policy is the key to the successful development of the state (De Laurentis, 2020). Throughout social and economic transformations, the regulatory role of the country in the development of territories has substantially weakened. This was manifested in the reduction of public investment in regional development, which negatively affected the economy of certain Kazakh regions. There was an imbalance in the development of transport and industrial infrastructures, the standard of living, and the availability of social services between regions. A developed region with a high population density and highly qualified personnel has experienced a decline in production and a demographic crisis.

The State is aiming at the decentralisation of resources and competencies. The regions are still heavily dependent on incentive measures and centrally determined priorities. There are limited financial, organisational, and human resources that are necessary to promote development considering local conditions. The current policy is aimed at raising certain sectors in specific areas without considering regional peculiarities. The general areas of the regional progress are to increase competitiveness and maintain economic stability. Although the list of strategic priorities covers a fairly wide range of spheres and areas, the main sectors are human capital development and the introduction of innovations and modern technologies. The Government of Kazakhstan determines the development procedure of strategic concepts and programmes for an integrated system of national policy in regions. National strategy and planning documents are being developed in two areas – economic and social. The purpose of the documents is to develop political, social, and economic spheres, increase social welfare and strengthen citizens' positions in regional society (Chang et al., 2018; Fricke, 2020).

An important priority for ensuring sustainable development is the transformation of common systems in the economy and the transition to innovative development. The regional development programme refers to the competence of local authorities. At the regional level, Territorial Development Programmes are being developed that cover all areas of a certain territory. The programmes include the main tasks of the region's development, areas, purposes, expected results, and the necessary resources. The main objective of this programme is to establish and stimulate capital in the economic growth centres through increasing competitiveness, as well as creating favourable living conditions in the region. The assessment of the state strategic plans entails determining the efficiency and implementation levels of programme documents. The assessment system determines the guidelines and principles of the state bodies' effectiveness according to appropriate methods (Latuconsina et al., 2018). One of the mechanisms for improving the state bodies' activities is the personnel management quality, as reveals the real potential and capabilities of the apparatus in each particular body, which is necessary since the activation of human resources becomes one of the priority strategic tasks of the state to increase labour productivity.

Rather than focusing on specific areas and regions, regional policy considers the subnational level as an analysis object. The use of potential increases productivity and introduces economic life at all levels. Thus, the regional development policy establishes a holistic strategic mechanism for the implementation of various measures aimed at economic growth at the subnational level. The regional policy can help identify the growth potential in certain regions and contribute to the establishment of a healthy business environment that considers local characteristics. This policy supports the diversification of regional economies, which allows maximising the effect of the agglomeration economy and reveal the growth potential in a less affluent region. The most effective measures for diversification focus on the development of the advantages of the current region: natural, physical, financial, and human resources. The rational combination of regional and national policy measures for the use and definition of this capital is of particular importance.

Thus, the political strategy of the regions can contribute to achieving the purpose of the entire state. At the regional level, an integrated policy and economic strategy can promote

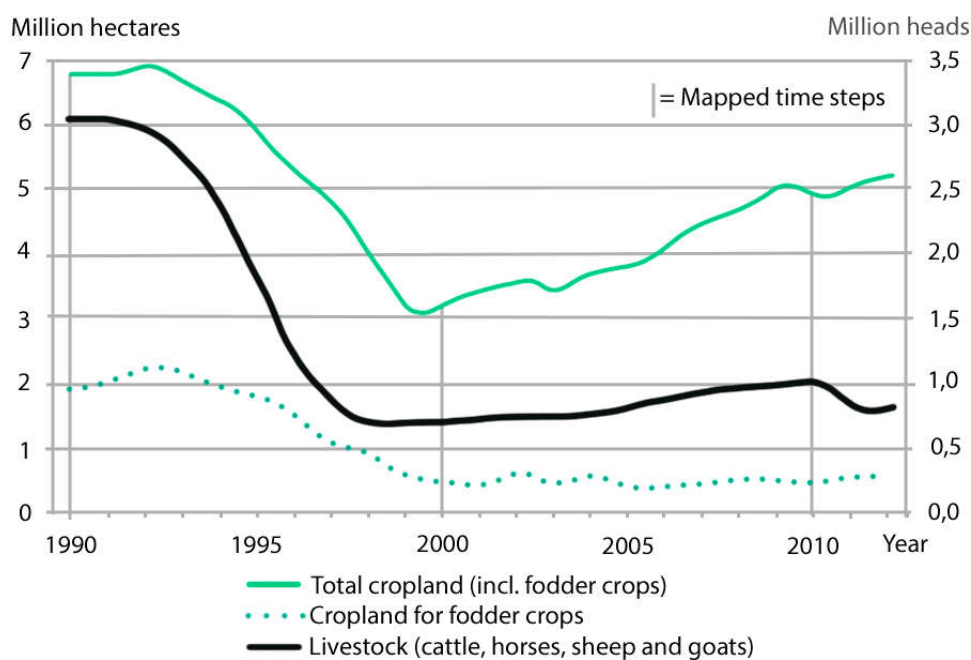
combining various components and lead to increased productivity. Therefore, it is important to determine its traditional tools and scope. Modern regional policy is aimed at competitiveness and growth, which apply to all regions. Sustainable economic growth ensures an increase in human capital competitiveness, which leads to an increased diversification through industrialisation and infrastructure development. In the course of diversification, there is a transition from an extensive path of development to an industrial and innovative one. Diversification is the main aspect of economic and social policy focused on spatial development (Pirvu et al., 2018).

2. Materials and Methods

In the course of the research, the authors applied theoretical, statistical, mathematical, empirical methods on the example of the Kostanay region. This region is endowed with considerable agricultural land and natural resources. Therein, the regional policy is aimed at implementing measures to use the potential of large enterprises and develop production facilities serving agriculture. Kostanay region is considered to be an area with an average competitiveness level. In order to determine the index components that reflect the development and competitiveness levels of the region, a number of indicators were considered when identifying the competitiveness of the region. An essential condition for index construction is a specific region and certain indicators that should fully reflect the main competitive advantages and the progressiveness of the industry structure. The choice of indicators is determined by the availability of statistical data.

To ensure the effective implementation of economic policy, a whole range of measures was provided in the economy sectors to increase the share of the real sector in the structure of the gross regional product. Thus, production in the industry is increasing due to the utilisation of production capacities. In the agricultural sector, due to the diversification of areas, there is an increase in crop production, new technologies and methods are used. In animal husbandry, there is a production increase of basic products due to the livestock growth in the production sector (Figure 1).

Figure 1. Agricultural development in Kostanay region



Despite the practical and methodological studies that consider the essence of the subject, the main priorities of the regional economy development concerning the structural policy improvement of the region, the integration of statistical assessment of competitiveness level, the search and development of new opportunities by improving the quality of human capital, remain understudied. The main research tools can be considered: the investment programme,

national programmes to support specific regions, coordination and planning of regional development. Recent data demonstrates that regional development is not related to the need for state reform. Such development is called functional, it is based on the economic development of the region, which does not need such political processes as regionalisation and decentralisation.

The mathematical methods are applied in the analysis of regional development due to the need to build mathematical models of economic dynamics. When forecasting the prospects for the regional political system development, it is necessary to identify effective ways to assess the consequences of current activities. It is necessary consider experience and results to develop correct economic solutions that can be obtained by mathematical and conceptual models. Mathematical methods allow drawing conclusions that contribute to the progress of regional national policy.

These research methods are a combination of induction, deduction, decomposition, and statistical analysis. The statistical analysis of the state systems of strategic planning and forecasting made it possible to identify mechanisms for implementing priorities and algorithms for achieving them, to identify progressive elements of strategic planning systems. When conducting an analysis, the authors took into account the provisions of the draft laws that changed the system of state strategic planning in the Republic of Kazakhstan. The material is normative legal acts in the field of regional development and statistical compilations.

In addition, the study was conducted by methods of logical generalisation and system analysis. It appeared that more accurate practical and theoretical information that meets the requirements of the regional economy is in need. The results obtained prove that the regional development policy should provide support and assistance in combination with diverse approaches and consider the typology of regions. Since, at present, almost all countries develop a regional policy, make decisions on changing the administrative-territorial division or consolidation between regions, develop various programmes and means of stimulating them. In general, all tools can be conditionally divided into financial, administrative, and organisational-economic.

The methods and materials considered are not exhaustive. Regional national policy is a rather complex research object in terms of forecasting, development, and analysis. It is necessary to consider many factors that have a direct impact on the region development. The main methodological approaches presented in the study can be applied in assessing various processes that occur in this region and to assess the consequences of political decisions on the investment state development. It is essential to identify the causes for the uneven development of regions and the factors that influence the inequality. Applying various methods of analysis allows stimulating the growth of regional policy in all regions, including the Kostanay region.

3. Results and Discussion

Strategic priorities of the state regional policy have become a relevant and important subject of the 21st century. The key task facing the Republic of Kazakhstan is to create an effective mechanism for implementing regional development policy measures. The state sets purposes to achieve balanced growth and transition from a resource-intensive model to a diversified one. To achieve these goals, reforms are required that would promote national growth while improving the well-being of the local population. During globalisation, the main factor of development is compliance with three requirements: competitiveness, integration into the world economy, and ensuring that these processes positively impact the country and its regions. Achieving this purpose is problematic without the participation of each region since the country's economy as a whole depends on the economy of administrative-territorial units and its components (Skantsev et al., 2019; Benedek et al., 2018).

The policy of the regions as an integral part of the national policy is aimed at orienting the national space in accordance with the chosen development strategy. This system, which implements the interests of the state in relation to the regions and the internal interests of the regions, also considers modern regional processes. The regionalisation of public administration has objective economic and political foundations. Economic and natural differences between regions determine the effectiveness of regional management and the best solution for the division of responsibilities and rights between central and local authorities.

Successful reforms are possible with an active national policy that will consider the specific features of each region. The establishment of modern democratic approaches will allow using the principles of decentralisation, which consequently provides conditions for the productive management of territorial entities.

Certainly, new approaches to the development of regional policy, the identification of new methods, such as programming and project management, are required. In this regard, it is currently important to analyse the decentralisation of public administration, to solve the issue of inter-budgetary relations for the regional management effectiveness, to designate the regional policy as the main part of the national policy. It is necessary to continue reforms on social, economic, and political modernisation in order to streamline the management system. The modernisation will strengthen the relationship between regional, central, and local government bodies based on the decentralisation of management functions. The implementation of an effective integrated approach to regional management increases the possibilities of market mechanisms and public utility systems. The qualitative economy growth is based on the improvement of the institutional state, increasing the competitiveness of human capital and business, technological modernisation, and minimising the negative impact on the environment.

The Republic of Kazakhstan demonstrates a regional interdependence, characterised by the economic openness of the regions that are parts of the economic system. Economic growth in the country is associated with the advanced development of the raw materials sector. Although there is stabilisation and growth in the raw material regions, the regions developed in the past with a high population density and qualified personnel are characterised by a decline in production, which leads to a difficult transition to market relations. As a result, the socio-economic differentiation of regions increases, which becomes more difficult to overcome (Babayev, 2020; Batur Sir and Çalışkan, 2019). The current circumstances necessitate the introduction and development of modern approaches to the effective study of interregional relations and the use of regional resources to ensure the development of the single economic space.

A number of common regional issues have been identified in the Kostanay region. Most of the issues are due to the raw-material based economy. There is a high level of prices, a low production level of industrial products per person, and low-quality personnel, which contributes to uneven economic development and a considerable inequality in indicators for assessing the potential of regional systems. The issues that have appeared are superimposed on those that have already existed for years. The lack of regional policy and a lack of a clear distinction between the functions of local and central executive bodies lead to a growing set of regional issues and strengthen the regional imbalance in terms of the population's living standard. The regional policy reform and its adaptation to the market system of management are very ambiguous. The mechanism for implementing the region's policy should be flexible to consider the features of tactical and strategic tasks (Martínez et al., 2020).

For regions with high scientific and production potential and strategically important types of mineral resources, national policy methods should aim at providing conditions for restructuring the region's economy and promoting technical re-equipment of enterprises to increase the output of export-oriented goods. For these regions, the regulating the trade sphere is of great importance. The incentive factor for structural adjustment in these regions may be depreciation benefits for priority industries. Attracting foreign investment in industries that can participate in the re-equipment of infrastructure and reach the world level in a short time plays a special role. For the country's food fund regions, economic incentives should promote the development of small and medium businesses to develop new forms of agro-industrial integration of enterprises and increase employment. Environmentally distressed, backward, and depressed regions need social support and assistance to activate the economy and eventually implement certain complex projects to improve socio-economic and environmental development, as well as to assist in attracting humanitarian and foreign aid.

An important strategic priority of regional policy is the forecast scheme, which determines the approaches of the state in key areas of sectoral development. The scheme can ensure the development of current and long-term, macroeconomic and regional aspects, and allow coordinating the actions of territorial authorities and businesses. The complexity and long-term orientation of the scheme will allow using it to identify existing opportunities and

develop promising areas for economic development (Gagarina et al., 2019; Varavin et al., 2018). The forecast scheme solves complex and systemic regional issues, considering the potential of a particular region. To implement the reform of the regional policy, the main approaches have been identified: the removal of infrastructure restrictions in the region, the stimulation of agglomeration, the development of a modern territorial and spatial base. It is agglomerations that play a crucial role in the development of the country as they reveal the labour and economic potential. Therefore, one of the most important tasks of the new regional policy of Kazakhstan is to increase the efficiency of public investments in the social sphere and infrastructure. Thus, the reform of this sector will improve the system of inter-budgetary relations.

Due to certain measures and the influence of positive factors, the economy has recently been booming in most regions of the country. However, the main regional problems have not yet been resolved. To solve them, a strategy has been developed that assumes a transition to a policy of forming and supporting the entire economy of the territory. This approach corresponds to the global trends and practices of territorial development. The main task of the regional policy within this approach was to ensure sustainable economic growth in each region and satisfy the need to develop regional concepts in order to justify the new policy of the regions (Gruia et al., 2019). Modern concepts are associated with a change in state intervention level in economic processes, the development of space with new and modern aspects, and the increasing role of individual territories in the country's economy. With the expansion of globalisation, new factors of placement appeared, telecommunications networks and information technologies began to develop, production and market infrastructure expanded. Regional development has become the dominant component of practical activity.

The main part of the activities is carried out within the framework of the general macroeconomic and social policy. However, when developing and implementing it, it is necessary to consider the agglomeration regional effect and compliance with the interests of the socio-economic development of the regions. The state can establish a regional development fund, which will finance various projects of regional and interregional significance. The territory regulation should be based on the appropriate mechanism of relations between different government levels. It is necessary to prepare regulatory and legal documents on the delegation of powers between the republican authorities and the regional authorities. The procedure for providing state support to the regions should be fixed. The economic mechanism of regional relations should aim at improving the budget and tax system and economic responsibility between political levels. The main task of the state is to motivate regions to achieve the best economic results on a national scale (He et al., 2020; Kong et al., 2019).

A productive mechanism for conducting regional policy helps to increase the regional potential, which leads to an increase in investment, the activity of entrepreneurs, human capital and contributes to the development of various activity types. As mentioned above, this policy does not consider special issues related to competition policy and the regulatory framework, the quality of financial markets, and corruption. The development policy of a particular region considers its specific features to stimulate economic convergence. Policies that consider local characteristics are a necessary part of national structural reforms. It is important to consider several other development and implementation policy aspects that consider local conditions when implemented. These are the development of additional measures to maximize the impact of the region's strong sectors on the economy, as well as the goal coordination of the governing bodies.

The main priority of the effective functioning of the state regional policy is to focus on the potential of its own reproduction, which becomes the main factor of economic security of a particular region. Regional policy plays a key role in the functioning of a socially-oriented economy. The regional economy acts as a tool for implementing the social orientation of the national economy. From the perspective of macroeconomic policy development by region, the most vulnerable objects are considered to be the structures of the regional economy, where the population's main social interests are concentrated. It is necessary to include a social orientation to the regional policy, which will contribute to the creation of a holistic strategic picture (Nakrošis et al., 2020). The absence of social components turns state orientation into an element of spatial policy.

Achieving the goals of regional development involves increasing the efficiency of using budget funds at the regional level and improving the quality of public administration. The introduction of new partnership mechanisms at the regional level and programme-targeted budgeting are becoming one of the priorities of the regional development strategy of Kazakhstan. As part of improving the quality of management at the regional level, measures should be taken to create a system for monitoring socio-economic indicators, eliminate barriers to doing business, and create incentives for the introduction of strategic planning tools.

When a country consists of regions that differ in their resources and characteristics, then they can complement each other with mutual benefit within the framework of the territorial division of labour. Each region can specialise in the production type that requires the lowest cost and halt the production that is more efficient in other regions to exchange the goods among regions. One of the most important tasks of the state in the framework of regional policy is to transform the regional relations from competition to interaction, to organise their cooperation, benefiting from the territorial division of labour. Thus, the country is developing an additional resource for its development. The task of the regional authorities is to optimise two types of regional policy: "work for people" and "people for work". The policy of limiting agglomeration growth should again take a leading place in the regional policy in the modern format (Sagath et al., 2019; Paryzky, 2018).

A characteristic feature of modern regional management is its innovative type, in which the value share of the main resource in the final product is constantly increasing. This type of management is effective at present. It allows achieving the maximum effect with a minimum amount of costs, ensuring an increase in the life quality, and the development of the municipality. The innovative method of municipal education development includes a programme-target approach, which is considered the most common modern method of management activity. To ensure the productivity of such activities, it is necessary to simultaneously clearly interact and separate responsibilities and roles. Therewith, it is important to establish responsibility for the distribution of the information and decision-making.

Freedom of choice of market partners, economy de-monopolisation, and self-government should become integral conditions for the development of the Kostanay and other regions. Regional management provides for a maximum consideration of all types of features of the regions. As a result, the successful project implementation will positively change the investment attractiveness of the region and increase business activity. Increasing the role of regions and their authorities in the political and economic development of the country is not of local importance, but is a global trend. The development of this trend leads to the need for an optimal combination of local and territorial self-government, the redistribution of functions between regions and the state. It is impossible to create statehood in the republic without the presence of extensive infrastructure and economically developed regions. Defining the regional policy clearly is a logical issue. Therefore, the main principle of this policy is to provide the producer and consumer with freedom for economic activity (Halynska, 2008; Popescu, 2018).

The political environment of the 21st century has changed substantially since its development. New values and scales have been acquired. The modern globalisation era is based on global development. It has become impossible to create and develop national policy without an effective and correct internal apparatus. Countries that have weak peripheries and regional conflicts occupy the last places in the lists of leading states. Therefore, a particularly important preference is given to the issues of regional development. Drawing conclusions, the authors can confidently state that the priorities of public policy strategies are acquiring a new global significance and strengthening their positions in the field of science, creating an additional area for research and development.

The industrially-oriented Kostanay region actively implements state programmes and greatly contributes to the development of the socio-economic potential of the country. An important role in the regional economy is played by high rates of civil and industrial construction, as well as the production of building materials. At the enterprises of the region, equipment is being upgraded and highly efficient digital technologies are being introduced. In general, the fields of crop production and animal husbandry are being developed by

diversifying the areas and introducing highly productive varieties. The taken measures are aimed at increasing competitive products and increasing production growth and efficiency. In market conditions, regions are competing for resource sources and sales markets, for foreign and state resources. Regions are independent entities in the national and international markets. The State strives to improve socio-economic well-being through regional policy.

4. Conclusions

The main strategic purpose of regional policy is to overcome the territorial differentiation and economic disintegration of the country. New modern methods and tools are transforming the state economy of specific regions. This goal is achieved through structural transformations of regional policy. The increase in the productivity of regional development management demonstrates that it is necessary to improve basic policy methods, especially in weak, lagging regions. The development of certain regions that have investment attractiveness considerably increases due to the adoption of special state measures and economy modernisation. To prevent economic stagnation, lagging regions require special attention and support. Equalising the socio-economic development levels of the country's regions will stimulate the use of internal resources of the region. At the stage of modernisation and development of new industries, foreign direct investment is the most important tool in regional policy. In the future, the foreign investments will be replaced by domestic ones, which corresponds to the state interests in terms of socio-economic development of the regions and ensuring economic independence and security.

Thus, sustainable development in the conditions of an economic crisis is impossible without effective regulation of legal and economic mechanisms, the industrial and natural resource sector, which assumes a comprehensive account of economic, social, and environmental factors. For the regions of the Republic of Kazakhstan, it is necessary to implement such approaches, since they still have an imbalance between the existing material base and plans for its development. To date, a number of programmes have been developed for the successful implementation of regional policy in the Kostanay region and the country as a whole. This implementation entails the growth of the state at the international level. Globalisation requires regional development not only within the state but also on the world stage. New concepts and priorities of the state regional policy of the Republic of Kazakhstan are a reflection of changes in the political life of the country.

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TRENDS, PROBLEMS, AND MECHANISMS OF THE DEVELOPMENT OF NORTHERN RURAL TERRITORIES IN THE EUROPEAN RUSSIA

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Abstract

The article presents the results of the analysis of trends and issues of socio-economic development of the Russian Federation's rural territories and subjects, situated in Russia's European North. It reveals that the key problems of territorial development are unfavorable demographics; poor housing improvement regarding all improvement types; high share of the population provided with bad-quality drinking water; noticeable income difference between rural and urban population, etc. The authors propose a typology of rural territories according to the size of rural population, periphery, and their economic specialization. We reveal that the territories adjacent to large and major towns, as well as ones having agro-industrial and extractive specialization, are developed the most. We substantiate a mechanism for managing Russia's rural territories in current conditions and propose recommendations for updating their state development policy: 1) to ensure a complete implementation and achievement of goals of the RF state program “Integrated development of rural territories”; 2) to provide an equal availability of state support measures to rural developers; to help provide state support measures for the development of small- and medium-sized businesses in rural areas; 3) to create conditions for attracting non-budget financing investment sources to socio-engineering countryside infrastructure; 4) to develop different forms of agricultural cooperation; 5) to establish professional teams of experts, specialists, and activists, interested in developing rural territories, in each subject of the Russian Federation, etc.

Keywords: rural territories, European North of Russia, socio-economic development, typologization, control mechanism.

JEL classification: R1, R5

The author declares that this article is original, its materials have not been published anywhere before.

1. Introduction

Rural territories (territories outside urban settlements) are a special and priority management object and a subject of scientific studies. These territories are the basis for the development of agricultural production, food security, and, to a certain extent, national security, and they play a crucial role in the sustainable development of the country, its regions, and municipalities. Rural territories' primary national economic functions are the following: production, socio-demographic, cultural and ethnic, eco-logical, re-creation, spatial and communication, political functions, as well as the function of a territory's social control.

Despite a remaining steady trend of increasing the share of urban population among most countries' total population, it is still relevant for several states to maintain a noticeable number of rural residents. Thus, among European countries, the highest value of this indicator was recorded in late 2019 in Slovakia, Romania, Slovenia, Macedonia, Austria (42–46%); among Asian countries – in Tajikistan, India, Kyrgyzstan, Vietnam, Pakistan, Egypt, the Philippines (53–74%); among American countries – in Mexico (19.8%) (Russia and Countries of the World, 2020). In the Russian Federation, 25% of the country's population live in rural areas.

Since the 2000s, Russian authorities have been approving special state programs to create conditions for rural areas' sustainable, balanced development and to solve existing problems of their development: federal target program “Rural social development until 2013” (RF Government Decree no.858, dated December 3, 2002); federal target program “Sustainable rural development for 2014–2017 and until 2020” (RF Government Decree no. 598, dated

July 15, 2013); state program of the Russian Federation “Integrated development of rural territories” with the implementation period until 2020–2025 (RF Government Decree no. 696, dated May 31, 2019). Besides, the Strategy of sustainable development of rural areas of the Russian Federation for the period till 2030 was approved (RF Government Decree no. 151-p., dated February 2, 2015). However, it was not possible to significantly improve the situation in rural areas everywhere due to the lack of a necessary integrity, consistency of these state programs, these programs’ limited focus, and an obvious lack of funding.

The best way to assess the quality of life and comfort of living in rural areas, as well as to identify existing problems of their development, is to analyze the assessments of these aspects by residents of such localities. The Federal State Statistics Service of the Russian Federation conducts comprehensive monitoring of the living conditions among population every 2 years on the basis of a survey (sample observation) of 60 thousand households in all the Russian Federation’s subjects. Certain results of this study are presented in Table 1.

Table 1. Russian residents’ assessment of certain aspects of living conditions in localities

Indicator’s title	Urban localities	Rural localities
Share of households intending to improve their housing conditions	14.8	21.5
Share of respondents who said that housing conditions are generally satisfactory	71.1	66.6
Share of households that rated the quality of water, coming from the most accessible water source, as poor	15.3	24.3
Share of households that indicated that the disposal of wastewater in their house is carried out in a centralized sewer system	89.6	25.2
Share of households that use:		
- network gas	67.1	65.4
- imported liquefied gas	2.2	1.2
- liquefied gas in cylinders	2.2	17.3
- do not have an opportunity to use domestic gas	4.0	6.6
- do not need to use household gas	24.5	9.5
Share of people employed in the economy who rated their main job as difficult and very difficult	19.7	25.8
Share of people aged 15 years and above who rated their health status as very good and good	44.9	38.0
Share of people aged 15 years and above with a professional degree	77.2	62.7
Share of people aged 15 years and above who use Internet	76.5	62.3
Share of parents with the desire that their children, studying in general educational organizations, continue their education in educational organizations of primary or secondary vocational education	15.3	24.6
Share of people aged 15 years and above who mentioned the problems related to living conditions in their locality	72.7	81.7
Share of people aged 15 years and above who mentioned the following problems related to the living conditions in their locality (area of residence):		
- unavailability of state and municipal healthcare services	22.9	37.5
- unavailability of state and municipal preschool and school education services	8.2	17.3
- great remoteness of retail locations	7.1	23.6
- great remoteness of pharmacies	9.1	49.9
Share of people aged 15 years and above who are not satisfied with trade services	6.7	19.5
Share of people aged 15 years and above who are not satisfied with household services	8.9	34.3

Source: Comprehensive monitoring of population’s living conditions – 2018. *Federal State Statistics Service*. Available at: https://gks.ru/free_doc/new_site/KOUZ18/index.html

This table clearly shows that residents of rural localities are noticeably worse at assessing living conditions. Thus, nearly a quarter of the respondents indicated a poor quality of consumed water, the same number use liquefied gas in cylinders or do not have the opportunity to use household gas at all; only a quarter of households are provided with centralized sewerage; there is a significantly higher share of those, in comparison with urban areas, who reported the unavailability of healthcare and education services, the greater remoteness of retail facilities and pharmacies, and dissatisfaction with trade and household surveys. Simultaneously, 25% of respondents want their children to continue their education in institutions of primary and secondary vocational education (a significant part of which is in municipal areas).

Therefore, an important scientific task is to analyze trends and identify key problems in the development of the country’s rural areas and its regions. It is also necessary to scientifically

substantiate recommendations for improving the federal and regional socio-economic policy in terms of rural development on this basis. These circumstances determine the relevance of the study, and its main results are presented in this paper.

2. Methodological aspects of studying rural areas

It should be noted that there is no unified definition of the term “rural territories”, “rural area” in domestic and foreign science and practice. To classify a territory as rural, several countries use the following criteria: density and number of population, characteristics of a settlement, density of development, specialization in agriculture, etc.

The state program of the Russian Federation “Integrated development of rural territories” describes rural territories as: 1) rural settlements or rural settlements and inter-settlement territories united by a common territory within the boundaries of a municipal district; 2) rural localities that are a part of urban settlements, municipal districts, urban districts (with the exception of urban districts that include administrative centers of subjects of the Russian Federation); 3) rural localities that are a part of the inner-city municipal formations in Sevastopol; 4) workers’ comp settlements with the status of urban settlements; 5) workers’ comp settlements that are a part of urban settlements, municipal districts, urban districts (with the exception of urban districts that include administrative centers of subjects of the Russian Federation). In this case, it is about nearly all localities – except for urban localities (towns and urban-type settlements). We adhere to this definition in the reported study. In accordance with the Federal Law no. 131-FZ “On the general principles of the organization of local self-government in the Russian Federation”, a rural settlement is defined as one or more rural localities united by a common territory (settlements, localities, stanitsas, villages, hamlets, kishlaks, auls, and other rural settlements), where local self-government is carried out directly by population and (or) through elected and other local self-government bodies.

Foreign (Battino, 2019; Cei, 2018; Chen, 2019; Konecny, 2019; Michalcewicz-Kaniowska, 2019; Li, 2018; Nardi, 2007; Plummer, 2018; Schiller, 2013; Stoyanets, 2018; Zasada, 2018; Mantino, 2010 etc.) and Russian scientists and researchers (Bondarenko, 2020; Gumerov, 2019; Ivanov, 2019, 2020; Kostyaev, 2018; Leyzerovich, 2008; Adukov, 2019; Morozova, 2015; Mukhametova, 2016; Nefedova, 2013; Nikolaeva, 2019; Panteleeva, 2012; Polushkin, 2017; Pryazhnikova, 2020; Tyurin, 2007; Uzun, 2019; Trotskovsky, 2013; Ushachev, 2019; Shulepov, 2020, etc.) analyze main areas and implementation mechanisms of the policy for developing rural territories, substantiate ways of its improvement. The work (Li, 2018) emphasizes that conditions for sustainable development of rural territories in current knowledge-based economy are: 1) development of new economic activities that can meet potential urban demand; 2) local entrepreneurship that can create and expand such new activities; 3) social capital that can support entrepreneurship in new areas of activity with access to credit, labor, human capital, external markets, and external knowledge for learning and innovation. In this regard, it is important to have a state policy in the country aimed at creating conditions for the development of basic economic activities and the diversification of the rural economy, ensuring favorable financial and institutional conditions for the development of rural areas, and comfortable living conditions for population.

The analysis of global experience shows that the European Union implements the most comprehensive and integrated policy for the development of rural areas (at the supranational and country level). The development of rural areas in the EU is carried out within the framework of the Common Agricultural Policy (CAP), a new stage of which is 2021–2027. It will include nine target areas, which are supposed to ensure that farmers receive a fair income; to increase competitiveness of the industry; to balance energy consumption in the food production and supply chain; to take measures that prevent climate change and promote environmental protection; to ensure the preservation of natural landscapes and biodiversity; to support the generational change process in the farming community; to help preserve local identity of rural areas; to maintain a high quality of food (Pryazhnikova, 2020). Each EU country will develop its own strategic plan for this policy. The policy is financed by two funds: the European Agricultural Guarantee Fund (EAGF; funding – 291.1 bil. euro for 2021–2027) and the European Agricultural Fund for Rural Development (EAFRD; 95.5 bil. euro) (Future of the common agricultural policy). Moreover, the European Network for Rural

Development (ENRD) was established. It is a structure that unites all interested parties and aims to achieve better results in the development of rural areas. One of the key technologies for implementing rural development projects is the LEADER project, which is a local development method that has been used for 20 years for involving local subjects in the development and implementation of strategies, decision-making, and resource allocation for the development of their rural areas (Cork 2.0 Declaration, 2019; Leader Local Development Strategies).

In the United States, in addition to life-support issues (environmental quality, health, infrastructure, housing, etc.; provision of rural residents with the same level and number of services as urban residents) and solving general socio-economic problems, introduction of renewable energy sources and creation of viable and sustainable rural communities are urgent tasks of rural development (Mukhametova, 2019). The US Department of Agriculture and its Rural Development Division (USDA Rural Development) implement the following areas of state support: rural business cooperatives (support for agricultural innovation, infrastructure development programs, intermediary lending, loans, and grants for rural economic development, assistance to rural micro-entrepreneurs, investment in rural businesses, grants for the development of rural businesses, rural cooperatives, and socially vulnerable groups, etc.); rural housing construction (direct loans and grants for public organizations, grants for rural community development initiatives and housing preservation, direct loans for multi-family housing, direct housing loans for single-family housing, etc.); rural utilities and services (financing of distributed energy generation projects, loans for energy efficiency and energy conservation, grants for distance learning and telemedicine, rural decentralized water supply systems, solid waste management, financing of water supply and sanitation projects, pre-planning of water supply and waste disposal systems).

Since 2007, Chinese Ministry of Agriculture has been implementing “ten programs” of rural development. Funds are mostly allocated for the development of rural infrastructure (construction of reservoirs, provision of clean drinking water to population), construction of socially significant facilities in rural areas, development of specific local industries, as well as environmentally safe agricultural production, repayment of interest on bank loans, increase in subsidies (for elite varieties of rice, wheat, corn and the purchase of agricultural machinery). The experience of setting up village-volost enterprises in China, which should become the most important element of the cooperative sector in rural areas (Panteleeva, 2012), is also interesting. The programs “Rural Revitalization” (until 2022), “Rural Rejuvenation” (until 2020), “Agricultural Modernization” (until 2035) and “Creation of a strong agricultural sector and achievement of full self-realization of farmers” (until 2050) (Naumov) are also being implemented.

In general, we should mention that, currently, neo-endogenous approach to the formation of rural areas is forming in the world. According to RAS Academician A. I. Kostyaev, the key principle of such approach is the knowledge economy; the key development force – human and social capital within the “network” of enterprises, practical workers and institutions, working in rural areas; the functions of rural territories are the increase of the importance of functions of living places (counter-urbanizations), leisure, tourism, employment in “networks”, etc.; the main development problems are heterogeneity of rural areas by the development of human capital and intellectual assets, attraction of universities as development agents; development direction is the creation of institutional potential aimed at the mobilization of internal resources and external factors active in a region. Development of rural territories in Russia is still conducted within exogenous-industrial approach (Kostyaev, 2018).

Several scientists also develop different typologies of rural territories (Leyzerovich, 2008; Nefedova, 2013; Trotskovsky, 2013). Besides, issues of developing typologies and analysis of features of socio-economic development of rural territories, including case-studies of large macro-regions, are not sufficiently explored. In the research, the results of which are presented in this article, we used the typology of rural territories by periphery (remoteness from large towns; Table 2) and economic specialization.

Table 2. Structure within a regional space of rural periphery

Close periphery			Average periphery		Far periphery
1 order	2 order	3 order	1 order	2 order	
Rural territories, included in agglomerations. Rural territories that have large and major towns as centers	Rural territories, situated in an influence zone of a large or major town	Rural territories that have small or average towns as their centers	Rural territories that are outside a zone of active influence of a town and neighboring rural territories of the I order	Rural territories that are outside a zone of active influence of a town and neighboring rural territories of the II order	Rural territories that are far from region's towns

Note: it is common to distinguish between the following classifications of towns: towns with population of up to 50 thousand residents are usually classified as small ones, from 50 to 100 thou. – medium ones, from 100 to 250 thou. – to large ones, from 250 thou. to 1 mil. – to major ones, exceeding 1 mil. – to metropolises. An area of a town's influence is defined by the following radii: for a city with population exceeding 1 mil. people – 70–80 km.; 250 thou. – 1 mil. people – 50–60 km; 100–250 thou. people – 30–40 km; less than 100 thou. people – 20–25 km.

Source: Sustainable development of rural territories of the Altai Territory: socio-economic and spatial aspects: Coll. Monograph. Ed. by Trotskovskii A.Ya. Barnaul: Altai University Publishing, 2013. 330 p.

To define industrial (or economic activity type) specialization of territories (municipal formations) the following indicators are used: localization coefficient, per capita production coefficient, index method, calculated by gross commodity output, main industrial funds, number of industrial and production personnel, number of employees. Coefficient values that are equal or exceed 1 show the presence of specialization by the given activity type. In the presented research, we calculated localization coefficients according to the indicator “average list number of employees of organizations according to the economic activity types”.

3. Current state and problems of development of rural territories in the European North of Russia

The study of rural territories in Russia was conducted using the materials of a large macro-region of the European North of Russia (ENR) that is the biggest economic region of Russia's European part. Its area is 1466 thou. sq. km, which is 9% of the whole country's territory. It includes: Republic of Karelia (administrative center is Petrozavodsk), Komi Republic (Syktyvkar), Arkhangelsk Oblast (Arkhangelsk), Nenets Autonomous Okrug (Naryan-Mar), Vologda (Vologda) and Murmansk (Murmansk) oblasts. The key development factors of ENR rural territories are unfavorable natural and climatic conditions (that limit the possibilities of highly efficient rural economy), focal settlement, and predominance of sparsely populated rural settlements (with a population of less than 1,000 people).

The key development problem of most rural areas in Russia is an unfavorable demographic situation: a significant reduction of population due to a natural decline and high migration outflow. All of this leads to the “extinction” of entire settlements and the loss of territorial manageability. As for the regions of the European North of Russia, size of rural population decreased the most in the Komi Republic and in the Arkhangelsk Oblast – by 30–37% in 2000–2019 (Table 3).

Table 3. Average annual number of permanent population, thou. people

Territory	Urban population			Rural population		
	2000	2019	2019 to 2000, %	2000	2019	2019 to 2000, %
Russia	107245,6	109508,0	102,1	39351,3	37256,7	94,7
Republic of Karelia	544,4	498,1	91,5	187,7	118,0	62,8
Komi Republic	791,6	645,6	81,6	258,8	179,8	69,5
Nenets Autonomous Okrug	25,6	32,3	126,5	15,5	11,6	75,1
Arkhangelsk Oblast (without Autonomous Okrug)	1006,9	862,4	85,6	331,8	234,0	70,5
Vologda Oblast	890,2	845,4	95,0	404,8	318,7	78,7
Murmansk Oblast	859,7	686,7	79,9	72,3	58,0	80,3

Source: here and in tables 4–8 and in the image 1 calculated by: Unified Interdepartmental Statistical Information System (UISIS). Available at: <https://www.fedstat.ru/>

In 2019, all ENR regions, with the exception of the Nenets Autonomous Okrug and the Murmansk Oblast, were characterized by a natural decline of rural population (Table 4). The most unfavorable situation is in the Republic of Karelia. The largest migration outflow of rural population was recorded in the Arkhangelsk Oblast and the Nenets AO (11–14 per mille). In turn, a positive balance of migration growth in 2019 was recorded only in the Vologda Oblast.

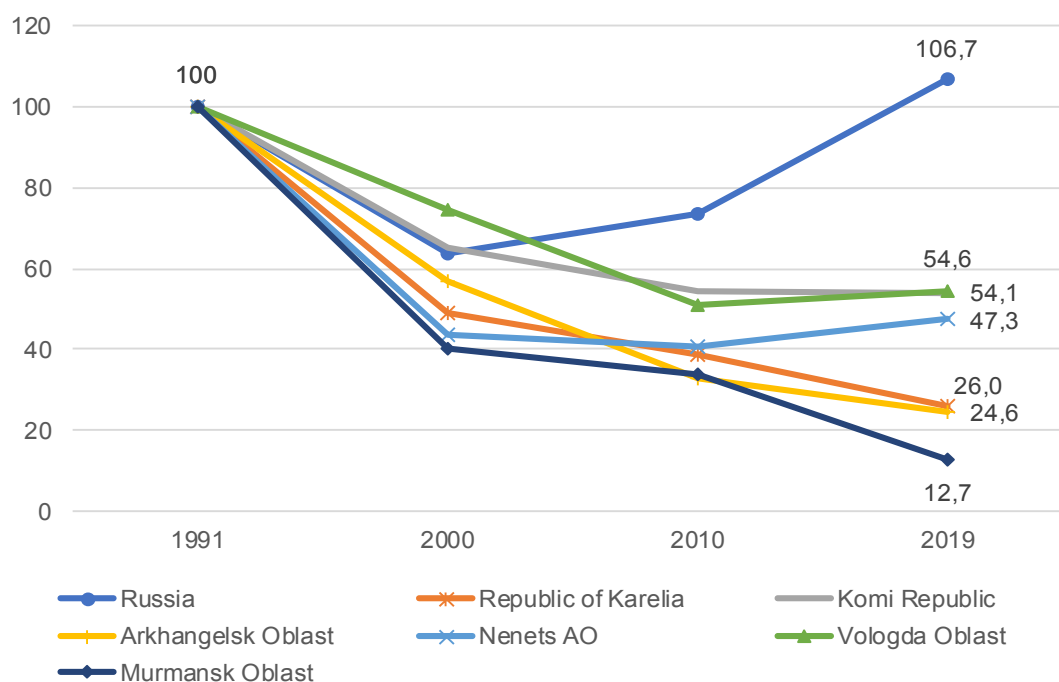
Table 4. Coefficients of natural and migration population growth, per mille (per 1,000 residents)

Territory	Natural population growth				Migration population growth	
	Urban population		Rural population		Urban population	Rural population
	2000	2019	2000	2019	2019	2019
Russia	-6.3	-1.7	-7.3	-3.5	2.5	0.3
Republic of Karelia	-6.8	-3.7	-10.7	-12.2	0.7	-9.0
Komi Republic	-2.5	-1.7	-6.7	-5.0	-10.3	-6.3
Nenets AO	-0.2	5.9	0.9	1.3	7.4	-14.0
Arkhangelsk Oblast (without Autonomous Okrug)	-	-3.1	-	-9.1	-0.6	-10.9
Vologda Oblast	-5.3	-2.6	-11.4	-9.3	-2.8	1.0
Murmansk Oblast	-3.1	-2.7	-1.9	1.6	-6.8	-3.2

The basis of the economic development of most rural areas is agriculture, which provides most jobs in rural areas. The overall level of development of a territory, including infrastructure, and the attractiveness of an area for living depends on the state of agricultural production. The territory of the Northern Economic Region is characterized by unfavorable farming conditions: severe climatic conditions (several territories of the district are the regions of the Far North and the areas equated to them), low quality of the fertile layer, swampiness, and high forest cover of most territory. At the end of 2019, the volume of agricultural production in value terms in the ENR regions amounted to only 1.1% of the total Russian volume. In 2019, 53.8% of the ENR agricultural output was produced in the Vologda Oblast; 17.0% – in the Arkhangelsk Oblast; 17.5% – in the Komi Republic; 7.3% – in the Republic of Karelia; 2.8% – in the Murmansk Oblast; 1.5% – in the Nenets Autonomous Okrug.

While Russia's physical volume of agricultural production exceeded the level of 1991 by 6.7% in late 2019, all ENR regions saw a decrease in this indicator's values: by 45% – in the Vologda Region and the Komi Republic, by 87% – in the Murmansk Region, by 74–75% – in the Arkhangelsk Oblast and the Republic of Karelia (Image 1).

Image 1: Index of the physical volume of agricultural production, in % to 1991



The key development problem in most rural areas of Russia is an extremely low level of improvement of settlements with basic communal goods. Thus, in 2019, only 36% of rural housing stock was equipped with all types of amenities (Table 5). A high value of this indicator (80%) was recorded in 2019 in the Murmansk Oblast (79%); the lowest values appeared in the Republic of Karelia and the Nenets Autonomous Okrug (less than 5%).

Table 5. Share of the housing stock area provided with all types of improvement in total area of the housing stock of a subject of the Russian Federation, %

Territory	2013	2014	2015	2016	2017	2018	2019	2019 to 2013, p.p.
Russia	26.0	28.3	30.8	31.5	32.6	34.2	36.3	10.3
Republic of Karelia	10.1	3.3	4.1	4.2	4.7	4.7	4.7	-5.4
Komi Republic	6.3	6.2	6.1	6.3	6.1	5.9	5.9	-0.4
Nenets AO	3.0	2.9	3.0	2.9	3.7	3.7	4.0	1.0
Arkhangelsk Oblast (without Autonomous Okrug)	6.6	6.5	6.6	6.6	6.4	6.6	6.6	0.0
Vologda Oblast	11.8	12.4	12.8	13.2	13.3	13.4	13.7	1.9
Murmansk Oblast	82.4	79.9	80.1	82.9	82.1	79.8	78.9	-3.5

Another important problem is the poor quality of road infrastructure in municipalities. In 2019, 48% of local roads (most are in rural areas) did not meet the regulatory requirements, in the Arkhangelsk and Vologda oblasts – 96 and 73%, respectively (Table 6).

Table 6. Share of public roads of local significance that do not meet regulatory requirements, %

Territory	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Russia	45.0	44.6	41.7	43.9	43.4	44.8	46.5	46.8	47.2	48.0
Republic of Karelia	18.4	18.5	22.7	28.8	29.4	26.6	39.5	47.0	46.4	48.0
Komi Republic	63.2	58.2	60.0	58.3	56.5	54.8	52.7	51.1	53.8	55.7
Nenets AO	88.2	88.8	96.4	96.7	96.7	98.8	93.3	91.5	92.8	93.2
Arkhangelsk Oblast (without Autonomous Okrug)	98.1	98.0	98.7	97.6	96.9	96.4	96.2	96.1	96.3	96.0
Vologda Oblast	7.9	51.5	39.9	51.4	63.6	64.8	74.2	72.8	72.0	72.5
Murmansk Oblast	3.8	5.6	19.6	15.0	17.6	19.7	18.3	20.2	29.1	21.2

According to the results of 2019, available resources of rural households were, on average, only 64% of the level of the country's urban settlements (Table 7). In all ENR regions, the value of this indicator was higher than the national average: the highest value was recorded in the Arkhangelsk and Murmansk oblasts in 2019 (91–93%), the lowest – in the Komi Republic (77%).

Table 7. Ratio of household disposable resources in rural and urban areas, %

Territory	2014	2015	2016	2017	2018	2019	2019 to 2014, p.p.
Russia	62.3	65.3	63.5	67.3	64.9	63.8	1.4
Republic of Karelia	69.5	76.7	92.0	92.5	87.3	82.5	13.0
Komi Republic	83.1	88.3	88.0	76.3	76.9	71.7	-11.4
Nenets AO	89.9	81.9	82.3	88.5	90.3	67.0	-23.0
Arkhangelsk Oblast (without Autonomous Okrug)	81.8	74.8	94.4	83.9	92.8	79.5	-2.3
Vologda Oblast	66.6	67.2	86.3	84.0	80.4	83.7	17.1
Murmansk Oblast	106.3	92.4	84.7	90.2	91.1	93.1	-13.2

Rural territories (rural municipalities) differ significantly in a variety of parameters that characterize objective natural and climatic conditions and resources (potential) available in the territory, as well as an achieved level of socio-economic development. In this regard, while implementing federal and regional social and economic policies for the development of rural areas, it is important to consider the features and conditions of different types of territories.

Next, we explore socio-economic development features of designated (Tab. 8) types of rural territories. To do this, it is advisable to conduct an analysis in accordance with the following approach. 9 key indicators were selected (presented in the note to table 8) that

characterize the development of municipalities. For each district, we calculated the ratio of the value in a region (urban district) with the average value for a corresponding subject of the Russian Federation. Then we calculated an arithmetic mean of corresponding ratios for municipalities belonging to each type (the results of the values obtained are presented later).

Thus, the authors proposed a typology of rural territories in the European North of Russia (70 municipal regions and urban districts, where the share of rural population is higher than 25% among total population) for the following reasons (Table 8): by the share of rural population among total population of a municipality; by the periphery – remoteness from large towns; by economic specialization.

Table 8. Average ratio of indicators of socio-economic development of rural municipal regions and urban districts by type of a territory with average values of these indicators for the subjects of the NWFD at the end of 2019, %

Type of territory	PD	VA	PH	I	OR*	R	MS	VS	CA
Typology by rural population share									
Completely rural (share of rural population is 100%) – 40% of total number of analyzed rural territories (25.2% of total number of municipal regions and urban districts of the ENR)	52.5	233.5	132.2	39.7	23.9	147.7	88.5	21.3	126.8
Mostly rural (share of rural population is 50-99%) – 20% of total number of analyzed rural territories (12.6% of total number of municipal regions and urban districts of the ENR)	57.2	234.6	117.9	213.5	27.6	123.9	97.5	201.1	76.0
Mostly urban (share of rural population is 25-49%) – 40% of total number of analyzed rural territories (25.2% of total number of municipal regions and urban districts of the ENR)	81.8	122.5	118.0	77.8	25.4	118.3	94.8	50.4	65.8
Type of territory by periphery									
Close periphery of the 1 order (7.2% of its total number)	104.3	625.3	111.4	87.8	30.9	117.4	102.4	52.8	254.8
Close periphery of the 2 order (8.7%)	116.5	213.1	113.7	92.6	29.7	118.6	94.6	55.8	118.8
Close periphery of the 3 order (33.3%)	80.3	152.6	116.7	79.3	24.7	119.0	95.4	51.5	67.6
Average periphery of the 1 order (10.1%)	47.2	182.9	132.3	20.2	21.1	129.1	82.7	10.4	94.2
Average periphery of the 2 order (4.3%)	39.6	79.3	125.0	16.3	31.1	128.8	87.7	35.0	89.6
Far periphery (36.2%)	39.7	143.5	132.0	129.3	23.9	149.7	91.8	113.5	74.5
Type of territory by economic specialization									
Mostly agricultural specialization (23.2% of its total number)	72.7	174.7	125.6	51.1	20.8	134.9	85.3	15.3	87.3
Agro-industrial (26.1%)	76.2	343.6	120.3	58.5	26.6	122.3	88.5	28.6	122.1
Depressive agro-industrial (18.8%)	34.7	118.0	135.7	17.1	20.8	146.9	83.7	14.7	71.0
Extracting (11.6%)	98.6	180.5	104.7	357.6	35.5	118.6	107.7	357.4	71.2
Mostly industrial (13.0%)	60.1	92.2	126.4	41.3	27.8	132.7	108.6	92.8	90.1
Service (7.2%)	38.9	46.6	122.0	182.8	25.4	125.6	105.0	30.9	86.6

The symbols in the table are as follows: PD – population density; VA – volume of agricultural production per 1 resident; PH – provision of population with houses; I – investment volume per 1 resident (excluding small businesses); OR – share of own budget revenues; R – local budget revenues per 1 resident; MS – average monthly salary; VS – volume of shipment of own-production goods per 1 resident; CA – commissioning of apartment buildings per 1 resident.

* Absolute average value for a group of municipalities is presented, not the ratio with the region's average, %.

It is established that the most developed territories are those adjacent to large and major towns (a near periphery of the 1st and 2nd order) and ones with agro-industrial and extracting specialization; a lower level of development is typical for municipalities of the far periphery. Specific features of the development of each territory type are revealed.

Next, we explore the main characteristics of the state program of the Russian Federation “Integrated development of rural areas” (approved by the Decree of the Government of the Russian Federation no. 696, dated May 31, 2019). This state program is currently a key mechanism for the development of rural areas. The program implementation period is 2020–2025. A responsible executor of the program is the Ministry of Agriculture of the Russian Federation. The objectives of the state program are:

- 1) to maintain the share of rural population in the total population of the Russian Federation at the level of at least 25.1% in 2025 (in the 2017 base year – 25.7%);
- 2) to achieve the ratio of average monthly available resources of rural and urban households to 75.5% in 2025 (in the 2017 base year – 67.0%);
- 3) to increase the share of total area of comfortable residential premises in rural settlements to 43.2% in 2025 (in the 2017 base year – 32.6%).

The state program “Integrated development of rural territories” includes 5 directions (subprograms) that implement 3 departmental target programs (DTP) and 5 departmental projects (DP) using the following mechanisms and tools: social payments, social hiring, compact construction, housing (mortgage) credits (loans), consumer credits (loans); development of a network of highways leading from the network of public roads to socially significant objects of settlements located on the RT, objects of production and processing of products; projects for integrated rural development; compensation of costs for apprenticeship contracts concluded with employees, costs for practical training, preferential lending for infrastructure development; projects for the improvement of rural territories; development of gasification and water supply, projects of complex arrangement of sites for compact housing development; formation and annual update of a database and indicators of the level of socio-economic state of rural territories (rural agglomerations); training of authorities on the development and implementation of projects, holding annual events aimed at promoting and encouraging achievements in the field of integrated rural development.

People are the main source of power in any democratic and social state, and they implement their power directly or by forming/participating in the formation of various levels of government. For Russia, the largest country in the world, it is always important to efficiently manage the vast space of the country, considering the specifics of different types of territories and interests of the country’s residents.

In recent years, federal authorities pay significant attention to the necessity to purposely manage the country’s spatial development, to form, and to implement the state policy of regional development. In accordance with the Presidential Decree no. 13 “On the approval of the fundamentals of the state policy of regional development of the Russian Federation for the period up to 2025”, dated January 16, 2017, the goals of this policy are to ensure equal opportunities for the realization of the economic, political, and social rights of Russian citizens established by the Constitution of the Russian Federation and federal laws throughout the country, to improve their quality of life, to ensure sustainable economic growth and scientific and technological development of the regions, to increase the competitiveness of the Russian economy on world markets on the basis of balanced and sustainable socio-economic development of the subjects of the Federation and municipalities, as well as to maximally involve population in solving regional and local problems. One of the priority tasks of this policy is to clarify the powers of federal state authorities, state authorities of the subjects of the Russian Federation, and local self-government bodies, to improve their financial support, and to organize the effective execution of these powers (with the maximum involvement of population in state and municipal management), including the introduction of additional mechanisms for attracting citizens of the Russian Federation to the participation in state and municipal management, increasing their civic responsibility in addressing issues of territories’ socio-economic and political development, as well as mechanisms for taking into account population’s opinion in addressing these issues.

There are great opportunities for involving the population in the direct solution of local issues and problems at the settlement level (in rural settlements and rural localities).

In practice, effective forms of population’s public participation are territorial public self-government, self-taxation of citizens and local referendums, initiative budgeting, participation of residents in the development and implementation of development strategies for municipalities, including rural settlements. Next, we explore them in detail.

1. Territorial public self-government

In accordance with the Federal Law no. 131-FZ “On the general principles of the organization of local self-government in the Russian Federation”, dated October 6, 2003, territorial public self-government is understood as the self-organization of citizens at their place of residence in a territory of a settlement, inner-city territory of a federal significance city, urban district, or an inner-city district for an independent and responsible implementation of their own initiatives on local issues. TPS can be organized within such territories of citizens’ residence: entrance of an apartment building, an apartment building, a group of apartment buildings, a residential micro-district, a rural locality that is not a settlement, or other territories of residence.

Activity areas of modern Russian TPS include: protection of the rights and interests of residents; implementation of social projects; work with children and adolescents; control over trade and quality of various services; coordination of land use; participation in the protection of public order; organization of leisure activities of residents; maintenance and improvement of a territory; repair and operation of housing stock; organization of charitable and volunteer events, etc.

The TPS activity, if regional and district authorities are interested in it, can have a significant economic and social impact. In the Arkhangelsk Oblast, with the support of the Institute of Public and Humanitarian Initiatives and allocation of financial resources for the TPS activities from the regional budget, local population implemented 54 projects worth 1.75 million rubles over four years (the early – mid-2000s), which produced an economic effect of nearly 30 million rubles. (Tyurin, 2007).

According to the Ministry of Justice of the Russian Federation (Report on the results...), as of March 2020, approximately 32.0 thousand TPS operate within the borders of 6.7 thousand municipalities across the country. The TPS institute is distributed extremely unevenly, but it is more or less represented in 84 of the 85 constituent entities of the Russian Federation (with the exception of the Chukotka Autonomous Okrug). However, in order to expand the geography of the TPS activities and achieve the greatest social and economic impact, the state support for TPS is required through specially formed state programs of the subjects of the Russian Federation that provide co-financing of TPS projects. It is also advisable to create a Council for the TPS Development under a head of a municipal region, municipal district, or urban district, which will include the heads of TPS bodies and their representatives, head of a municipality, administration specialists, and representatives of public organizations.

2. Self-taxation of citizens and local referendums

With the adoption of Federal Law no. 131-FZ of October 6, 2003 “On the general principles of the organization of local self-government in the Russian Federation” and its entry into force throughout the country on January 1, 2009, self-taxation of citizens became common in many subjects of the Russian Federation. This law understands the means of citizens’ self-taxation as their one-time payments to solve specific local issues. The amount of payments in the order of citizens’ self-taxation is set in an absolute value equal for all residents of a municipality (a locality that is part of a settlement, an inner-city district, an inner-city territory of a city of federal significance, an urban district, or located on an inter-settlement territory within the boundaries of a municipal district) with the exception of certain categories of citizens, whose number cannot exceed 30% of the total number of residents of a municipality and for whom the amount of payments can be reduced. Issues of introduction and use of one-time payments of citizens are decided at a local referendum and at a meeting of citizens in cases when less than 100 people live in a municipality.

An approximate list of activities, which funds of residents’ self-taxation can be spent on, of a settlement includes the following (based on the experience of introducing self-taxation in municipalities of various subjects of the Russian Federation): improvement of settlements of a municipality; repair and reconstruction of roads, bridges, baths, paramedic and midwifery stations, sports facilities, housing and communal services, kindergartens, libraries, clubs, and other cultural and educational, medical and preventive institutions in settlements; construction and reconstruction of monuments, recreation areas, wells, bathing places, springs within the boundaries of a settlement; other measures to develop the socio-cultural and engineering infrastructure of a settlement.

According to the Ministry of Finance of the Russian Federation (Information on the results), in 2019, the volume of citizens' self-taxation funds amounted to 287.5 million rubles (compared to 2013, its volume increased by 11.2 times). The geography of self-taxation includes 35 regions. Self-taxation of citizens was introduced in 2019 in 2,787 municipalities, which is 13.4% of the total number of municipalities. The largest volume of self-taxation revenues in 2019 (95.5%) was received on ten subjects of the Russian Federation: Republic of Tatarstan (246.6 million rubles; 85.8% of the total volume of all self-taxation funds in the country), Kirov Oblast (9.2 million rubles; 3.2%), Perm Oblast (4.9 million rubles; 1.7%), Samara Oblast (2.8 million rubles; 1.0%), Lipetsk Oblast (2.3 million rubles; 0.8%), Kaluga Oblast (2.1 million rubles; 0.7%), Republic of Mordovia (2.0 million rubles; 0.7%), Altai Krai (1.5 million rubles; 0.5%), Republic of Bashkortostan (1.5 million rubles; 0.5%), Udmurt Republic (1.5 million rubles; 0.5%).

Several Russian regions use a mechanism for encouraging local self-government bodies and population to introduce self-taxation by providing inter-budget transfers from the budget of a constituent entity of the Russian Federation to local budgets to resolve local issues, carried out with the participation of self-taxation funds of citizens. Thus, in the Penza, Vladimir, and Ulyanovsk oblasts, 1 ruble is provided from the regional budget for each ruble of citizens; in the Kirov Oblast, 1.5 rubles are provided from the regional budget for each ruble raised by self-taxation of citizens.; in the Tomsk Oblast, 3 rubles are allocated for each ruble of self-taxation funds from the regional budget; in the Perm Oblast – 5 rubles, in the Republic of Tatarstan – 4 rubles.

3. Proactive budgeting

Proactive budgeting is a form of direct participation of population in the implementation of local self-governance by putting forward initiatives for spending a certain part of budget funds. Two main practices (technologies) of proactive budgeting exist in Russia: program for supporting local initiatives (PSLI) and participatory budgeting (PB) (Proactive Budgeting, 2017).

As practice shows, the project "People's Budget", which has been implemented in the Vologda Oblast since 2015, is an example of the implementation of proactive budgeting and an efficient tool for involving the population in local management processes. Within the framework of this project, the ideas that are formed locally are financed through the joint participation of population, business, regional and local budgets. The purpose of a competitive selection is to determine the municipalities of a region, whose budgets will be provided with subsidies from the regional budget for the implementation of projects. In 2015, 60 projects were implemented within the framework of this project, and 976 projects in all 26 districts of the region in 2020 (the total amount of subsidies from the regional budget for co-financing projects in 2020 amounted to 210 million rubles).

Issues that are solved by projects within the framework of the "People's Budget" in the Vologda Oblast: 1) housing and communal services (construction of wells, repair of water pipes, gas pipelines, construction of heating networks, etc.) – 23% of all projects in 2017; 2) providing population with services of cultural organizations (repair of cultural centers, purchase of equipment for cultural centers, tailoring of stage costumes, development of tourism in the settlement) – 15%; 3) construction and repair of playgrounds – 13%; 4) other landscaping (construction of pedestrian bridges, purchase of containers, repair of rafts and rafts for rinsing, cutting down emergency trees, etc.) – 12%; 5) development of physical culture and sports (construction of sports grounds, repair and construction of rinks, stadiums, repair of FOK (sports and recreation complex), purchase of sports equipment) – 11%; 6) repair and maintenance of street lighting – 9%; 7) improvement of places of mass recreation – 6%; 8) construction and repair of monuments – 6%; 9) fire safety issues – 4%; 10) provision of public communication services – 2%.

4. Involvement of population, experts, and professionals in the processes of strategic development of rural areas

Success of the development of rural areas and rural settlements is now largely determined by the presence of heads of municipalities, population, and business representatives of a strategic vision of the prospects, opportunities, and mechanisms for the development of certain territories. According to the global and Russian practice, when forming an efficient system of strategic management and a team of professionals and stakeholders, it is possible to

attract funds effectively and sufficiently (from higher budgets, businesses, population, various funds) for advancing territories, to develop and implement effective and successful projects for the development of a municipality, to involve a maximum size of population and business representatives in the territorial development processes.

Smetanino locality, situated in the Verkhovazhsky District of the Vologda Oblast, is a striking and successful example, where it was possible to achieve a lot in a short period of time with an active initiative and support of a deputy of the RF State Duma and a team of experts and activists. "Experience shows that in places where the residents unite for the future of their locality, everything turns out better than expected. Over one year, we achieved the following results: began gasification of the locality, opened a new farm, built a new FAP (a paramedic and midwife station), modernized a sports base, revived a destroyed temple, created landscaped green areas, and so on. We did not need major budget expenditures to implement all this: we based our activities on the resources of local residents and businesses. People voluntarily invested time, effort, and money in their locality" (From the hinterland...).

It is also important to organize professional teams of experts, specialists, and activists interested in the development of rural areas in each subject of the Russian Federation (following the example of the project of the All-Russia People's Front "Locality. Development territory"). More information about this project is available on the website of the All-Russian People's Front (<https://onf.ru/project/81716/news/>) and in the VK group (https://vk.com/proekt_pro_selo). The purpose of this project is to analyze the implementation of national projects in rural areas and to form new approaches to rural development. The project aims at monitoring the implementation of national projects and state programs that affect the development of rural areas, developing proposals to improve the quality of life in rural areas, and involving local residents in the development of their settlements.

4. Prospects for the development of rural areas in Russia

The situation that has developed since 2020 and is associated with the coronavirus pandemic, as well as the manifestation of a number of crisis phenomena in the economy, has predetermined many challenges for all countries. Adequate and effective countermeasures will largely determine the success of any country's development in the coming years.

In 2020, various Russian experts *identified trends in the development of rural areas* that will determine the transformation of localities in the near- and long-term perspective (Russian Agricultural Bank...): robotization and automation of the agricultural sector; growth in demand for organic products and local agricultural products, opening of online stores selling farm products; transition to a rational use of natural resources; development of ecological and rural tourism; return migration and development of eco-settlements; expansion of a territorial area suitable for agriculture and living; increased requirements for rural residents' education level and technical literacy. According to data of the Center for Industry Expertise of Russian Agricultural Bank, 2–3 million people may return to the countryside within a few years (Center for Industry Expertise...) due to the threats of the coronavirus pandemic and consequences of the global economic crisis. In order to meet the demand for moving to rural areas and to secure/preserve residents in these territories, starting from 2020, Russia is implementing a preferential mortgage at a rate not exceeding 3% per annum for the purchase and construction of housing in rural areas.

In the Spatial Development Strategy of the Russian Federation until 2025 (approved by the Decree of the RF Government no.207-p., dated February 13, 2019), *the solution of the problem of increasing the stability of the settlement system due to the socio-economic development of rural areas* (taking into account population density, different nature of the development and use of such territories, natural conditions, distance from major cities) is planned through:

- improving the living conditions of residents of rural localities, including the ensuring of a sustainable reduction in the share of uninhabitable housing stock, increasing the level of rural localities improvement, providing communal infrastructure; boosting their transport accessibility to the nearest inter-municipal service centers through the development and bringing to a standard state of the network of regional and local roads, stimulating the development of public transport;

- promoting the development of small and medium-sized towns and large rural settlements as inter-municipal service centers for rural areas, providing the population and entrepreneurs with various types of services;

- improving their economic competitiveness by promoting unique local brands, encouraging the development of consumer, credit, and other forms of cooperation, farming, increasing the availability of agricultural markets for small and medium-sized producers, supporting the development of specialized infrastructure for storing agricultural products, introducing technologies and equipment for deep processing of agricultural raw materials, and promoting the development of land reclamation facilities, involvement in the agricultural turnover of unused land and arable land in rural areas suitable for conducting effective agriculture;

- encouraging the diversification of employment and expanding support for initiatives of population in the field of entrepreneurship, not related to agriculture too; assisting the development of tourist and supporting infrastructure (transport, energy, utilities, engineering protection facilities) in rural areas and promoting their tourist resources on the domestic and international tourist markets, etc.

We have developed an organizational and economic mechanism that provides conditions for the integrated and sustainable development of northern rural areas, and it is aimed at creating conditions for the diversification of the rural economy, increasing the efficiency of using the existing potential of rural areas, advancing the comfort of living in them (development of engineering and social infrastructure), creating favorable institutional conditions (development of local self-government, cooperation, inter-municipal cooperation, business support institutions, public-private and municipal-private partnerships).

The authors substantiate conceptual provisions of implementing the authorities' differentiated approach to the development of various types of rural areas in the European North of Russia. On the basis of the proposed typologies of rural territories, we identified their types for management purposes ("successful", "restructuring", and "problem" territories). For each one, the tasks and directions (tools) of socio-economic development policy are defined. Thus, for the first type, it is important to create incentives for their self-development and further sustainable economic growth; for the second type – to diversify economic activities in the territories, identify and implement strategic priorities for their development, activate the development of small and medium-sized businesses; for the third type – to ensure the provision of a necessary level of services to population, preserve and develop necessary social and engineering infrastructure in order to prevent a significant migration outflow of population from these territories.

During the coronavirus pandemic and after the end of an active phase of the fight against it, the *key tasks, measures, and events for the development of rural areas in Russia are the following.*

1. To ensure the complete implementation of measures and achievement of the goals of the RF state program "Integrated development of rural areas" in accordance with the amount of financial support for this program, specified in its original version. In addition, it is advisable to expand the scope of the state program's activities in terms of solving the tasks of diversifying rural economy and creating new jobs, reducing the significant migration outflow from rural areas, more extensively developing a centralized water supply and sewerage in rural areas, attracting and securing qualified personnel in rural areas, etc. Within the framework of the state program for the development of agriculture and regulation of markets for agricultural products, raw materials and food (implementation period – 2013–2025), approved by the Decree of the RF Government no.717 dated July 14, 2012 (ed. on May 28, 2020), it would be advisable to provide subsidies to agricultural producers for the introduction of robotic systems, systems and mechanisms based on precision farming technologies, artificial intelligence, and other modern information and innovative technologies.

2. In terms of the economic diversification and employment of rural population, it is necessary to ensure equal access of agricultural producers to the means of state support; to provide measures of state support for the development of small and medium-sized businesses in rural areas, including rural tourism (ecological, event, ethnographic, gastronomic, etc.), which has significant potential in the coming years, taking into account possible remaining restrictions on international movement.

It is advisable to approach the development of tourism and encourage urban residents to move to rural areas from a marketing point of view, including the formation of local brands (for example, gastronomic ones), introduction of a full-time specialist in the development of tourism and recreation in the economic departments of municipal districts.

3. To create conditions for attracting extra-budgetary sources of financing for investments in the social and engineering infrastructure of the countryside, including the introduction of the practice of implementing projects on the basis of public-private and municipal-private partnerships.

4. To ensure the development of various forms of agricultural cooperation, for example, through the measures of its state support like grant support directed to the development of the material and technical base of agricultural consumer cooperatives; co-financing from the federal budget for the development of cooperative infrastructure in the regions (regional funds for financial support of cooperatives, centers of competence and advanced training of cooperative personnel, cooperative distribution network).

In general, the development of Russian rural areas may be successful, in our opinion, only if all authorities use a comprehensive and systematic approach to their development, and if there is the provision of effective interaction between authorities, business, population, scientific community in these processes, introduction of modern innovative technologies in the agro-industrial complex, and management of municipalities, as well as an active dissemination and support of successful and effective forms of public participation in the development of rural areas described earlier.

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EFFECTS OF CLIMATIC FACTORS ON THE PRODUCTIVITY OF SMALLHOLDER RUBBER PLANTATIONS IN SOUTH SUMATRA, INDONESIA

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Abstract

South Sumatra Province is known as Indonesia's largest natural rubber-producing center. In the last few decades, South Sumatra has faced climate change issues marked by increased variability of maximum temperature, mean temperature, minimum temperature, and rainfall. On the other hand, smallholder rubber plantations are considered to be particularly vulnerable to climate change. Therefore, the goal of this study was to identify the climatic factors that affect the productivity of smallholder rubber plantations in South Sumatra. The data was gathered from the Indonesian Central Bureau of Statistics and the Indonesian Agency for Meteorology, Climatology, and Geophysics from January 2006 to December 2019. A quadratic regression model was used to analyze the data. The results showed that maximum temperature, mean temperature, minimum temperature, and rainfall affect the productivity of smallholder rubber plantations. Maximum temperature and rainfall indicate a pattern that is increasing to the optimum point of 32.29 °C and 281.40 mm respectively and after that, it will slow down. The mean temperature and minimum temperature show a pattern that is decreasing to the optimum point of 26.84 °C and 22.14 °C respectively and after that, it will slow down.

Keywords: productivity, smallholder rubber plantations, temperature, rainfall

JEL classification: Q15, Q54, Q57

1. Introduction

Indonesia's agriculture sector plays a vital role in the country's economy. The agricultural sector is considered to have great potential in absorbing labor (Fafurida, Setiawan, and Oktavilia 2019). The agricultural sector absorb 34.60% of Indonesia's overall population and has big effects on economic growth (Dewi, Prihanto, and Edy 2016; Abd. Majid et al. 2018; Rahmi and Aliasuddin 2020). Labour absorption must be accompanied by an increase in agricultural labor productivity and a decrease inequality in every region in Indonesia (Feriyanto and Sriyana 2016; Purnastuti, Suprayitno, and Sugiharsono 2016). Higher labor productivity can trigger economic expansion and increase added value to agricultural products (Hurri et al. 2019). Agricultural products are critical to a country's population's resiliency (Stratigea 2014). Agricultural products vary widely and are divided into several sub-sectors, with the plantation sub-sector being one of them.

Rubber is one of Indonesia's most essential plantation commodities (Kadir et al. 2018). Several provinces have become rubber-producing centers in Indonesia, but South Sumatra Province is the primary producer of natural rubber production. According to Indonesia's Central Statistics Agency, South Sumatra accounts for 27.87 percent of the country's total

natural rubber production in 2019 (BPS 2019). Smallholder plantations dominate natural rubber production in South Sumatra. Smallholder plantation rubber accounts for 95.28 percent of total rubber production in South Sumatra. This shows that the rubber commodity is a community's economic center and that it can encourage the downstream industry from processed natural rubber products to grow (Syahril et al. 2019). However, smallholder plantations are highly vulnerable to various socioeconomic and environmental changes (Jamshidi et al. 2019). In the socio-economics aspect, rubber smallholders are sensitive to price fluctuations, land fragmentation, uncertainty and instability in social and political issues (Gyulgyulyan and Bobojonov 2019; Mukhlis et al. 2020; Dovgal et al. 2017). In terms of the environment, rubber smallholders are vulnerable to geographic conditions that lead to differences in climatic factors in each region of Indonesia (Panjawa, Samudro, and Soesilo 2018). This level of vulnerability is getting bigger along with the occurrence of climate change in Indonesia.

Currently, almost all regions in Indonesia are facing a quite alarming climate change phenomenon. Climate change is marked by the emergence of several phenomena, such as increased temperature, unpredictable rainfall, and extreme weather events (Harvey et al. 2018; Onzima, Katungi, and Bonabana-Wabbi 2019). This impacts the increasing frequency of droughts, floods, unpredictable precipitation patterns, and heatwaves (Arora 2019; Diendéré 2019). Indonesia is expected to experience an increase in temperature of around 0.80 °C in 2030. In addition, the rainfall pattern is also expected to change, with the rainy season ending sooner and the length of the rainy season shortening (Oktaviani et al. 2011). Climate change is associated with an increase in biotic and abiotic environmental stress to directly affect the decrease in agricultural production quantity and quality (Mall, Gupta, and Sonkar 2017; Stevanovic et al. 2016).

Climate change causes the increase in variability of climatic factors, such as temperature, humidity, and rainfall (Thornton et al. 2014). Climate change, in the form of increased air temperatures and unpredicted rainfall, has decreased the quality of soil and water (Gornall et al. 2010; Lemi and Hailu 2019). This condition causes a decrease in the optimum production of agricultural commodities that can be achieved (Chandio et al. 2020). In addition, extreme weather days negatively correlate with the gross output value of agriculture due to a decrease in the level of efficiency of agricultural production (Shi et al. 2020). A study in Ekiti State, Nigeria showed that the amount and frequency of rainfall and minimum temperature were positively correlated with rice cultivation during the planting period, while the maximum temperature was negatively correlated over the same phase (Olanrewaju, Tilakasiri, and Oso 2017).

According to Wildayana (2017), climate change also affects the production and productivity of rubber plants. The tapping results depend on the climate and conditions of rubber trees and plantations. On the other hand, Budiasih et al. (2020) stated that the impact of prominent climate change would affect and decrease the production of rubber plants. Not to mention the fact that this plant is susceptible to climatic variability (Hutapea, Siregar, and Astuti 2015). An increase in the minimum temperature of 1 °C has the potential to reduce rubber production by 3 g per tapping per tree (Ali, Aziz, and Williams 2020). In addition, rainfall has a positive and significant effect on latex production, with a 1 mm rise in rainfall increasing rubber latex output by 924.335 milliliters (Sinaga, Irsal, and Mawarni 2017; Umar et al. 2017).

Previous studies on the impact of climate on rubber production used a linear model, but this method has a weakness of could not predicting the optimum value of each climatic factor. Therefore, this study uses a quadratic regression model to overcome this weakness. This method has the advantage of being able to predict the inflection point, which shows the optimal point of each climate factor for smallholder rubber plantation productivity (Correia et al. 2017). We believe this study will provide researchers with perspectives on how better to assess the effects of climate change on agriculture. Meanwhile, this study will provide practical contributions, especially strategic steps to mitigate climate change's effects. This study aimed to determine the climatic factors that affect the smallholder rubber plantation productivity in South Sumatra and determine its optimal point.

2. Literature Review

Indonesia is known as one of the largest natural rubber exporters in the world. Indonesia's natural rubber production is recorded to share 28.06 percent in the international market, with an average production of 2,810,379 tons per year (Trademap 2021). Indonesian rubber has a competitive advantage to compete in the international natural rubber commodity market. However, the current climate change phenomenon is a challenge that Indonesia must face.

The annual mean temperature in Indonesia has increased by 0.30 °C per decade, accompanied by a decrease in overall annual precipitation by 2-3 percent (Case et al., 2007). The increase in temperature is expected to continue to increase up to 0.80 °C in 2030 (Oktaviani et al. 2011). In addition, Indonesia has also experienced a trend of increasing sea surface temperature and sea wave height in recent years (Zikra et al., 2015). This phenomenon is expected to worsen along with the increase in pollution and greenhouse gas emissions in Indonesia (Amheka 2018; Nastiti and Giyarsih 2019; Miyata, Wahyuni, and Shibusawa 2013)

Climate change is not only happening at the national level but also the provincial level. South Sumatra Province is also experiencing the phenomenon of climate change. This is indicated by the increasing temperature and rainfall which tend to fluctuate (BMKG 2021). The average maximum temperature in South Sumatra was recorded to increase by 0.004 °C per month in 2006-2019. Meanwhile, the average minimum and mean temperatures also increased by 0.007 °C and 0.003 °C per month in 2006-2019. Meanwhile, the rainfall in South Sumatra tended to decrease in the same period by 0.215 mm per month.

High rainfall is predicted to reduce rubber production due to wasting latex by rainwater (Mesike and Esekade 2014). On the other hand, low rainfall can also trigger a groundwater balance deficit and inhibit the latex flow of rubber plants (Sahuri 2018). Changes in temperature that occur, either at maximum, mean or minimum temperatures can trigger changes in the physiological processes of rubber plants. Temperature can affect the turgor pressure, evapotranspiration rate, and respiration of rubber plants, affecting the production of natural rubber produced by rubber plants (Ali et al., 2020; Ulfah et al., 2015).

By looking at the various literature reviews, the hypotheses of this study are:

Hypothesis 1: Rainfall has a significant effect on the productivity of smallholder rubber plantations in South Sumatra Province

Hypothesis 2: The maximum temperature has a significant effect on the productivity of smallholder rubber plantations in South Sumatra Province

Hypothesis 3: The mean temperature has a significant effect on the productivity of smallholder rubber plantations in South Sumatra Province

Hypothesis 4: The minimum temperature has a significant effect on the productivity of smallholder rubber plantations in South Sumatra Province

3. Methods

The data of this study is sourced from the Indonesian Central Bureau of Statistics (BPS) and the Indonesian Agency for Meteorology, Climatology and Geophysics (BMKG). The data were collected monthly from January 2006 to December 2019. In addition, the selection of the research location, namely South Sumatra, was carried out using the purposive sampling method. South Sumatra was chosen because it is Indonesia's largest natural rubber-producing center (Table 1).

Table 1. Top 5 Natural Rubber Production Centers in Indonesia

Province	Production (ton)	Share of Production (%)	Ranks
South Sumatra	927,023	27.87	1
North Sumatra	400,372	12.04	2
Riau	318,043	9.56	3
Jambi	306,998	9.23	4
West Kalimantan	259,545	7.80	5
Indonesia	3,325,894	66.51	

Research variables include dry natural rubber productivity data from smallholder rubber plantations, maximum temperature, mean temperature, minimum temperature, and rainfall in South Sumatra. The dry natural rubber productivity variable is obtained by dividing total dry natural rubber production by the area of productive rubber plantations. The variables of maximum temperature, mean temperature, minimum temperature, and rainfall are indicators for climatic factors. The following is the formula for calculating rubber productivity:

$$Productivity = \frac{Rubber\ Production\ (ton)}{Land\ Area\ (ha)} \quad (1)$$

The use of time-series data requires consideration of the data's nature, which is the emergence of specific patterns in the data, causing the data to be non-stationary over time. Non-stationary data can lead to spurious regression with biased results (Asafo 2017; Chamalwa and Bakari 2016; Okon and Sunday 2014). The stationarity test can be used to determine the data's stationarity. The Augmented Dickey-Fuller test was used to determine stationarity in this study. The results of the stationarity test show that all research variables are stationary at the level stage (Table 2).

Table 2. Stationarity Test

Variable	Stage	ADF Statistic	Prob.	Information
PDVT	Level	-5.42	0.00	Stationary
MAX	Level	-5.99	0.00	Stationary
AVG	Level	-6.26	0.00	Stationary
MIN	Level	-5.39	0.00	Stationary
RAIN	Level	-8.16	0.00	Stationary

After obtaining stationary data, the next step is to determine the climatic factors that affect the productivity of smallholder rubber plantations in South Sumatra. It can be done using a quadratic regression model. The quadratic regression is used in this study due to the advantages of the model. The quadratic regression model can predict the optimum point of a variable that affects other variables. The output of this analysis is the influence of each climate factor on the productivity and the inflection point (Correia et al. 2017; Susetyo and Hadi 2012). The inflection point will show the optimum point of each climate factor that affects the productivity of smallholder rubber plantations in South Sumatra. The quadratic regression model can be written mathematically as follows (Gujarati 2004):

$$Y = \alpha_0 + \alpha_1 X + \alpha_2 X^2 \quad (2)$$

where Y is the dependent variable, X is the independent variable in the model and α_0 , α_1 , and α_2 are constant parameters. Four possibilities can occur in the quadratic regression model as follows.

1. Increases at an increasing rate, when 1st order derivative > 0 and 2nd order derivative > 0 ;
2. Increases at a decreasing rate, when 1st order derivative > 0 and 2nd order derivative ≤ 0 ;
3. Decreases at an increasing rate, when 1st order derivative ≤ 0 and 2nd order derivative < 0 ;
4. Decreases at a decreasing rate, when 1st order derivative ≤ 0 and 2nd order derivative ≤ 0 .

Based on this theory, this research can be structured into a quadratic regression model by placing the natural rubber productivity variable as the dependent variable and climate factors as the independent variable. The quadratic regression model of this study is as follows.

$$PVID_t = \alpha_0 + \alpha_1 MAX_t + \alpha_2 MAXSQ_t + e \quad (3)$$

$$PVID_t = \alpha_0 + \alpha_1 AVG_t + \alpha_2 AVGSQ_t + e \quad (4)$$

$$PVID_t = \alpha_0 + \alpha_1 MIN_t + \alpha_2 MINSQ_t + e \quad (5)$$

$$PVID_t = \alpha_0 + \alpha_1 RAIN_t + \alpha_2 RAINSQ_t + e \quad (6)$$

where:

$PVID_t$	= Productivity of smallholder rubber plantations in year t (ton/ha)
MAX_t	= Average maximum temperature in year t (°C)
$MAXSQ_t$	= Average maximum temperature square in year t (°C)
AVG_t	= Average mean temperature in year t (°C)
$AVGSQ_t$	= Average mean temperature square in year t (°C)
MIN_t	= Average minimum temperature in year t (°C)
$MINSQ_t$	= Average minimum temperature square in year t (°C)
$RAIN_t$	= Average rainfall in year t (mm)
$RAINSQ_t$	= Average rainfall square in year t (mm)
e	= Error term

The validation of the quadratic regression model can be seen from the significance value of the inflection point and the significance value of the F-statistics. When the inflection point in a model has a significant effect, it means that a regression model has an optimum point. Furthermore, when a model has an optimum point, the regression model can form a U-shape curve, a special characteristic of the quadratic model (Hintz et al., 2019). The significant value of the F-statistic confirms that the quadratic regression model used is valid. In addition, the accuracy in using the quadratic model can be seen from the adjusted R² value in each model used. The higher the adjusted R² value, the higher the accuracy of the quadratic regression model (Gholami et al., 2012; Shahbazi, 2015).

4. Findings and Discussion

According to summary statistics, the average productivity of smallholder plantations in South Sumatra from January 2006 to December 2019 was 0.09 tonnes per month with the characteristics of monthly climatic factors, such as the average maximum temperature of 32.41 °C, average mean temperature of 27.12 °C, the average minimum temperature is 23.66 °C, and the average rainfall is 209.66 mm (Table 3). Smallholder rubber plantation productivity in South Sumatra fluctuates with a standard deviation value of 0.02 tonnes per hectare. The minimum productivity was 0.04 tonnes per hectare in October 2006. In the same period, the maximum temperature and mean temperature reached their highest point of 34.90 °C and 28.37 °C, respectively, in January 2006 and December 2019. In addition, the minimum temperature was also recorded to have increased from the previous month's average (21.57 °C) to 23.23 °C in October 2006. Furthermore, the rainfall in October 2006 was one of the lowest rainfall in South Sumatra, which is 27.30 mm, well below the average rainfall from January 2006 to December 2019. This phenomenon shows that the low productivity of smallholder rubber plantations in South Sumatra is linked to high maximum temperature, mean temperature and minimum temperature, as well as low rainfall.

Table 3. Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
PVID	168.00	0.09	0.02	0.04	0.13
MAX	168.00	32.41	0.91	29.83	34.90
AVG	168.00	27.12	0.65	24.66	28.37
MIN	168.00	23.66	0.67	20.87	25.11
RAIN	168.00	209.66	141.06	1.00	653.10

The productivity of smallholder rubber plantations in South Sumatra reached its highest point in January 2016, reaching 0.13 tonnes per hectare. This productivity is supported by different climatic characteristics when productivity reaches its lowest point. In January 2016, the maximum temperature was recorded at 32.56 °C, slightly higher than the average maximum temperature. In addition, the mean and minimum temperatures at this point are 27.32 °C and 24.34 °C, respectively. This value is higher than the average mean or minimum temperatures from January 2006 to December 2019. Other climatic factors, namely rainfall, reached 217.50 mm during the same timeframe, higher than the average rainfall from January 2006 to December 2019.

Figure 1 shows the pattern of smallholder rubber plantation productivity in South Sumatra against various climatic factors, namely maximum temperature, mean temperature, minimum

temperature, and rainfall. From January 2006 to December 2019, the productivity of smallholder rubber plantations tended to increase, although it seemed to fluctuate. Rainfall data also shows a high degree of fluctuation (see Figure 1a). The highest rainfall in South Sumatra was 653.10 mm in November 2008. The high rainfall was caused by the impact of the La Nina phenomenon (the Oceanic Niño Index or ONI value was less than -0.50) that occurred during that period. On the other hand, the ONI value was greater than +0.50 occurred in September 2015. The ONI value in that period was +2.16, putting it in the range of a compelling El Nino phenomenon (Azlan et al. 2016). This causes the monthly rainfall in South Sumatra Province to reach its lowest point of 1.00 mm.

The El Nino and La Nina phenomenon not only affects rainfall, but also the variability of other climatic factors, such as maximum (Figure 1b), mean (Figure 1c), and minimum (Figure 1d) temperatures. The highest maximum, mean, and minimum temperatures in South Sumatra are closely related to the El Nino phenomenon. In contrast, decreases in maximum, mean, and minimum temperatures were strongly related to La Niña events (Azmoodehfar & Azarmsa, 2013; Salau, et al., 2016).

Image 1: (a) Indonesia's Dry Natural Rubber Productivity Versus Rainfall, (b) Indonesia's Dry Natural Rubber Productivity Versus Maximum Temperature, (c) Indonesia's Dry Natural Rubber Productivity Versus Mean Temperature, (d) Indonesia's Dry Natural Rubber Productivity Versus Minimum Temperature

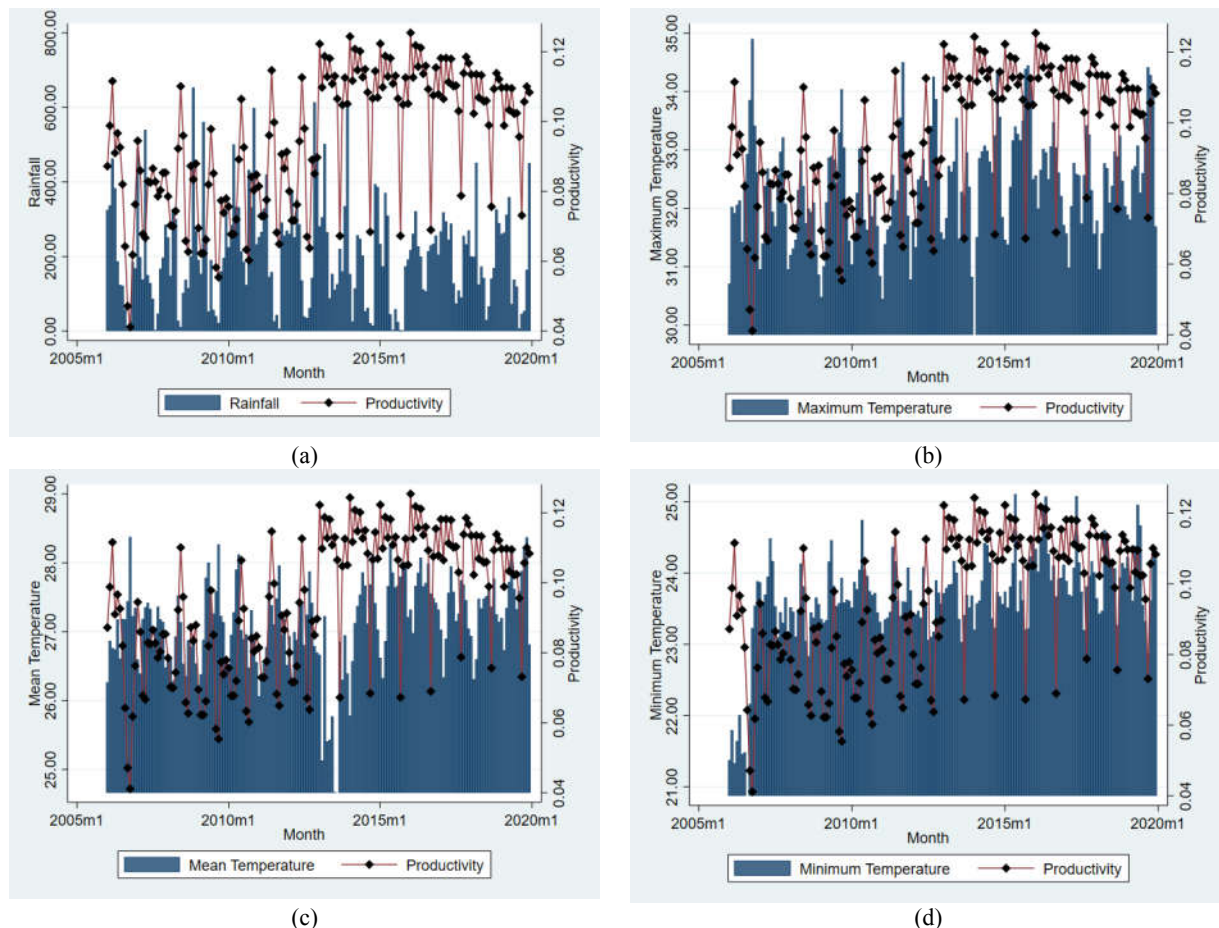


Figure 1a shows that the pattern of increasing productivity is positively associated with a pattern of increasing rainfall. As an example, the year 2006 can be used. The month with the most rain was March 2006, with 462.70 mm. At the same time, smallholder rubber plantations were able to produce 0.11 tonnes per hectare. In 2006, this was the highest value of productivity. On the other hand, low rainfall is associated with low productivity levels. For example, September 2015 saw the lowest rainfall total for the whole year. There was only 1 mm of rain in that month, and productivity was only 0.07 tonnes per hectare. The productivity value for September 2015 is the lowest productivity value for the whole year of 2015.

Table 4. Quadratic Model of Rainfall

Variable	Coefficient	Std. Error	t-Statistic	Prob
Inflection Point	281.39740***	35.69235	7.88000	0.00000
RAIN	0.00008***	0.00003	2.77000	0.00600
RAINSQ	-1.50e10-07***	-5.48e10-08	-2.75000	0.00700
Cons.	0.08602***	0.00367	23.44000	0.00000
Adjusted R ²				0.03390
F-statistic				3.93000
Prob. (F-statistic)				0.02160

Where: *** Significant at 1 percent alpha

The trend seen in Figure 1a can be confirmed using the quadratic regression model in Table 4. The regression model shows that the variable rainfall (RAIN) and RAINSQ affect the productivity of smallholder rubber plantations in South Sumatra at a 1% alpha level. According to the model, the inflection point is significant at a 1% alpha level, and the probability F-statistic is significant at the 5% alpha level. The coefficients of RAIN and RAINSQ are both positive and negative, so it can be interpreted that the higher rainfall, the higher of smallholder rubber plantations productivity until the optimum point of rainfall, and a further increase in rainfall (after reaching the optimum point) can further increase rubber productivity at a decreasing rate (see Figure 2a). The optimum point of rainfall is the inflection point with a value of 281.40 mm. The regression coefficient for the RAIN variable is 0.00008, while the regression coefficient for the RAINSQ variable is -1.50e10-07. This value can be interpreted as follows: a 1 mm increase in rainfall increases productivity by 0.00008 tonnes per hectare until it reaches an optimum point of rainfall of 281.40 mm. An increase in rainfall can slows the rate of increase in natural rubber productivity.

Rainfall has a positive correlation with rubber plant growth. Increased rainfall can increase the girth of rubber trees, which has a beneficial effect on increasing rubber plant productivity (Sangchanda et al., 2014). The availability of groundwater strongly correlated to rainfall will affect latex production (Budiasih et al. 2020). The lack of rain will reduce groundwater level, resulting in a water balance deficit in rubber plants. When the Soil water level drops below 100 mm, the maximum latex yield that rubber plants can produce is only 18 g / t / t, much less than normal conditions, which can reach 28 g / t / t (Sahuri 2018). However, excessive rainfall will reduce latex production. According to Mesike & Esekade (2014), rubber production can be hampered by high rainfall because of reduced tapping frequency and latex waste by rainwater. Furthermore, high rainfall causes runoff erosion and depletes soil nutrients, resulting in reduced smallholder rubber plantation productivity (Vrignon-brenas et al. 2019).

The productivity of smallholder rubber plantations in South Sumatra has a positive relationship with the pattern of maximum temperature (Figure 1b). Increases in maximum temperature have been shown to increase productivity. This can be seen from the movement of productivity and maximum temperature in May 2008. During this period, the maximum temperature reached its highest point (32.82 °C), while natural rubber productivity reached 0.09 tonnes per hectare. In the same year, when the maximum temperature reached its lowest point of 31.20 °C in January, the productivity of natural rubber was only 0.08 tonnes per hectare.

Table 5. Quadratic Model of Maximum Temperature

Variable	Coefficient	Std. Error	t-Statistic	Prob
Inflection Point	32.29030***	0.25579	126.24000	0.00000
MAX	0.21389***	0.08172	2.62000	0.01000
MAXSQ	-0.00331***	0.00126	-2.63000	0.00900
Cons.	-3.35639**	1.32669	-2.53000	0.01200
Adjusted R ²				0.03180
F-statistic				3.74000
Prob. (F-statistic)				0.02570

Where: *** Significant at 1 percent alpha ** Significant at 5 percent alpha

The analysis results show that the maximum temperature (MAX) and MAXSQ affect the productivity of smallholder rubber plantations in South Sumatra (Table 5). In addition, the inflection point is also significant at the 1% alpha level, resulting in a quadratic pattern relationship between maximum temperature and productivity (Figure 2b), and the F-statistics

probability is significant at the 5% alpha level. Table 4 shows that increasing the maximum temperature by 1 °C increases productivity by 0.21 tonnes per hectare until it reaches the optimum temperature at 32.29 °C. The effect comes at a declining rate as the maximum temperature rises and passes the optimum limit, implying that the maximum temperature that exceeds the threshold (optimum maximum temperature) will minimize the increase in natural rubber productivity. Rubber plants require a maximum temperature within the threshold to maintain a low viscosity level, so the water absorption and photosynthesis are not inhibited (Marpaung and Hartawan 2014). In their study, Yu et al. (2014) found that maximum temperatures above 28.50 °C will increase rubber plant productivity. However, an excessively high maximum temperature can interfere with plant physiological processes, thereby reducing plant productivity (Yohannes 2016).

The mean temperature fluctuated in its movement pattern (Figure 1c). The movement of the mean temperature exhibits a tendency that is inversely proportional to the movement of natural rubber productivity. Increasing mean temperature tends to decrease productivity. This phenomenon can be seen in September 2006 where the mean temperature reached the highest temperature of 28.37 °C, but productivity reached the lowest point of 0.04 tonnes per ha. In January of the same year, the mean temperature fell to 26.26 °C, and productivity fell to 0.09 tonnes per hectare.

Table 6. Quadratic Model of Mean Temperature

Variable	Coefficient	Std. Error	t-Statistic	Prob
Inflection Point	26.83630***	0.29717	90.30000	0.00000
AVG	-0.20905*	0.11067	-1.89000	0.06100
AVGSQ	0.00389*	0.00206	1.89000	0.06100
Cons.	2.89731*	1.48470	1.95000	0.05300
Adjusted R ²				0.00930
F-statistic				1.78000
Prob. (F-statistic)				0.17110

Where: ***Significant at 1 percent alpha *Significant at 10 percent alpha

Table 6 indicates the significant mean temperature inflection point at the 1% alpha level. These results confirm a quadratic pattern between mean temperature and productivity of smallholder rubber plantations in South Sumatra (Figure 2c). The regression coefficients AVG and AVGSQ also have a significant effect on productivity. According to the findings, a 1°C rise in mean temperature reduces smallholder rubber plantation productivity by 0.21 tonnes per hectare until it reaches the optimum point mean temperature of 26.84 °C. The effect of increasing the mean temperature above the threshold has a minor declining effect. According to Yu et al. (2014), increasing the mean temperature will decrease rubber productivity, while an average temperature below 25.70 °C will increase rubber productivity. Excessively raising the mean temperature will minimize latex flow (Zhang et al. 2014).

Figure 1d shows the movement pattern of dry natural rubber productivity for smallholder rubber plantations in South Sumatra against the minimum temperature. The minimum temperature and productivity have an inverse relationship in terms of movement; an increase in the minimum temperature is correlated with a reduction in the productivity of dry natural rubber. This can be seen in the productivity against the minimum temperature data in 2012. The highest minimum temperature in 2012 was 24.08 °C with a productivity of only 0.09 tonnes per ha. This value is lower than the productivity of dry natural rubber, which was 0.10 tonnes per hectare when the lowest minimum temperature occurred in 2012 (23.06 °C) This statement is supported by the quadratic regression model in Table 7.

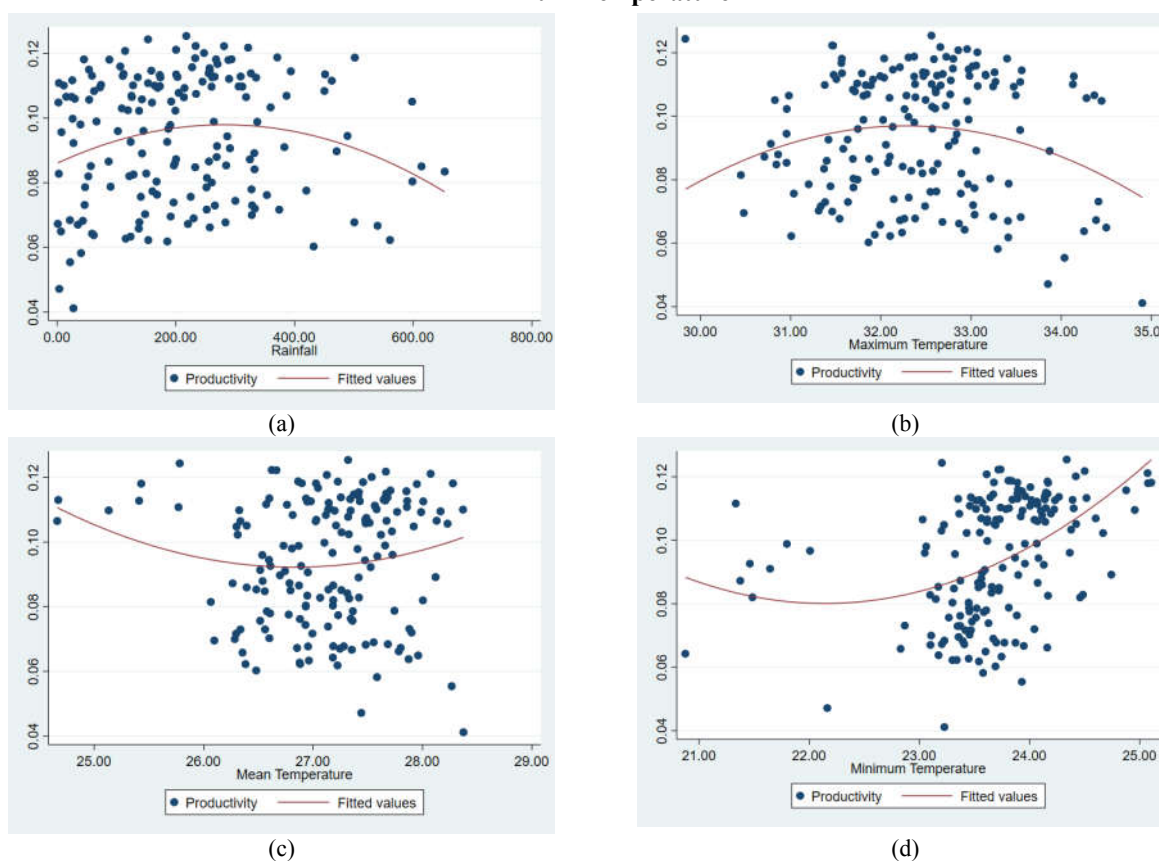
Table 7. Quadratic Model of Minimum Temperature

Variable	Coefficient	Std. Error	t-Statistic	Prob
Inflection Point	22.14086***	0.36927	59.96000	0.00000
MIN	-0.22807***	0.07069	-3.23000	0.00200
MINSQ	0.00515***	0.00152	3.38000	0.00100
Cons.	2.60488***	0.81979	3.18000	0.00200
Adjusted R ²				0.18280
F-statistic				19.67000
Prob. (F-statistic)				0.00000

Where: ***Significant at 1 percent alpha

The significant inflection point at the 1 percent alpha level indicates a quadratic relationship between minimum temperature and productivity of smallholder rubber plantations (Figure 2d). In addition, the MIN and MINSQ variables are also significant at the 1% alpha level with the negative and positive regression coefficients, respectively. The quadratic regression model between the minimum temperature and dry natural rubber productivity shows that a 1 °C rise in minimum temperature will reduce dry natural rubber productivity in South Sumatra by 0.23 tons per hectare until it reaches the optimum point minimum temperature of rubber plants of 22.14 °C. The minimum temperature has a negative relationship with productivity. This is closely related to the turgor pressure conditions of rubber plants. Rubber that is tapped under conditions of high turgor pressure produces more latex (Ulfah, Thamrin, and Natanael 2015). The highest turgor pressure in rubber plants occurs when the minimum temperature is reached. Turgor pressure is associated with latex flow. The evapotranspiration rate in rubber plants increases as the minimum temperature rises, lowering the turgor pressure and reducing latex flow (Ali, Aziz, and Williams 2020).

Image 2: (a) Quadratic model of Indonesia's Dry Natural Rubber Productivity Versus Rainfall, (b) Quadratic model of Indonesia's Dry Natural Rubber Productivity Versus Maximum Temperature, (c) Quadratic model of Indonesia's Dry Natural Rubber Productivity Versus Mean Temperature, (d) Quadratic model of Indonesia's Dry Natural Rubber Productivity Versus Minimum Temperature



In South Sumatra, appropriate mitigation measures on smallholder rubber plantations are needed due to the fluctuating climatic factors such as rainfall, maximum temperature, mean temperature, and minimum temperature. To overcome this, making bio pores can be the best alternative. Bio pores can absorb rainwater during high rainfall and store it properly, so that rubber plants can use it when there isn't a lot of rain. In addition, bio pores have a role in maintaining optimum temperature and humidity. Implementing a rubber-based agroforestry scheme will also help to mitigate smallholder rubber plantations. Some plants can synergize well with rubber plants such as peanut, sweet potato, maize, T. cacao, C. arabica, F. macrophylla, or D. cochinchinensis (Chen et al., 2017; Singh, 2018). A rubber-based agroforestry system is considered capable of overcoming erosion from runoff due to the participation of intercrops in rubber plantations which can act as a mulch for the beating action of raindrops (Chen et al. 2017).

5. Conclusion

The productivity of smallholder rubber plantations in South Sumatra is influenced by climatic factors, such as rainfall, maximum temperature, mean temperature, and minimum temperature. The optimum rainfall that affects smallholder rubber plantations' productivity is 281.40 mm, while the optimum temperatures for maximum, mean, and minimum temperatures are 32.29 °C, 26.84 °C, and 22.14 °C, respectively. The high fluctuations of climatic factors affect the productivity of smallholder rubber plantations. This indicates the need to implement appropriate mitigation strategies. This strategy can make bio pores on smallholder rubber plantations and implement a rubber-based agroforestry system, allowing smallholder rubber plantations in South Sumatra to be more resilient to climate change. Finally, this study increases experts', the public's, and the government's understanding of the need to mitigate the effects of climate change. Based on engagement theory, this awareness can be developed by education and involvement of all stakeholders in the rubber plantation

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ASSESSMENT OF THE INTERCONNECTEDNESS OF CITIES IN THE RUSSIAN FAR EAST

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Abstract

Today, determining the priorities of spatial and economic development of Russian cities is a key strategic goal in the Russian Federation. Acting as points of growth and connecting elements of economic processes, cities form a common framework of settlement. Existing urban disparities distort the territorial space, demonstrate its insufficient integrity, which reduces the quality of life of the population and poses a threat to socio-political stability.

The purpose of the study is to determine the features of the interconnectedness of cities in the Russian Far East using the Moran index. The estimation method is based on the calculation of the global and local Moran indices to determine the effects of connectivity of territories by indicators: "population size", "population density", "volume of products shipped per capita", "average monthly salary". The information base was the data of the Federal State Statistics Service, the distance calculation was carried out according to the data of the automobile portal. The object of the study is the cities of the Far Eastern Federal District, with a population of more than 100 thousand people in 2017. The calculations made it possible to determine the type (direct and reverse) and the strength of interterritorial relations according to the considered parameters. According to the indicators "population size", "population density", there is a negative autocorrelation, according to the indicators "volume of products shipped per capita", "average monthly salary", there is a positive autocorrelation. The calculations revealed the presence of polarization in the territory of the Russian Far East. The strongest relationships are between Vladivostok (LISA -0,314), Khabarovsk (LISA -0,026) in terms of population; Artem (LISA -0,165) Vladivostok (LISA -0,084) – population density; Artem (LISA 0.116), Komsomolsk-on-Amur (LISA -0,036) – the volume of products shipped per capita; Ussuriysk (LISA 0.081), Artem (LISA 0.092) – average monthly wages.

The scientific significance of the conducted research consists in the development of theoretical and methodological provisions in relation to the assessment of spatial interterritorial relations. In the future, work will continue in terms of studying autocorrelation in dynamics, expanding the analyzed indicators and identifying spatial and temporal shifts, for a deeper understanding of the patterns of spatial development of cities.

Keywords: Moran index, spatial autocorrelation, inter-territorial connection, city

JEL classification: R12

1. Introduction

Determining the priorities of the spatial and economic development of Russian cities is a key strategic goal of our time. Acting as points of growth and connecting elements of economic processes, cities form a common framework of settlement. Existing urban disparities in a number of key indicators (population size and density, income level, investment volume, industrial development, etc.) distort the territorial space, demonstrate its insufficient integrity, which reduces the quality of life of the population and poses a threat to socio-political stability.

Today, an urgent economic problem is the intensive growth of individual cities with millions of inhabitants against the background of "desertification" of the peripheral territories of promising economic development. This trend justifies the need for each city to determine a unique development vector based on scientifically based approaches in the development of regional policy and strategy. New methods and concepts of strategic planning are needed due to the increasing complexity of the management of urban systems. Understanding the mechanisms, conditions and factors of spatial development of territories, their growth, location features and interconnectedness will contribute to making more effective management decisions.

The purpose of the study is to determine the features of the interconnectedness of cities in the Russian Far East using the Moran index.

2. Literature review of the study

To conduct this study, a detailed analysis of the literature was carried out in two directions: the spatial development of cities and the theory of spatial autocorrelation.

In foreign scientific literature at the end of the 20th century, the urban agglomeration economy, singled out, as a field of knowledge from the new economic geography, became a popular direction. Economists try to explain the role of city size (population) in economic efficiency and to assess the interaction of cities. The underlying principle of the theoretical models is that, in industrialized countries, not only a large part of the population but also economic activity is concentrated in cities, and urban structure is the result of the dynamic interaction of economic activity and urban growth [Gabaix, 1999; Duranton, 2007; Corboda, 2008; Tripathi, 2017; Lagarias, Sayas, 2018; Akbaşoğullari, 2020; Anastasiou, 2020].

Particularly popular is the urban growth theory presented in the works of K. Gabaix [Gabaix, 1999], J. Eeckhout (2004) [Eeckhout, 2004], M. Partridge, D. Rickman, C. Ali, M. Olfert [Partridge et al, 2008], C. Bizzarri [Bizzarri, 2014], K. Schlüter, A. Lalanne, M. Zumppe [Schlüter et al, 2015], G. Guastella, S. Pareglio [Guastella, Pareglio, 2015], Urban growth models are based on a balance of advantages, the costs of agglomeration, economic forces such as employment, transport costs, market potentials and technological innovation. A number of models offer similar deterministic factors that are fundamental to explaining the complex dynamics of urban hierarchies.

The issues of the agglomeration process in cities and regions have been widely developed in Russian and foreign literature, scientists are making attempts to identify the main factors in the emergence of agglomeration, to determine its positive effects. [Rastvortseva, 2017; Rastvortseva, Chentsova, 2017; Kozhevnikov, 2019; Muštra, Kalinić, 2020].

The problem of the location and development of cities in the spatial economy is gaining in importance in the work of Russian scientists at the beginning of the 21st century. A.I. Trejvish assessed the dynamics of the rank of Russian cities from 1967 to 2002 and concluded that in a significant part they (ranks) remain. This conclusion confirms the stability of the urban system of the Russian Federation [Trejvish, 2009]. A. M. Arhipov developed a functional typology of cities with the allocation of features: the degree of development of the functional structure, territorial content of functions, economic and geographical location [Arhipov, 2010]. Andreev evaluates the location of cities in the Volga Federal district using the Zipf law [Andreev, 2017]. E. A. Kolomak presented empirical patterns of development of the Russian urban system, analyzed the level of urbanization, and offered econometric estimates of factors of development of the urban system [Kolomak, 2018].

In modern works, the features of the spatial development of Russia are considered, the problems of assessing the socio-economic potential of the northern territories are raised [Baburin et al, 2018; Maslikhina, 2018].

In our earlier studies, we assessed the factors of inequality in Russian cities, the manifestation of Zipf's law in urban systems [Manaeva, Rastvortseva, 2016; Manaeva, Kanishteveva, 2017].

Spatial autocorrelation theory has been a key element of geographical analysis for more than twenty years. The availability of large data sets with spatial reference and complex visualization capabilities have created a need for new methods of spatial data analysis, both research and confirmatory [Anselin, 1992; Openshaw, 1993]. Spatial structural instability or spatial drift has been included in a number of modeling approaches. Discrete spatial modes are taken into account in the analysis of variance [Griffith, 1978; Griffith, 1992; Sokal et. al., 1993] and in regression models with spatial structural changes [Anselin, 1988; Anselin, 1990]. A number of spatial correlation measurements are proposed to study the spatial process of geographical evolution from different points of view [Bivand, 2009; Haining, 2009; Li et. al., 2007; Tiefelsdorf, 2002; Weeks et. al., 2004]. The most popular tool for measuring correlation is the Moran index [Moran, 1948], which is a generalization of the Pearson correlation coefficient. Concepts and methods of spatial autocorrelation have been applied to many areas, resulting in a number of interesting results. Chen reconstructed the matrix of spatial weights and the Moran index and, improving the scattering graph, presented four approaches to calculating the Moran index, which contributed to the development of the analytical process of spatial autocorrelation [Chen, 2005]. Yu. V. Pavlov and E. N. Koroleva apply the local and global Moran index to identify clusters and subclusters. Scientists have identified four territorial clusters and six subclusters in the Samara region [Pavlov, Koroleva, 2014]. V. A. Rusanovskij and V. A. Markov use the Moran index to measure the spatial localization of unemployment. This index gives correct results for complex systems when relations between neighboring territories are linear [Rusanovskij, Markov, 2016]. A.V. Suvorova using the Moran index developed an approach for identifying direct and inverse effects of the development of growth poles, and measured the scale of their influence on the territories centered around [Suvorova, 2019].

3. Research methodology

When analysing the spatial characteristics of cities, priority is given to the characteristics of their population, the proximity of the objects, the scale of the systems and their concentration within the territory. Spatial econometric techniques - the calculation of global and local Moran indices - are useful for determining the effects of urban connectivity, which will make it possible to determine the degree of coherence of the parameters characterizing the development of neighboring cities.

The methodology for assessing urban connectivity using the Moran index consists of the following steps:

1) Collection of statistical data, construction of a matrix containing information on the distances between all territorial units studied (in this study - cities within the boundaries of the Southern Federal District). The distance matrix will be based on information on the length of roads between cities of the Federal District.

2) Calculation of the global Moran index by the formula:

$$I_G = \frac{N}{\sum_i \sum_j w_{ij}} * \frac{\sum_i \sum_j w_{ij} (x_i - \mu) (x_j - \mu)}{\sum_i (x_i - \mu)^2} \quad (1)$$

Where I_G is the Moran Global Index,

N is the number of cities;

w_{ij} is an element of the spatial balance matrix for the names of the hyons i and j ;

μ - the average value of the indicator;

x is the analyzed measure.

3) Calculation of the mathematical expectation of the index:

$$E(I) = \frac{-1}{n-1} \quad (2)$$

where $E(I)$ is the mathematical expectation of the index,
 n is the number of territories analysed.

4) Determination of the existence and nature of spatial autocorrelation.

$I_G \geq E(I)$ is a positive spatial autocorrelation (the values of the indicator in question are close to each other for neighbouring cities);

$I_G \leq E(I)$ is a negative spatial autocorrelation (the values of the indicator of neighboring cities differ).

$I_G = E(I)$ - no spatial autocorrelation [Rusanovskij, Markov, 2016].

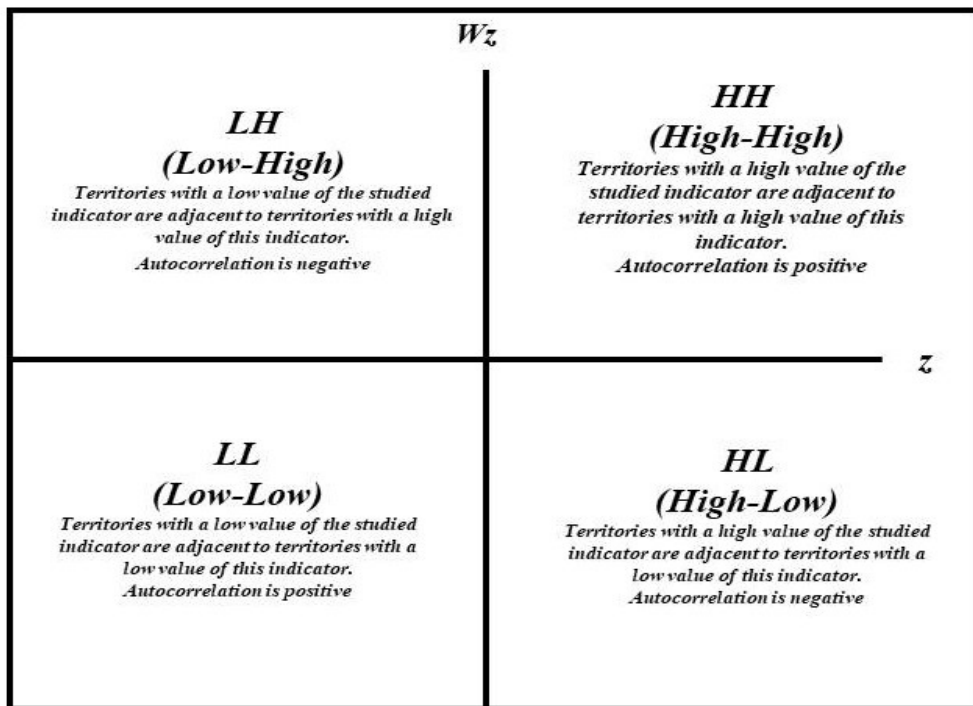
5) Verification of the significance of the obtained results by the method of statistical hypothesis testing (z-test), by determining the value of Z-statistics:

$$z - stats = \frac{I - E(I)}{\sqrt{E(I)^2 - E(I)^2}} \quad (3)$$

The value obtained is the number of standard deviations by which the actual value of the Moran index is removed from the expected value.

6) Construction of the spatial Moran scatter diagram. The abscissa axis is the standardized z -values of the studied indicator, and the ordinate axis is the values of the spatial factor Wz . The diagram reproduces the regression line Wz by z , the slope of which is equal to the coefficient of total spatial autocorrelation I for a standardized weight matrix. The spatial autocorrelation coefficient demonstrates the degree of linear relationship between the z vector of centered values of the studied indicator and the Wz vector of spatially weighted centered values of the studied indicator in neighboring cities (regions) [29] (Fig.1).

Figure 1. Spatial dispersion diagram of the Moran index



7) Calculate the values of the local Moran index (*LISA* - Local Index Spatial Autocorrelation), determine the tightness of a particular city's connection to all others.

$$I_{Li} = z_i \sum w_{ij} z_j \quad (4)$$

where

I_{Li} is the local Moran index for the i -city;

w_{ij} is the standardized distance between i -th and j -th city;

z_i and z_j are the standardised values for the i -th and j -th city.

The values obtained may range from -1 to 1.

For $I_{Li} < 0$, the negative autocorrelation for the city i . i.e. the given city by this value differs significantly from the neighbouring city (outlier).

For $I_{Li} > 0$, the autocorrelation is positive, i.e. the given city is similar to neighboring cities (cluster).

For $|I_{Li}| > |I_{Lj}|$ - similarity/difference of cities i with surrounding neighboring cities is greater than for city j and its neighbors.

To conduct the study, a sample was formed, which included cities of the Far Eastern Federal District of Russia with a population of more than 100 thousand people. Poorly developed municipal statistics and the absence of a number of indicators do not allow us to include the remaining group of cities in the analysis.

Analyzed indicators: population size, population density, volume of products shipped per capita¹, average monthly salary. The study period is 2017. The source of information was the data of the Federal State Statistics service, the calculation of distances was carried out according to the data of the automobile portal².

4. Results of the author's study and discussion

The analysis of the key indicators of the urban systems of the regions of the Far Eastern Federal District in 2017 is presented in Table 1.

Table 1 Key indicators of urban systems of the regions of the Far Eastern Federal District of Russia in 2018.

Регион Region	Number of cities / monocities	Population, thousand people			Population density, people per km ²	Urbanization level, %	Distance to Vladivostok, km.
		Region, total	Regional capitals	Of the remaining cities / monocities			
1	2	3	4	5	6	7	8
Amur region	10/4	798,4	225,1	238,6/170,3	2,2	57	1274
Jewish Autonomous region	2/0	162	73,6	8,5/0	4,7	49	944
Kamchatka Krai	3/0	315,6	181,2	61,2/0	0,7	76	2257
Magadan region	2/0	144,1	92,8	4,7/0	0,3	66	5048
Primorsky Krai	12/4	1913	604,9	715,4/128,4	11,6	68	-.-
Sakhalin region	14/0	490,2	199	171,9/0	5,6	74	2032
Khabarovsk region	7/0	1328,3	618,2	359,4/0	1,7	73	754
Chukotka autonomous region	3/0	49,3	15,6	10,6/0	0,1	48	3702
The Republic of Sakha (Yakutia)	13/3	964,3	311,8	198,8/103,8	0,3	52	3112

Compiled according to: Regions of Russia. The main socio-economic indicators of cities 2018: stat. compendium / Rosstat. – M., 2018. S, 172-208.

There are no million-plus cities in the Far Eastern Federal District. There is a wide differentiation of cities in terms of population and concentration in the regions of the federal district under consideration. The range of the population of the capitals of the regions varies from 15.6 thousand people (Anadyr) to 604.9 thousand people. (Vladivostok). The share of capitals in the citywide population ranges from 45.8 % (Primorsky Krai) to 95 % (Magadan Region). On the territory of the Far Eastern Federal District, there are eight single-industry towns, 402.5 thousand people live on their territory.

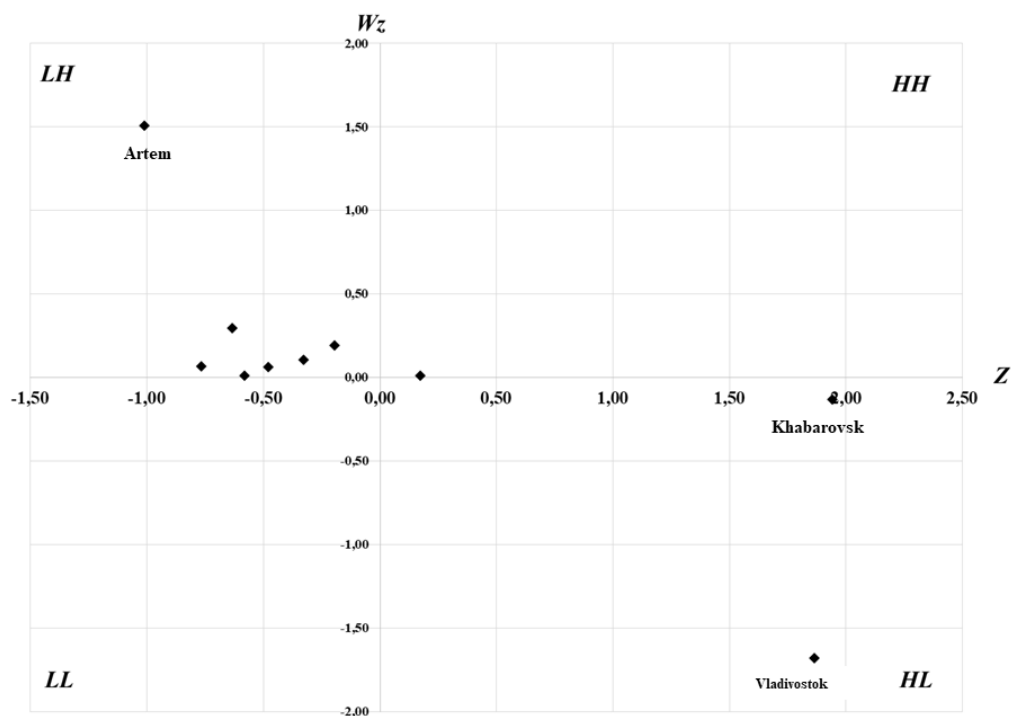
¹ By type of activity, mining, manufacturing, electricity, gas and water production.

² Automotive Portal of Cargo. Available at: www.avtodispatcher.ru

Figures 2-5 show the spatial dispersion diagrams of the global Moran index for the analyzed indicators for 2017 in the cities of the Far Eastern Federal District. Tabular representations of the local Moran index are given in Tables 2-5.

The indicators analyzed in the study are the resulting parameters of the socio-economic development of the city. Population size and population density are indicators of the success of a city's development. The volume of products shipped per capita – the scale and success of the economic activity of the city, the average monthly salary – the quality of life of the population.

Fig. 2 Spatial Moran scattering diagram (population) for the cities of the Far Eastern Federal District in 2017.



Compiled according to: Regions of Russia. The main socio-economic indicators of cities 2018: stat. compendium / Rosstat. – M., 2018. S, 172-208.

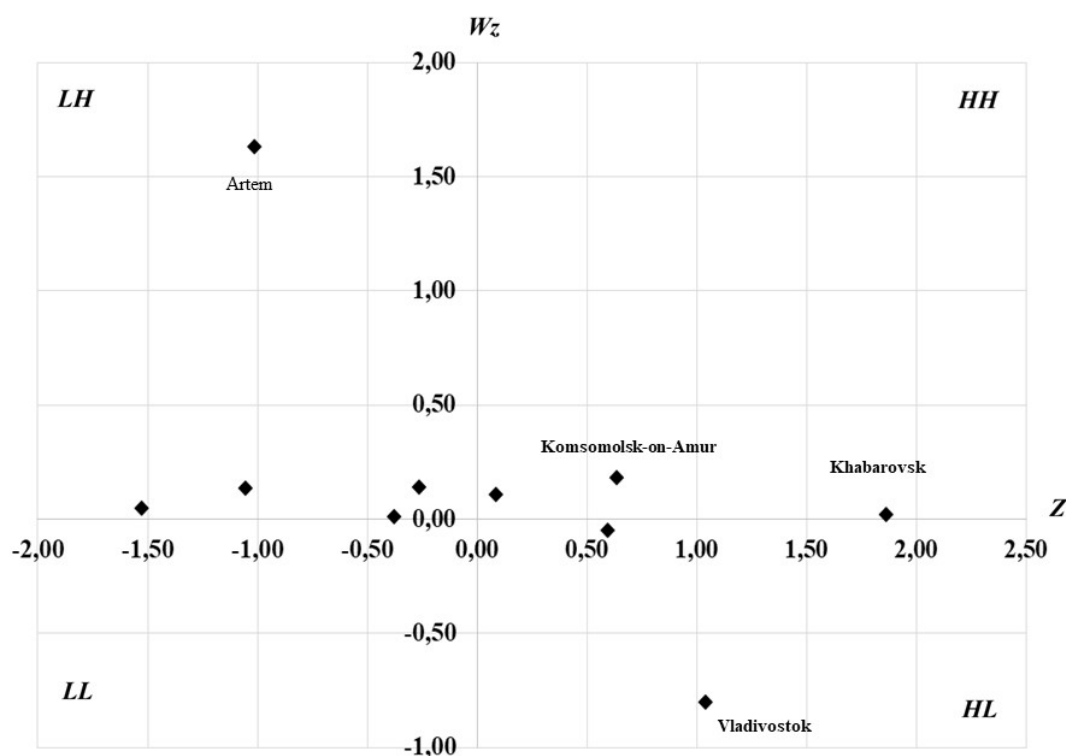
Table 2 Grouping of cities in the Far Eastern Federal District according to the Moran index (population) in 2017

LH				HH			
City	Z	Wz	LISA	City	Z	Wz	LISA
Petropavlovsk-Kamchatsky	-0,580	0,010	-0,001	Yakutsk	0,174	0,008	0,0001
Ussuriysk	-0,633	0,296	-0,019				
Find	-0,764	0,068	-0,005				
Artem	-1,010	1,505	-0,152				
Komsomolsk-on-Amur	-0,193	0,190	-0,004				
Blagoveshchensk	-0,326	0,103	-0,003				
Yuzhno-Sakhalinsk	-0,477	0,061	-0,003				
LL				HL			
City	Z	Wz	LISA	City	Z	Wz	LISA
				Vladivostok	1,866	-1,681	-0,314
				Khabarovsk	1,943	-0,132	-0,026

Compiled from: Regions of Russia. Main socio-economic indicators of cities 2018: Stat. Sat. / Rosstat. – M., 2018.S., 172-208.

In the cities of the Far Eastern Federal District, according to the indicator "population", there is a negative autocorrelation (the global Moran index is -0.5, the mathematical expectation is -0.1). Khabarovsk and Vladivostok have a relatively high population, and their local Moran index allows us to conclude that Vladivostok (LISA -0.3) has strong inter-territorial ties. The concentration of cities is observed in the square LH. The HH square contains one city, Yakutsk. There are no cities in the LL square.

Fig. 3 Spatial Moran scattering diagram (population density) for the cities of the Far Eastern Federal District in 2017.



Compiled from: Regions of Russia. Main socio-economic indicators of cities 2018: Stat. Sat. / Rosstat. - M., 2018.S., 172-208.

Table 3. Grouping of cities in the Far Eastern Federal District according to the Moran index (population density) in 2017

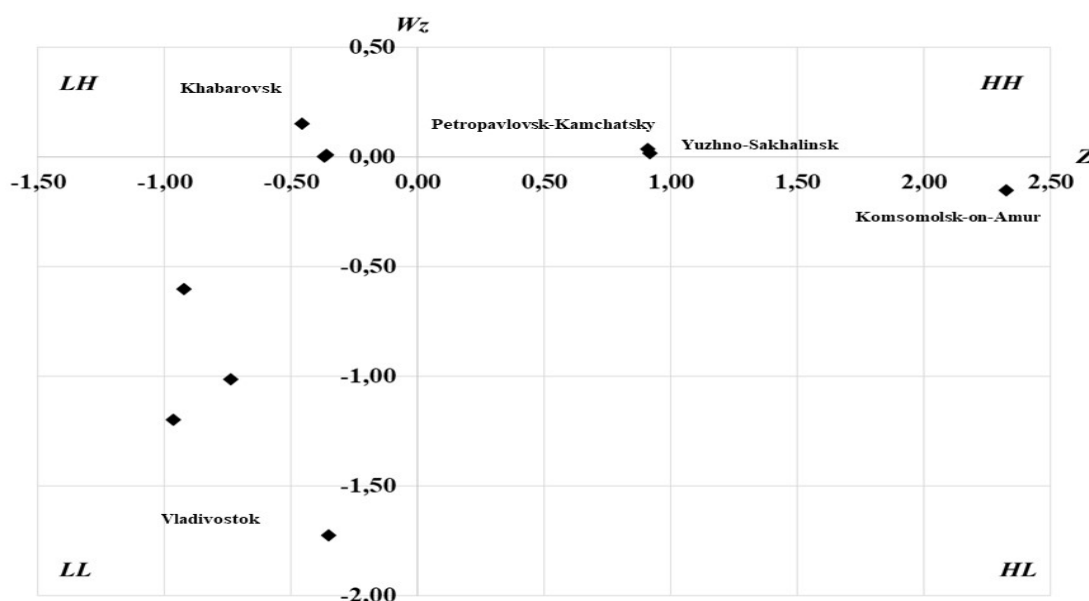
LH				HH			
City	Z	Wz	LISA	City	Z	Wz	LISA
Yakutsk	-1,525	0,045	-0,007	Khabarovsk	1,864	0,020	0,004
Petropavlovsk-Kamchatsky	-0,376	0,010	0,000	Komsomolsk-on-Amur	0,639	0,180	0,012
Find	-0,262	0,140	-0,004	Blagoveshchensk	0,086	0,106	0,001
Artem	-1,012	1,628	-0,165				
Yuzhno-Sakhalinsk	-1,053	0,133	-0,014				
LL				HL			
City	Z	Wz	LISA	City	Z	Wz	LISA
				Vladivostok	1,041	-0,802	-0,084
				Ussuriysk	0,597	-0,052	-0,003

Compiled from: Regions of Russia. Main socio-economic indicators of cities 2018: Stat. Sat. / Rosstat. - M., 2018.S., 172-208.

In the course of assessing the spatial autocorrelation in the cities of the Far Eastern Federal District by the indicator "population density", the calculated global Moran index -0.3 (mathematical expectation -0.1) was obtained, which indicates the presence of feedback. Five

cities have a relatively high population density (three are located in the HH square and two in the LH square).

Fig. 4 Spatial Moran scattering diagram (volume of products shipped per capita) for the cities of the Far Eastern Federal District in 2017.



Compiled from: Regions of Russia. Main socio-economic indicators of cities 2018: Stat. Sat. / Rosstat. - M., 2018.S., 172-208.

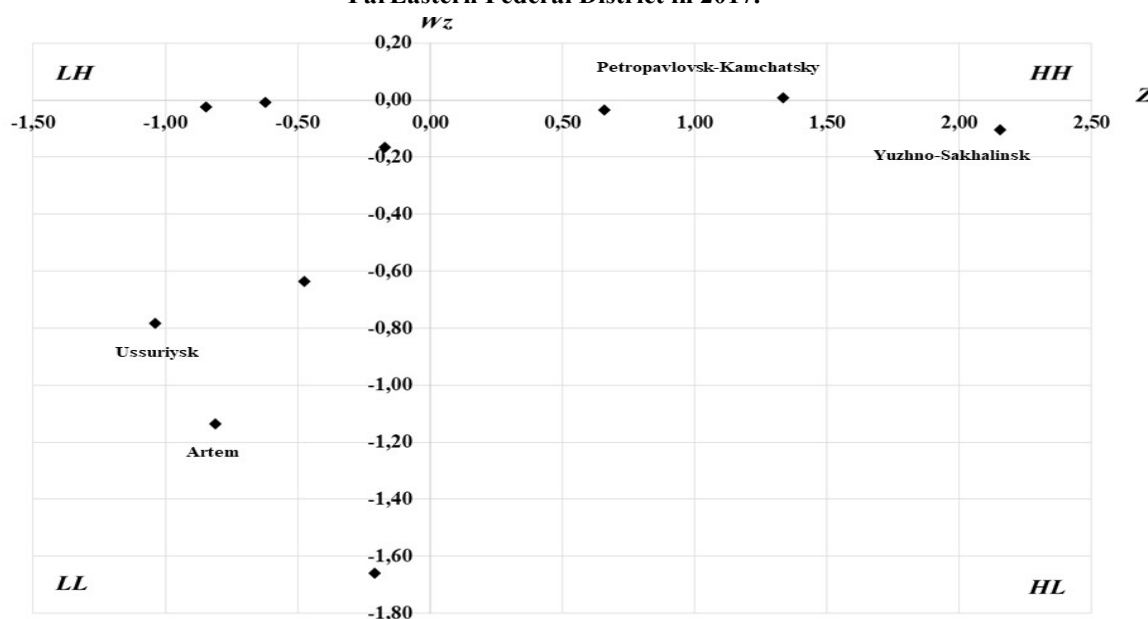
Table 4. Grouping of cities in the Far Eastern Federal District according to the Moran index (volume of goods shipped per capita) in 2017

LH				HH			
City	Z	Wz	LISA	City	Z	Wz	LISA
Khabarovsk	-0,456	0,148	-0,007	Petropavlovsk-Kamchatsky	0,918	0,014	0,001
Blagoveshchensk	-0,361	0,005	0,0001	Yuzhno-Sakhalinsk	0,909	0,035	0,003
LL				HL			
City	Z	Wz	LISA	City	Z	Wz	LISA
Yakutsk	-0,368	-0,002	0,0001	Komsomolsk-on-Amur	2,328	-0,155	-
Vladivostok	-0,349	-1,729	0,060				
Ussuriysk	-0,736	-1,016	0,075				
Find	-0,920	-0,603	0,055				
Artem	-0,965	-1,201	0,116				

Compiled from: Regions of Russia. Main socio-economic indicators of cities 2018: Stat. Sat. / Rosstat. - M., 2018.S., 172-208.

During the assessment of interterritorial interaction in the cities of the Far Eastern Federal District in terms of the volume of products shipped per capita, the global Moran index was 0.3 (mathematical expectation -0.1), which confirms the presence of a positive autocorrelation, there is a concentration of cities in the LL square. The two cities are located in the square LN. Three cities of the Far Eastern Federal District have relatively high values of the volume of shipped products per capita: Petropavlovsk-Kamchatsky (square NN), Yuzhno-Sakhalinsk (square NN) and Komsomolsk-on-Amur (square LN). The maximum value of the local Moran index was obtained for Komsomolsk-on-Amur (LISA -0.04). The strongest interterritorial relations are manifested relative to Khabarovsk (LISA -0.004).

Figure 5 Spatial Moran scattering diagram (average monthly salary) for the cities of the Far Eastern Federal District in 2017.



Compiled from: Regions of Russia. Main socio-economic indicators of cities 2018: Stat. Sat. / Rosstat. - M., 2018.S., 172-208.

Table 5 Grouping of cities in the Far Eastern Federal District according to the Moran index (average monthly salary) in 2017

LH				HH			
City	Z	Wz	LISA	City	Z	Wz	LISA
				Petropavlovsk-Kamchatsky	1,337	0,008	0,001
LL				HL			
City	Z	Wz	LISA	City	Z	Wz	LISA
Vladivostok	-0,206	-1,660	0,034	Yakutsk	0,661	-0,036	-0,002
Ussuriysk	-1,038	-0,784	0,081	Yuzhno-Sakhalinsk	2,158	-0,106	-0,023
Find	-0,473	-0,638	0,030				
Artem	-0,808	-1,136	0,092				
Khabarovsk	-0,167	-0,167	0,003				
Komsomolsk-on-Amur	-0,619	-0,009	0,001				
Blagoveshchensk	-0,844	-0,024	0,002				

Compiled from: Regions of Russia. Main socio-economic indicators of cities 2018: Stat. Sat. / Rosstat. - M., 2018.S., 172-208.

The analysis of spatial interaction in the cities of the Far Eastern Federal District according to the indicator "average monthly salary" showed the presence of a positive autocorrelation (the global Moran index is 0.2, the mathematical expectation is 0.1). Thus, the value of the indicator under consideration during the transition from city to city occurs gradually. The largest share of cities in the Far Eastern Federal District is located in the LL square. The territories with a high level of average monthly wages include three cities: Petropavlovsk-Kamchatsky (square NN), Yakutsk (square HL), Yuzhno-Sakhalinsk (square HL). The low value of the local Moran index for these territories and the absence of cities in the square LN allows us to conclude that there is no significant influence on their part.

5. Conclusion

The study revealed the presence of direct and inverse spatial relationships in the cities of the Far Eastern Federal District. According to the indicators "population size", "population density", there is a negative autocorrelation, according to the indicators "volume of products

shipped per capita", "average monthly salary", there is a positive autocorrelation. The calculations revealed the presence of polarization in the territory of the Russian Far East. In terms of population, Khabarovsk and Vladivostok are separated from the rest of the group of cities, in terms of the volume of products shipped per capita, Petropavlovsk-Kamchatsky, Komsomolsk-on-Amur, Yuzhno-Sakhalinsk are located to the right and separated from the remaining cities in the diagram, and Petropavlovsk-Kamchatsky and Yuzhno-Sakhalinsk are polarized in terms of average monthly wages. The analysis of the local Moran index allows us to conclude that Vladivostok (LISA -0.314) and Khabarovsk (LISA -0.026) have the strongest relationships in terms of population; Artem (LISA -0.165) Vladivostok (LISA -0.084)-population density; Artem (LISA 0.116), Komsomolsk-on-Amur (LISA -0.036) – volume of shipped products per capita; Ussuriysk (LISA 0.081), Artem (LISA 0.092) – average monthly salary.

The scientific significance of the conducted research consists in the development of theoretical and methodological provisions in relation to the assessment of spatial interterritorial relations. In the future, work will continue in terms of studying autocorrelation in dynamics, expanding the analyzed indicators and identifying spatial and temporal shifts, for a deeper understanding of the patterns of spatial development of cities.

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PRODUCTION AND MARKETING EFFICIENCY OF PATCHOULI OIL INDUSTRY IN INDONESIA

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Abstract

This study aims to empirically measure and analyse the production and marketing efficiency of the patchouli oil industry in Aceh, Indonesia. The study uses primary data collected from 120 patchouli farmers and analysed using the Data Envelopment Analysis (DEA) approach. The results showed that, on average, the patchouli oil production and marketing efficiency levels were in the moderate-efficient and the low-efficient categories, respectively. The patchouli farmers have great opportunities to improve their production and marketing efficiency by optimising the use of proper inputs' combinations and agricultural intensification technologies.

Keywords: Production efficiency, Marketing efficiency, Agricultural technology, DEA

JEL classification: D24, C14, Q13

1. Introduction

The agricultural sector is one of the most essential production sectors of the economy worldwide (Martinho et al., 2018), as it mainly contributes to the citizen's survival, welfare, and quality of life through agricultural food security (Stratigea, 2014). In Indonesia, the plantation has been viewed as one of the most important agricultural sub-sectors that play a vital role in the country (Fufurida et al., 2019) amidst the decline contribution of oil and gas to the national economy (Hurri et al., 2020). The agricultural sector consists of the sub-sector of food crops, horticulture, plantations, livestock, hunting and farming services, forestry and logging, and fisheries. This plantation sub-sector contributed 25.7% to the agricultural sector's Gross Domestic Product (GDP). It has been the only sub-sector with a positive trade balance during the period 2014-2018. Several plantation commodities have contributed significantly to the positive net export, while other agricultural sub-sectors recorded negative net exports (Agricultural Statistics, 2019).

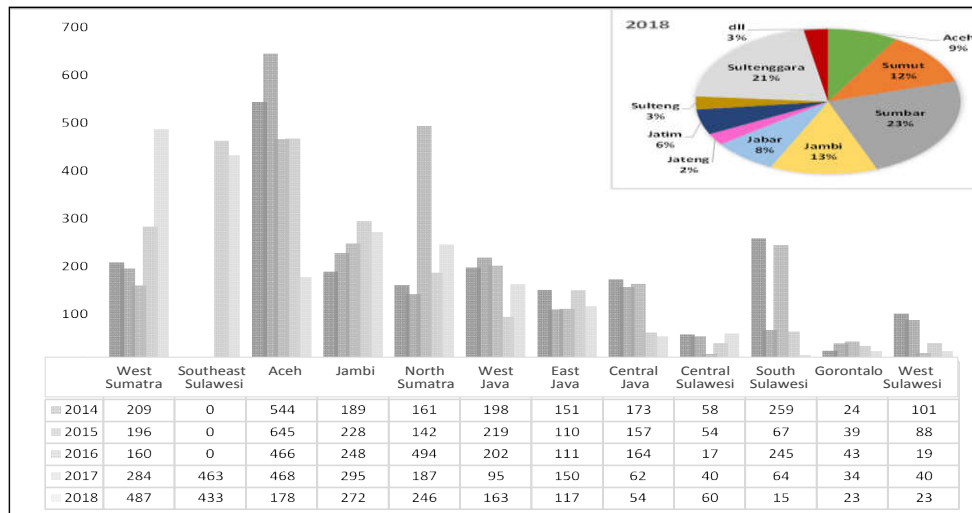
Apart from crude palm oil (Syahril et al., 2019) and cocoa beans (Mukhlis et al., 2020), patchouli is one of the plantation commodities that have contributed a high export value to the Indonesia's economy. Patchouli is the primary sources of essential oil. Patchouli oil, known in Latin as *Pogostemon Cablin Benth*, is one of the nine leading agricultural commodities in the province that has gained international market recognition due to its high quality. Patchouli from Aceh Province can produce patchouli oil with Patchouli Alcohol (PA) content above 30%. This causes the patchouli oil from Aceh Province to be highly demanded, especially as a perfume fixative. Another immense benefit of patchouli oil is for pharmaceutical purposes,

such as anti-depressants, anti-bacterial, anti-viral, anti-infective, anti-inflammatory, anti-microbial, antiseptic, disinfectant, tonic, dandruff, deodorant, dermatitis, eczema, herpes, haemorrhoids, constipation, indigestion, fatigue, infections, scars, burns, allergies, acne medication, mouth sores, and others (American College of Healthcare Science, 2012).

The international market demands patchouli oil from 1400-1600 tons per year, and this volume has been increasing about 5% annually. Meanwhile, patchouli oil supply that meets international market standards has only reached 1,000-1200 tons per year. This shows that the high potentiality of the export market for patchouli oil. As one of the largest patchouli oil-producing countries, Indonesia supplies 80% -90% of the world's demand for patchouli. Indonesia has exported patchouli oil to various countries, such as the United States, Spain, France, Switzerland, England, and other countries (Ministry of Agriculture, 2020).

Of the 34 provinces in Indonesia, four Sumatra region areas, namely Aceh, North Sumatra, West Sumatra, and Jambi, contributed 57% of Indonesia's patchouli oil in 2018. Aceh Province has been the largest patchouli producing area in Indonesia since 1921 (Puteh, 2004). In the 1980s, around 80% of Indonesia's patchouli oil supply came from Aceh Province. However, currently, Aceh Province's patchouli production has decreased significantly. Figure 1 shows that Aceh Province's patchouli production averaged only 20.98% in 2014-2018 and sharply decline to only 8.6% in 2018. This phenomenon raises an important question: why this happens? Does it relate to low-level patchouli oil in the province?

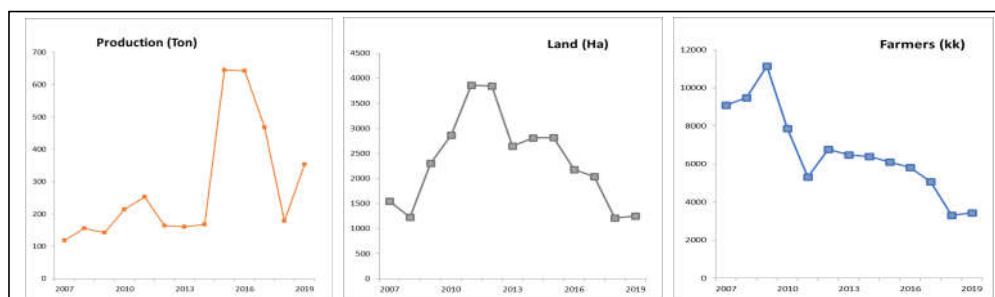
Figure 1. Patchouli oil production in Indonesia, 2015-2018 (ton)



Source: Agricultural Statistics, Ministry of Agriculture, the Republic of Indonesia (2019).

On the other hand, patchouli oil demand has been notably increased globally in the last few decades. However, the patchouli farmers from Aceh Province have been unable to capture the global patchouli oil potentiality benefits by increasing their patchouli oil production. Figure 2 illustrates that the patchouli oil production in the province has been declined over the period 2015-2017, contributed mainly by the decline in their inputs, particularly the patchouli oil land area and the number of patchouli oil farmers.

Figure 2 shows that patchouli oil production has fluctuated, as is the case of its main inputs, namely land area and farmers' number. The changes in patchouli oil production inputs have not fully and positively correlated with patchouli oil production. An increase in production had occurred when the land area and the number of farmers had decreased, and vice versa. These contradicting figures raise interesting questions for the present study to research: what determines the fluctuations in the patchouli oil production in Aceh Province, Indonesia? Do the changes in patchouli oil production relate to its inefficiency? If so, to what extent is patchouli oil production's efficiency level in Aceh Province, Indonesia?

Figure 2. Patchouli production, land, and farmers in Aceh, Indonesia, 2007-2019

Source: Plantation Statistics (2020), Aceh Plantation Office.

Studies on production efficiency have been conducted by many previous researchers using both the parametric approach (Aigner et al., 1977) and the non-parametric approach (Charnes et al., 1978). These approaches have been used to measure efficiency in various fields such as industry, banking, education and agriculture. The Stochastic Frontier Approach (SFA) is the most widely used parametric approach to measure the efficiency of Decision-Making Units (DMUs) (Battese and Coelli, 1995; Choi and Weiss, 2005; Omar et al., 2006; Kokkinou, 2010; Masunda and Chiweshe, 2015; Konstantinidis and Pelagidis, 2018; and Noviar et al., 2020). Meanwhile, the Data Envelopment Analysis (DEA) approach is the most widely used non-parametric approach to measure the efficiency of DMUs (Alexander et al., 2007; Banker and Natarajan, 2008; Bremmer et al., 2008; Furtan and Sauer, 2008; Tiemann and Schreyögg, 2008; Saad et al., 2010; Keramidou et al., 2011; Riaz et al., 2013; Lee and Worthington, 2014; Cázares and Filipescu, 2014; Masunda and Chiweshe, 2015; Barbullushi and Dhuci, 2015; Majid et al., 2017; Konstantinidis and Pelagidis, 2018; Noor et al., 2020; Pougkakioti and Tsamadias, 2020; and Abidin et al., 2021).

The DEA approach has also been used to measure the efficiency of the agricultural sector in Malaysia (Shamsudin et al., 2011), Ghana (Abatania et al., 2012), Turkey (Atici and Podinovski, 2015), Indonesia (Lawalata et al., 2015), and Portugal (Marta-Costa, 2017). Especially in Indonesia, Lawalata et al. (2015) only determine the technical efficiency of red onion farming in Bantul regency, Special Province of Yogyakarta, Indonesia. However, their study did not measure the marketing efficiency and only focused on specific districts in the Special Province of Yogyakarta, Indonesia. In his research on the patchouli farm's production efficiency, Sularso (1992) only uses the Cobb-Douglas production function model and focuses only on the patchouli farm in Banyumas Regency, Indonesia. Meanwhile, Agustiar and Sa'adan (2016) analyse the efficiency level of patchouli oil marketing institutions in a village of West Aceh Regency, Aceh Province, Indonesia using marketing indicators from the marketing aspect includes marketing margin, farmers share, and the ratio of benefit to costs. Finally, in their study, Rahmayanti et al. (2018) only measure Indonesia's patchouli oil supply chain's production costs and profit margins.

Although several previous studies have explored the efficiency of patchouli oil, however, to the best of our knowledge, none of them has measured and analysed both the patchouli oil industry's production and marketing efficiency within Indonesia's broader geographical area using the DEA approach. Thus, this study aims to fill the existing gaps, aiming at empirically measuring and analysing the levels of production and marketing efficiency of patchouli oil in Aceh Province, Indonesia, using a non-parametric approach of DEA.

DEA, initially developed by Farrel (1957), is the most popular linear programming optimisation method used to measure the technical efficiency of a DMU and compare it relatively to other DMUs. DEA enables measuring the technical efficiency of one input with one output and multi-input with multiple outputs using the relative efficiency value framework as the input ratio to output (Giuffrida and Gravelle, 2001; and Post and Spronk, 1999) could offer accurate and robust efficiency measures.

This study's results are expected to be useful for patchouli stakeholders to develop the patchouli oil industry in Indonesia by improving production marketing efficiencies. The promotion of patchouli oil would enhance the contribution of the agricultural sector to the national economic performance. Especially for patchouli farmers, this study's results are also hoped to shed some lights on designing proper business development steps to promote the

patchouli oil industry based on the conditions of the DMUs. Besides, this study's findings would enrich the existing empirical literature on production and marketing efficiencies of the patchouli oil industry from the world's largest patchouli oil producer of Indonesia.

The rest of the study is structured in the following sequences: Section 2 highlights research methods data employed in the study. Section 3 provides the results and their discussions, and finally, Section 4 concludes the study.

2. Research Methods

This study explores the production and marketing efficiencies of the patchouli oil industry in Aceh Province, Indonesia. The primary data are gathered from the patchouli oil farmers in the provinces using semi-structured questionnaires. Of the six zone areas, the patchouli farmers from 4 zones were selected as the study sample. According to the Regional Spatial Plan of Aceh Province (Aceh Qanun - Law No.19 of 2013 concerning Regional Spatial Plan of Aceh Province, 2013 - 2033), namely: (1) Gayo Lues Regency (Southeast Zone); (2) South Aceh Regency (South Zone); (3) Aceh Jaya District (West Zone); and (4) Aceh Utara District (North Zone) are the leading patchouli oil producer in the province. These four districts were chosen due to their largest patchouli oil production centres in each zone. These criteria include the amount of production, land productivity, and the number of patchouli farmers.

Of the 3,318 patchouli oil farmers in the province, this study's minimum sample size is determined based on the Slovin formula (Sekaran and Bougie, 2016) is only 98 respondents. However, to ensure its sample representativeness, this study selected 120 patchouli oil farmers as the study sample using the purposive sampling technique. The study sample of patchouli oil farmers was selected from the largest oil-producing district from the largest oil-producing zones' across Aceh Province, Indonesia. Only active patchouli farmers during the year 2019-2020 were randomly selected from each province's regency and zone. Besides, due to the population homogeneity, the determined sample size and the chosen respondents could represent the entire population of the patchouli oil industry in Aceh, Indonesia.

The Data Envelopment Analysis (DEA) method, developed initially by Farrell (1957), is used to measure and analyse production and marketing efficiency levels of the patchouli oil industry in Aceh Province. DEA is the most popular linear programming optimisation method used to measure a DMU's efficiency that can relatively compare it to other DMUs. DEA's advantages enable to measure the efficiency of the different number of inputs with various output (Giuffrida and Gravelle, 2001; Post and Spronk, 1999; Majid and Maulana, 2012; and Hasan et al., 2018) could offer more accurate and robust efficiency measures.

To measure the efficiency using the DEA approach needs input and output data. Referring to previous researches (Helfand, 2004; Koirala et al., 2014; Kuo et al., 2014; Mamondol, 2017; and Liu et al., 2020), this study uses land area, total capital, and the number of labour as input variables, and the amount of production as an output variable in measuring the efficiency of patchouli oil production in Aceh, Indonesia. Land, capital and labour are essential production factors (Solow, 1957) in the agricultural sector. Meanwhile, to measure the level of marketing efficiency of the patchouli oil industry in the province, the study uses input variables of marketing margins, farmers share, and the ratio of profit to cost of operating income as an output variable (Purcell, 1979; Kohls and Uhls, 2002; and Putri, et al., 2018).

Subsequently, the DEA estimation is estimated twice: (1) Assess the patchouli oil industry's production efficiency level with production variables (land, capital and labour). (2) Evaluate the patchouli oil industry's marketing efficiency level with marketing efficiency indicator variables (marketing margin, farmers share, and profit ratio to cost) in the Aceh Province, Indonesia. These DEA estimations are measured using both Constant Return to Scale (CRS) and Variable Return to Scale (VRS) assumptions.

2.1. CRS-DEA Model

DEA optimises the value of the function (P), which is the ratio of inputs and outputs at the same ratio limit in each DMU. The value of less than one indicates DMU is inefficient, while the value equal to one shows efficient (Charnes et al., 1978). The linear problem for a DMU is measured as follows:

$$\begin{aligned}
 \text{Max } P &= \left(\frac{u'yi}{v'xi} \right) \\
 &u, v \\
 \text{st } \left(\frac{u'yi}{v'xi} \right) &\leq 1 \text{ st} \\
 u, v &\geq 0 \quad i = 1, 2, \dots, N
 \end{aligned} \tag{1}$$

where $u'yi/v'xi$ is the value of the function (P), u is an $M \times 1$ vector of output weights, and v is a $K \times 1$ vector of input weights. The objective is to find the value of u and v to maximise the i th firm's efficiency value with the constraint that all efficiency values must be less than or equal to one. Formulation of this ratio ensures that $0 < \text{Max } P < 1$: the unit will be efficient if and only if this ratio is equal to one if it is not considered relatively inefficient. The model ratio formulation has an infinite number of solutions (if u and v are solutions, then α_u and α_v are solutions), so to avoid this problem, it is necessary to impose the following constraint:

$$\begin{aligned}
 v'xi &= 1 \quad \text{Maximization then becomes:} \\
 \text{max}(u'yi) \\
 &\mu, v \\
 \text{st}(v'xi) &= 1 \\
 u'yi - v'xj &\leq 1, j = 1, 2, \dots, N \quad \mu, v \geq 0
 \end{aligned} \tag{2}$$

Transforming u and v to μ and v by identifying the multiplier of the linear DEA programming. Envelopes are obtained using duality in linear programming to determine a linear combination of referents for each firm to minimise the following:

$$\begin{aligned}
 \text{TE crs} &= \min \theta \\
 &\theta, \lambda \\
 \text{st } -yi + Y\lambda &\geq 0 \\
 \theta xi - X\lambda &\geq 0 \\
 \lambda &\geq 0
 \end{aligned} \tag{3}$$

where θ is a scale that represents the minimum level; the input usage can be reduced without changing the output level. Scale θ provides general technical efficiency values for the i th company. The solution to this linear problem the analysed firms must have the same output and use only a portion of the various inputs. θ can meet conditions less than or equal to 1: if equal to one, the firm is considered technically efficient (the point at the frontier) (Farrell, 1957).

2.2. VRS-DEA Model

The measurement of the VRS-DEA method distinguishes between pure technical efficiency and scale efficiency. It also enables to identify whether it is found that the yield scale is increasing, constant or decreasing. Thus, the linear CRS assumption should be changed by adding a further convexity constraint, $N1'\lambda = 1$. The VRS-DEA with input orientation could be written as follows:

$$\begin{aligned}
 \text{TE vrs } \theta, \lambda &= \min \theta \\
 \text{st } -yi + Y\lambda &\geq 0 \\
 \theta xi - X\lambda &\geq 0 \\
 N1'\lambda &= 1 \quad \lambda \geq 0
 \end{aligned} \tag{4}$$

where $N1$ is an $N \times 1$ vector from one, and i is the input technical efficiency value under VRS that has a value of $0 \leq \theta \leq 1$. If the value of θ equal to one, the firm is in the frontier, whereas λ is a $N \times 1$ vector weights defining the firm's linear combination of firms. The VRS-DEA model is more flexible than the CRS-DEA model. Thus, the VRS technical efficiency

value is equal to or greater than the CRS technical efficiency value. These values can be used to measure the Scale Efficiency (SE) of a business:

$$SE = \frac{TE_{crs}}{TE_{vrs}} \quad (5)$$

where *SE* is the scale efficiency, *TE_{crs}* is the technical efficiency based on the constant return to scale measurement, and *TE_{vrs}* is the technical efficiency based on the variable return to scale measurement. *SE* = 1 shows scale efficiency, or *SE* < 1 shows scale inefficiency caused by increasing returns to scale or decreasing returns to scale. To determine whether a company is operating under Increasing Return to Scale (IRS) or Decreasing Return to Scale (DRS), the additional DEA equation of Non-Increasing Return to Scale (NIRS) is used. The previous VRS-DEA model was re-estimated by changing the restrictions from $NI' \lambda = 1$ to $NI' \lambda \leq 1$, distinguishing between the different scales in the production structure.

This study classifies the efficiency levels into five categories: optimal (full efficient), high efficient, moderately efficient, low efficient and very low (Table 1). A 100% efficiency level (*EFF* = 1) is considered optimal or fully efficient, while other efficiency values are categorised into different grouping levels, as illustrated in Table 1.

Table 1. Efficiency level category

Efficiency level	Category
0% < <i>EFF</i> < 25%	I: Very low
25% ≤ <i>EFF</i> < 50%	II: Low
50% ≤ <i>EFF</i> < 75%	III. Moderate
75% ≤ <i>EFF</i> < 100%	IV. High
<i>EFF</i> = 100%	V. Very high (Optimal)*

Note: * shows fully efficient

3. Results and Discussion

3.1. Descriptive of Patchouli Oil Farmers in Aceh, Indonesia

The study found that the average age of patchouli farmers was 39 years old, with the oldest being 80 years old and the youngest 20 years old. The most dominant generation of farmers was in the range of 20 - 40 years old (53.3%), followed by the age of 40 - 60 years old (41.7%), and the age of 60 - 80 years old (5%). Besides, the average patchouli oil farmers have 14 years of experience, with at least one year of experience and a maximum of 42 years of experience. There were 31.7% farmers with 1-5 years of farming experience; 19.2% experienced 5-10 years; 23.3% experienced 10-20 years; 17.5% experienced 20-30 years, and 8.3% have over 30 years of experience. The study also recorded that most of those with more than ten years of experience had not continuously cultivated patchouli oil farms. Sometimes, they stop farming when the demand for patchouli oil is accompanied by a low price (far from farmers' expectations) and return to cultivate patchouli farms when the price rises. Meanwhile, the average number of the patchouli oil farmers' dependents is 4, from 1–10 dependents. The most significant number of dependents of farmers was in the range of 4 - 6 people (50.8%), followed by 1-3 dependents (42.5%) and 7-10 dependents (6.7%).

The study also recorded the average size of land area used by the patchouli oil farmer annually was 0.8 Ha. Meanwhile, the farmer, on average spent IDR15,4 million for capital, involved two workers per farm annually and produced 89.4 Kg patchouli oil annually. The patchouli farmers get an average business income of IDR40.8 million and an average business profit of IDR25 million per season from the average price of patchouli oil of IDR469,000 received by farmers. Meanwhile, patchouli oil price at the exporter level reached IDR949,000 per kg. From this price difference, the farmers earned an average marketing margin of IDR480,000 with the farmers' share of 49.5%. Meanwhile, from the average income received by farmers, the ratio of profit to the average cost was 2 point.

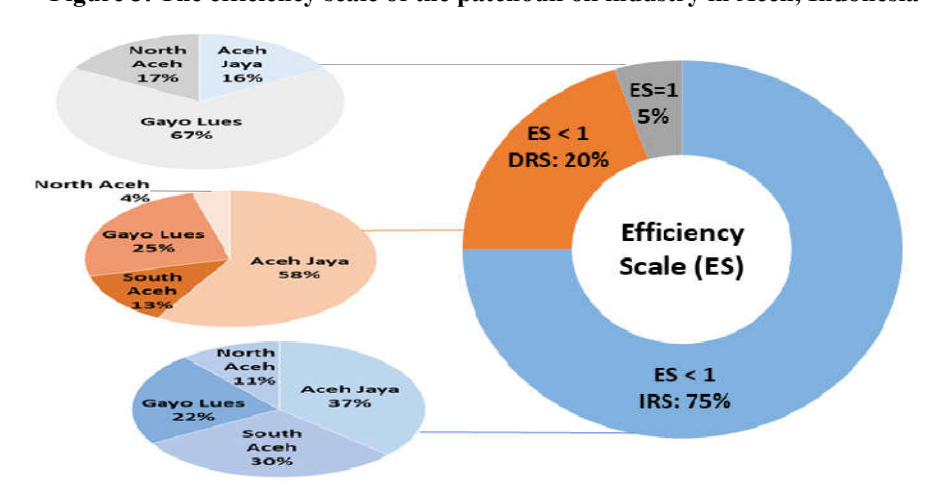
3.2. Production Efficiency Level

Table 2 (in the Appendix) reports the relative production efficiency level of the patchouli oil industry in Aceh Province, Indonesia, based on CRS-DEA and VRS-DEA models. The study found that patchouli oil production's relative efficiency level varied from 0.38 to 1 (38% - 100%). On average, based on the CRS-DEA and VRS-DEA models, the patchouli oil production efficiency are at the levels of 71% and 85%, respectively. Only 5.83% of the DMUs had the optimal efficiency level ($EFF = 1$) based on the CRS-DEA model. This shows that there were 94.17% of DMUs have experienced technical inefficiency. Meanwhile, based on the VRS-DEA approach, only 52.5% of the DMUs have experienced technical efficiency below the optimal level. These findings show that using a VRS assumption, almost half of the patchouli oil farmers in the province had run their businesses in a fully efficient.

Furthermore, Figure 3 portrays that 49.17% of the patchouli oil farmers recorded the efficiency level of 0.5 - 0.75 (50% - 75%) using the CRS-DEA model. 13.33% of them experienced a lower level of efficiency between 25% - 50%, while 31.67% of them recorded a higher level of an efficiency greater than 75% but lower than 100% ($75\% \leq EFF < 100\%$). On the other hand, using the VRS-DEA model, 47.5% of the patchouli oil farmers enjoyed the optimal efficiency level, while 2.5% experienced an efficiency level of 25% - 50%. When viewed from the geographical area, patchouli oil farmers in Gayo Lues District recorded a higher average efficiency level than other districts with a value of 0.84 (CRS-DEA) and 0.99 (VRS-DEA). On the other hand, the patchouli oil farmers in Aceh Jaya District have recorded average efficiency levels of 0.73 (CSR-DEA) and 0.82 (VRS-DEA), respectively. The patchouli oil farmers in North Aceh District have experienced average efficiency levels of 0.68 (CSR-DEA) and 0.85 (VRS-DEA), respectively. Finally, the patchouli oil farmers in South Aceh District have only enjoyed average efficiency levels of 0.58 (CSR-DEA) and 0.77 (VRS-DEA), respectively.

From an efficiency scale perspective, the findings show that 75% of the additional inputs contributed to increased production at the increasing rate greater than the increase in additional inputs (Increasing Return to Scale - IRS). Meanwhile, the addition of input impacted increasing output with a smaller percentage increase than the additional inputs (Decreasing Return to Scale - DRS) by 20%. In detail, the conditions of IRS (75%) in the four research zones, namely: Aceh Jaya District: 36.67% (27.5%); South Aceh District: 30% (22.5%); Gayo Lues District: 22.22% (16.67%); and North Aceh District 11.11% (8.33%). Meanwhile, in DRS conditions (20%), it comprises Aceh Jaya District: 58.33% (11.67%); South Aceh District: 12.5% (2.5%); Gayo Lues District: 25% (5%); and North Aceh District 4.17% (0.83%).

Figure 3. The efficiency scale of the patchouli oil industry in Aceh, Indonesia



Source: Primary data analysed (2020).

The relatively low production efficiency level of patchouli oil can be viewed from the average ability of the land area of 0.8 Ha only to produce patchouli oil of 89.4 Kg per season. This evidence shows that the level of land productivity is only 127.2 kg of patchouli oil per ha per season (Table 3). Meanwhile, the average potential output using superior patchouli

varieties, such as Tapak Tuan, Lhokseumawe, and Sidikalang varieties, could produce 350 kg per ha (Center for Plantation Research and Development, 2007). Our findings show that, on average, the actual production rate of patchouli oil in the province was only between 30% - 40%.

Table 3. Production gap of patchouli oil farmers in Aceh, Indonesia

Productivity (Kg/Ha)	Number of DMUs (%)	Mean Productivity of DMUs (Kg/Ha)	Mean of Actual Output/ Output Potential (%)
Productivity \leq 100	41.7	82.1	23.4
100 <Productivity \leq 200	55.8	156.2	44.6
200 <Productivity \leq 300	2.5	233.3	66.7
Overall DMUs	100	127.2	36.4

Source: Primary data analysed (2020).

As observed from Table 3, the average DMU only has an actual production capacity of 36% compared to its potential output. There were 41.7% of DMUs with a productivity level that reached 100 Kg/Ha. At this level, the DMUs' average productivity was only 82.1 Kg/Ha, with an average comparison of actual output to potential output of 23.4%. Besides, the number of DMUs with productivity levels above 100 to 200 Kg/Ha was 55.8%, with an average DMUs' productivity of 156.2 Kg/Ha and an average comparison of actual output to potential output of 44.6%. Meanwhile, the number of DMUs with productivity levels above 200 to 300 Kg/Ha was only 2.5%, with an average DMUs' productivity of 233.3 Kg/Ha and an average comparison of actual output to potential output 66.7%. Although the relative production efficiency of DMU shows the average at a moderate level (CRS-DEA) and high level (VRS-DEA), however, their average DMU's productivity level was still low (<50% compared to potential output). The low level of productivity caused the patchouli become less competitive (Dovgal et al., 2017) and threatened its sustainability (Vlachos and Malindretos, 2008; Marta-Costa et al., 2012; and Marta-Costa, 2017) in the global market. These findings are in line with the majority of the previous studies on agricultural commodities worldwide. For example, previous studies documented a low level of efficiency of the farming sector in Malaysia (Shamsudin et al., 2011), Ghana (Abatania et al., 2012), Turkey (Atici and Podinovski, 2015), and Indonesia (Sularso, 1992; and Lawalata et al., 2015).

The low level of production of the patchouli oil industry documented in our study is mainly due to improper combination of patchouli inputs by the DMUs, which is shown by 75% of the DMUs, were in a condition of IRS. In addition, a low production level is recorded due to their traditional production process. Thus, it is extremely important for the modernization of patchouli industry in the region (Papadopoulou et al., 2012). In this study, the production efficiency level measurements only used three inputs, namely land, capital, and labour, and did not include technology. Thus, the findings' study did not indicate the use of technology in the patchouli oil cultivation and production process. In terms of capital, it is also only for the provision of patchouli cuttings with a direct planting pattern on the land instead of the cuttings for obtaining superior patchouli seeds and labour costs for the land clearing, planting and harvesting processes. Most of the planting and harvesting costs are also not taken into account because they are done directly by farmers and family members.

3.3. Marketing efficiency level

This section reports the findings of patchouli oil farms' marketing efficiency level in Aceh Province, Indonesia, using the CRS-DEA and VRS-DEA methods. As illustrated in Table 4 (in the Appendix), only 2.5% of the DMUs have an optimal efficiency level based on the CRS assumption and 3.33% based on the VRS assumption, respectively. This finding shows that only a few patchouli farmers can market the agricultural patchouli commodities fully efficient. The traditional ways of cultivating and planting patchouli are believed to be the main contributors to marketing inefficiency. In addition, the limited technological supports to process the patchouli oil have resulted in a relatively higher cost of production. Thus, the patchouli farmers must adopt advanced agricultural technologies in producing and marketing patchouli oil commodities.

The mean score of marketing efficiency between the CRS-DEA and the VRS-DEA, as illustrated in Table 4, has almost similar mean value (CRS = 0.3381 and VRS = 0.3382); thus,

this shows the efficiency scale is equal to one. The scale efficiency score is measured by comparing the value of the CRS-DEA's efficiency and the VRS-DEA's efficiency. This finding shows an impossibility of further increasing efficiency scale because only 1.67% of DMUs were in a condition of increasing return to scale. Using marketing indicators as input variables for measuring marketing efficiency in both models might contribute to a scale efficiency score equal to one. In contrast, the production inputs used for measuring production efficiency causes the CRS-scale efficiency and VRS-scale efficiency to be dissimilar (Table 2 in the Appendix).

Furthermore, the study found 89.17% of DMUs recorded a relative high marketing inefficiency level of below 50%. Meanwhile, 6.67% of DMUs have enjoyed a higher level of marketing efficiency within the range of 50% to 75% (in both models). Only 1.66% (CRS-DEA) and 0.83% (VRS-DEA) of the DMUs have experienced an efficiency level above 75% and below 100% ($0.75 < \text{EFF} < 1.00$). Overall, the average level of marketing efficiency in both models was 33.8%. The low level of marketing efficiency is mainly due to the relatively low price of patchouli oil at the farmer level, far below their expectations. This fact can be viewed from the farmers' share, which was below 50%. Our findings of the low level of marketing efficiency of the patchouli oil industry in Aceh, Indonesia, are in harmony with previous studies investigating the marketing efficiency of watermelon farms in Nigeria (Onyemauwa, 2010) and the potato market in Uganda (Kyomugisha et al., 2018).

These findings imply that the development of the patchouli oil industry in Aceh Province has a huge opportunity to improve its marketing efficiency level. These farmers have a chance to improve their marketing efficiency level by 72.2%. This massive opportunity for improving marketing efficiency could be done by optimising the combination of appropriate inputs, adopting advanced agricultural-related technologies, and intensifying the planting seasons of patchouli. Efforts are needed to ensure patchouli oil price stability at the farmers' level to ensure their survival and improve their welfare.

Finally, the supply and marketing chains should be controlled and regulated to avoid unnecessary additional costs of patchouli production and marketing activities. The supply chain of patchouli oil has been the major problem in Indonesia (Rahmayanti et al., 2018), thus needs to be regulated. Marketing the patchouli oil through middlemen (patchouli agents) should also be monitored for them did not monopolise the market and control over price. The patchouli farmers deserve to enjoy more profit margin rather than their agents. Thus, the relevant government authorities, such as the Ministry of Agriculture and the Patchouli Oil Association, should design strategic policies for the patchouli farmers' maximum benefits.

4. Conclusion

The study empirically measured and analysed the patchouli oil industry's production and marketing efficiency in Aceh, Indonesia, using the Data Envelopment Analysis (DEA) approach. The study found that, on the production side, the average efficiency level of the patchouli oil industry in the province was relatively low based on both Constant Return to Scale (CRS) and Variable Return to Scale (VRS) assumptions. Very few patchouli farmers have recorded their production efficiency at the optimal level.

On the marketing side, the low marketing efficiency for the patchouli oil industry is also recorded. The majority of patchouli farmers recorded low marketing efficiency level, and very few of the farmers had experienced an optimal or entirely marketing efficiency. These findings showed that the patchouli farmers have an excellent opportunity to improve their production and marketing efficiency by properly mixes the inputs to produce maximum outputs and controls supply and marketing chains by being monopolised by middlemen (patchouli agents).

The low level of patchouli farmers' efficiency level in Aceh Province, Indonesia, is mainly due to traditional planting patchouli on-farm side. Thus, it is an urgent need for the government to design strategies to fully support the development of the patchouli industry by carrying out targeted and precise budgeting programs to adopt advanced technology in the patchouli agro-industry. Optimal technological intervention is expected to increase efficiency as well as productivity. Increasing efficiency is the initial stages of expanding the income of

patchouli farmers. This encourages farmers to always stay in patchouli farms and ensures patchouli oil production sustainability as a potential exporting commodity.

The low level of efficiency on the marketing side indicates the low price level and profit margin received by patchouli farmers. At the same time, most of the patchouli agents' reaped the benefits from monopolising the patchouli oil commodity. Price stability at the farmer level is very crucial in determining marketing efficiency. Therefore, the government needs to act as a price stabiliser by regulating the market favouring the interests of patchouli farmers, such as by setting a minimum selling price policy to create a fair trading system that supports the patchouli's sustainability agro-industry.

Future studies on the efficiency of the patchouli oil industry in Indonesia could cover a broader area across the 34 provinces nationwide to provide a comprehensive picture of the existing efficiency condition. Examining the patchouli oil efficiency determinants could offer better references for policy-makers to design a complete strategic policy to promote patchouli oil as a primary Indonesia's export commodity to strengthen the national economy. Finally, measuring efficiency level using a combination of parametric and non-parametric approaches could also enrich existing empirical evidence on the patchouli oil industry's efficiency.

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Appendices

Table 2. The production efficiency level of patchouli oil based on DEA-CRS and -VRS models

DMU	Efficiency Level		Category		Efficiency Scale	DMU	Efficiency Level		Category		Efficiency Scale	DMU	Efficiency Level		Category		Efficiency Scale
	CRS	VRS	CRS	VRS			CRS	VRS	CRS	VRS			CRS	VRS	CRS	VRS	
1	0.704	0.708	III	III	IRS	41	0.395	0.426	II	II	IRS	81	0.481	0.679	II	III	DRS
2	0.579	0.633	III	III	IRS	42	0.483	0.500	II	III	IRS	82	0.478	0.491	II	II	IRS
3	0.955	0.978	IV	IV	IRS	43	0.616	0.681	III	III	IRS	83	0.692	1.000	III	V	IRS
4	0.396	0.500	II	III	IRS	44	0.616	0.681	III	III	IRS	84	0.421	0.500	II	III	IRS
5	0.560	0.633	III	III	IRS	45	0.559	0.531	III	III	IRS	85	0.692	1.000	III	V	IRS
6	0.744	0.754	III	IV	DRS	46	0.717	0.728	III	III	DRS	86	0.384	1.000	II	V	IRS
7	0.462	1.000	II	V	IRS	47	0.448	1.000	II	V	IRS	87	0.507	0.643	III	III	DRS
8	0.462	1.000	II	V	IRS	48	0.395	1.000	II	V	IRS	88	0.519	0.664	III	III	DRS
9	0.556	0.636	III	III	IRS	49	0.880	0.908	IV	IV	IRS	89	0.490	0.528	II	III	IRS
10	0.880	0.908	IV	IV	IRS	50	0.825	0.900	IV	IV	IRS	90	0.573	0.571	III	III	IRS
11	0.880	0.908	IV	IV	IRS	51	0.658	1.000	III	V	IRS	91	0.698	1.000	III	V	IRS
12	0.658	1.000	III	V	IRS	52	0.658	0.684	III	III	IRS	92	0.615	1.000	III	V	IRS
13	0.880	0.908	IV	IV	IRS	53	0.958	1.000	IV	V	DRS	93	0.938	1.000	IV	V	IRS
14	0.880	0.908	IV	IV	IRS	54	1.000	1.000	V	V	ES1	94	0.807	1.000	IV	V	IRS
15	0.660	0.718	III	III	IRS	55	0.526	1.000	III	V	IRS	95	0.908	1.000	IV	V	IRS
16	0.789	0.800	IV	IV	IRS	56	0.474	1.000	II	V	IRS	96	0.698	1.000	III	V	IRS
17	1.000	1.000	V	V	ES1	57	0.672	1.000	III	V	IRS	97	0.908	1.000	IV	V	IRS
18	0.817	0.912	IV	IV	IRS	58	0.933	0.957	IV	IV	IRS	98	0.786	1.000	IV	V	IRS
19	0.880	0.908	IV	IV	IRS	59	0.933	0.957	IV	IV	IRS	99	0.738	0.962	III	IV	DRS
20	0.663	0.684	III	III	DRS	60	0.896	1.000	IV	V	IRS	100	0.938	1.000	IV	V	IRS
21	0.625	0.669	III	III	DRS	61	0.585	0.593	III	III	IRS	101	0.738	0.943	III	IV	DRS
22	0.521	0.528	III	III	DRS	62	0.846	1.000	IV	V	IRS	102	0.990	1.000	IV	V	IRS
23	0.648	0.719	III	III	IRS	63	0.443	0.444	II	II	IRS	103	1.000	1.000	V	V	ES1
24	0.719	0.713	III	III	DRS	64	0.666	0.660	III	III	IRS	104	0.975	1.000	IV	V	DRS
25	0.658	1.000	III	V	IRS	65	0.662	1.000	III	V	IRS	105	0.978	1.000	IV	V	DRS
26	1.000	0.896	V	IV	IRS	66	0.692	1.000	III	V	IRS	106	0.692	1.000	III	V	IRS
27	0.987	0.924	IV	IV	IRS	67	0.556	0.554	III	III	IRS	107	0.917	1.000	IV	V	IRS
28	0.789	0.681	IV	III	IRS	68	0.738	1.000	III	V	IRS	108	0.677	1.000	III	V	IRS
29	0.719	0.713	III	III	DRS	69	0.769	1.000	IV	V	IRS	109	0.738	0.943	III	IV	DRS
30	0.599	0.607	III	III	DRS	70	0.565	0.561	III	III	IRS	110	0.917	1.000	IV	V	IRS
31	0.729	0.810	III	IV	DRS	71	0.572	0.643	III	III	IRS	111	0.615	1.000	III	V	IRS
32	0.729	0.810	III	IV	DRS	72	0.385	1.000	II	V	IRS	112	1.000	1.000	V	V	ES1
33	0.719	1.000	III	V	IRS	73	0.538	1.000	III	V	IRS	113	0.990	1.000	IV	V	IRS
34	0.719	1.000	III	V	IRS	74	0.504	0.537	III	III	IRS	114	0.769	1.000	IV	V	IRS
35	0.987	1.000	IV	V	IRS	75	0.518	0.525	III	III	IRS	115	0.615	1.000	III	V	IRS
36	0.755	0.845	IV	IV	DRS	76	0.455	0.517	II	III	IRS	116	0.738	1.000	III	V	IRS
37	0.722	0.843	III	IV	DRS	77	0.821	0.830	IV	IV	IRS	117	0.957	1.000	IV	V	DRS
38	0.729	0.810	III	IV	DRS	78	0.554	1.000	III	V	IRS	118	1.000	1.000	V	V	ES1
39	0.755	0.845	IV	IV	DRS	79	0.846	1.000	IV	V	IRS	119	1.000	1.000	V	V	ES1
40	0.715	0.798	III	IV	IRS	80	0.538	1.000	III	V	IRS	120	0.769	1.000	IV	V	IRS
Mean													0.712	0.853	III	IV	IRS

Source: Primary data analysed (2020).

Note: I, II, III, IV, and V show efficiency categories: very low, low, moderate, high, and optimal (see Table 1). CRS = Constant Return to Scale; VRS = Variable Return to Scale; ES1 = Efficiency Scale=1; IRS = Increasing Return to Scale; DRS = Decreasing Return to Scale.

Table 4. The marketing efficiency level of the patchouli oil industry in Aceh, Indonesia

DMU	Efficiency Level		Category		DMU	Efficiency Level		Category		DMU	Efficiency Level		Category	
	CRS	VRS	CRS	VRS		CRS	VRS	CRS	VRS		CRS	VRS	CRS	VRS
1	0.353	0.353	II	II	41	0.596	0.596	III	III	81	0.578	0.578	III	III
2	0.228	0.228	I	I	42	0.712	0.712	III	III	82	0.314	0.314	II	II
3	0.436	0.436	II	II	43	0.321	0.321	II	II	83	0.184	0.184	I	I
4	0.148	0.148	I	I	44	0.370	0.370	II	II	84	0.263	0.263	II	II
5	0.214	0.214	I	I	45	1.000	1.000	V	V	85	0.181	0.181	I	I
6	0.364	0.364	II	II	46	0.636	0.636	III	III	86	0.093	0.093	I	I
7	0.099	0.099	I	I	47	0.129	0.129	I	I	87	0.474	0.474	II	II
8	0.143	0.143	I	I	48	0.100	0.100	I	I	88	0.483	0.483	II	II
9	0.185	0.185	I	I	49	0.332	0.332	II	II	89	0.270	0.270	II	II
10	0.271	0.271	II	II	50	0.238	0.238	I	I	90	0.374	0.374	II	II
11	0.271	0.271	II	II	51	0.162	0.162	I	I	91	0.169	0.169	I	I
12	0.149	0.149	I	I	52	0.323	0.323	II	II	92	0.173	0.173	I	I
13	0.271	0.271	II	II	53	0.305	0.305	II	II	93	0.385	0.385	II	II
14	0.271	0.271	II	II	54	0.476	0.476	II	II	94	0.168	0.168	I	I
15	0.221	0.221	II	I	55	0.131	0.131	I	II	95	0.189	0.189	I	I
16	1.000	1.000	V	V	56	0.119	0.119	I	I	96	0.169	0.169	I	I
17	1.000	1.000	V	V	57	0.145	0.145	I	I	97	0.189	0.189	I	I
18	0.180	0.180	I	I	58	0.476	0.476	II	II	98	0.189	0.189	I	I
19	0.317	0.317	II	II	59	0.476	0.476	II	II	99	0.517	0.517	III	III
20	0.581	0.581	III	II	60	0.190	0.190	I	I	100	0.470	0.470	II	II
21	0.400	0.400	II	II	61	0.365	0.365	II	II	101	0.514	0.514	III	III
22	0.559	0.559	II	II	62	0.211	0.211	I	I	102	0.497	0.497	II	II
23	0.302	0.302	II	II	63	0.322	0.322	II	II	103	0.470	0.470	II	II
24	0.372	0.372	II	II	64	0.416	0.416	II	II	104	0.444	0.444	II	II
25	0.149	0.149	I	I	65	0.170	0.170	I	I	105	0.470	0.470	II	II
26	0.197	0.197	I	I	66	0.171	0.171	I	I	106	0.235	0.235	I	I
27	0.467	0.467	II	II	67	0.365	0.365	II	II	107	0.471	0.471	II	II
28	0.391	0.391	II	II	68	0.198	0.198	I	I	108	0.236	0.236	I	I
29	0.374	0.374	II	II	69	0.188	0.188	I	I	109	0.477	0.477	II	II
30	0.324	0.324	II	II	70	0.388	0.388	II	II	110	0.424	0.424	II	II
31	0.457	0.457	II	II	71	0.238	0.238	I	I	111	0.198	0.198	I	I
32	0.464	0.464	II	II	72	0.105	0.105	I	I	112	0.378	0.378	II	II
33	0.186	0.186	I	I	73	0.142	0.142	I	I	113	0.457	0.457	II	II
34	0.196	0.196	I	I	74	0.315	0.315	II	II	114	0.216	0.216	I	I
35	0.994	1.000	IV	V	75	0.343	0.343	II	II	115	0.174	0.174	I	I
36	0.479	0.479	II	II	76	0.255	0.255	II	II	116	0.208	0.208	I	I
37	0.864	0.864	IV	IV	77	0.371	0.381	II	II	117	0.460	0.460	II	II
38	0.464	0.464	II	II	78	0.145	0.145	I	I	118	0.459	0.459	II	II
39	0.479	0.479	II	II	79	0.216	0.216	I	I	119	0.311	0.311	II	II
40	0.284	0.284	II	II	80	0.142	0.142	I	I	120	0.240	0.240	I	I
Mean											0.338	0.338	II	II

Source: Primary data analysed (2020).

Note: I, II, III, IV, and V show efficiency categories: very low, low, moderate, high, and optimal (see Table 1). CRS = Constant Return to Scale; VRS = Variable Return to Scale; ES1 = Efficiency Scale=1; IRS = Increasing Return to Scale; DRS = Decreasing Return to Scale.

DIVERSIFICATION OF STRUCTURAL AND CRISIS RISKS IN THE ENERGY SECTOR OF THE ASEAN MEMBER COUNTRIES

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Abstract

The study aims to assess the alternatives to the diversification of energy carriers in the ASEAN member countries in the context of minimizing the risks associated with the creation of an energy portfolio. To determine the level of diversification of energy carriers, the indicator of the diversification of the energy carriers of the country based on the Shannon-Wiener index is used. In order to identify possible changes in the energy market of the ASEAN member countries, three scenarios are proposed based on an increase in the share of renewable energy sources. The analysis of the energy production in the ASEAN member countries showed that Indonesia is the leader in the production of energy from traditional energy sources and Thailand has the most developed energy production from renewable energy sources. According to the two developed scenarios for increasing the share of renewable energy sources, there is an increase in the level of diversification of the energy sector in all countries considered. The assessment of possible deviations from the expected results according to the described scenarios for an increase in the share of renewable energy sources made it possible to single out countries affected by positive and negative deviations.

Keywords: renewable energy sources, risk minimization, energy efficiency, power supply, scenario.

JEL classification: F2, F4, O2

1. Introduction

Economic growth and social development do not reduce the importance of energy industry. The interdependence between the economic growth and the energy industry is the circle along which the world economy moves and societies function. Therefore, a reliable energy supply is a major challenge for both individual countries and unions (Uste and Aydin 2020). Southeast Asia is a very diverse and dynamic region that is characterized by one common feature - policymakers are intensifying their efforts to ensure a safer, more affordable and more sustainable development of the energy sector (Amheka and Higano 2015; Thanh and Nguyen 2020). These include measures to effectively attract investment in fuel, energy supply and infrastructure. In this context, the energy sector of the region has enormous potential for improving the well-being and quality of life of the population. However, there are also some warning features. The growing demand for fuel, especially oil, outpaces the production rate in the region. The Association of Southeast Asian Nations (ASEAN) is on the verge of becoming a net importer of fossil fuels for the first time. The demand for fuel is outstripping regional production; this shows that Southeast Asia is becoming a large net importer of fossil fuels - mostly oil - with an annual energy trade deficit that is expected to reach more than \$ 300 billion in the current political realities. In addition to high costs, there are energy security concerns as the region becomes increasingly vulnerable to fluctuations in global energy markets and unpredictable geopolitical events (Hajiyev 2019; International Energy Agency 2020a).

A profound structural change is also taking place; thus, the energy sector is moving away from rigid long-term contracts and prices dependent on oil towards a system which reflects the fundamentals of real-time energy supply through prices and, in particular, which reacts to short-term market signals (Khusaini, Wahyudi and Utama 2018). Every crisis brings a reassessment of the structures that the energy industry puts in place to ensure stability - long-term contracts with minimum purchase obligations - and complex pricing structures to smooth volatility, etc. A sharp imbalance between supply and demand accompanied by the volatility in the oil market has accelerated the dynamics and caused structural changes. Therefore, the study is aimed at determining the effective diversification of the risks of a structural crisis in the energy market of the ASEAN member countries due to the fact that they are important global energy market participants.

2. Literature review

The Association of Southeast Asian Nations has untapped potential to expand the use of renewable energy sources as there are more than 100 million people living in the region that do not have access to electricity (Mamat, Sani, and Sudhakar 2019a). The region also continues to develop its energy infrastructure and creates energy roadmaps for the coming years (Mamat et al. 2019b). Regional cooperation can contribute to energy security; but there are also many challenges in this diverse region that is characterized by different geographic conditions, energy demand, and resource availability. The most recent event of the Association of Southeast Asian Nations (ASEAN) aimed at the extension of cooperation in the energy and infrastructure sectors has been its inclusion in the regional agenda to ensure communication opportunities. It is based on previous transnational energy projects and seeks to build transnational infrastructure, including the ASEAN gas pipeline network and the regional power grid (Doshi 2020; Shi, Yao, and Jiang 2019). The ASEAN Master Plan addresses the extent to which a communications approach has the potential to address the energy challenges in the region. Generally, it is an assessment of the impact of regional integration on the solution of energy problems (Abeyasinghe, Tan, and Nguyen 2019; Papadaki 2012). The ASEAN faces several challenges: diverging needs and priorities of the member countries, dependence on external funding, competing connectivity programs, and the social (Ryazantsev et al. 2018) and environmental impact of energy production and consumption (Fünfgeld 2019a). This partnership has provoked a decrease in the role of SOEs and raised a number of difficult issues regarding the convergence of the roles of SOEs and public-private partnerships in the sector (Wisuttisak and Rahim 2018).

According to the estimates of the relationship between the energy sector, finance and economic growth in the ASEAN member countries based on the assessment of the autoregressive distributed lag (ARDL), the impact of the structural gap due to the financial crisis is identified. This confirms that the gap does not affect the long-term relationship between the energy sector, finance and economic growth (Mahi et al. 2020; Mazis and Sotiropoulos 2016).

The average annual growth rate of the ASEAN GDP is 5.1%. Coal production and consumption continue to increase despite the global downward trend. The same thing goes for all other sources of energy except oil. To identify risk diversification options based on the SWOT analysis, four strategies have been developed to overcome the structural crisis of the ASEAN energy market: modernization of traditional resource extraction, tough mandatory regional policy, substitution of fossil fuels for renewable resources, resource optimization, and mutual integration (Andreev, Lomakina, and Aleksandrova 2020; Borodin et al. 2019). The GDP per capita and energy prices have a significantly negative impact on the energy intensity of the ASEAN member countries and, on the contrary, energy consumption per capita has a significantly positive effect on energy intensity (Hurri et al. 2019; Ridzuan et al. 2020). The indicators, such as trade openness and foreign direct investment, do not significantly affect energy intensity (Fitriyanto and Iskandar 2019; Rahmi 2020). There is a bi-directional causal relationship between the oil price and the exchange rate in the ASEAN member countries. At the same time, there is a unidirectional causation - between the oil price and the exchange rate (Bui 2020; Kisswani, Harraf, and Kisswani 2019).

The most recent event aimed at regional integration within the ASEAN region, which also includes the extension of cooperation in the energy sector, is MPAC. The paper addresses the

issue of whether and to what extent the ASEAN approach to connectivity has the potential to address the energy challenges in the region. In MPAC, the development of cross-border energy infrastructure generally falls under the terms of “physical connectivity” and “sustainable infrastructure”. Two flagship programs that are widely cited in MPAC, as well as in other documents related to energy policy, are the ASEAN Power Grid (APg) and the Trans-Asia Gas Pipeline (TAGP) (Fünfgeld 2019b; Low 2020).

The ASEAN has set a goal to increase the share of renewable energy sources in its energy portfolio to about 23% by 2025. Renewable energy, especially volatile and variable energy sources, poses challenges to grid operators due to the uncertainties over the timing and quantity of electricity supplies (Huang, Kittner, and Kammen 2019; Masbar, Majid and Syahnur 2019). Thus, there are uncertainties and risks of a structural crisis in the energy market, as well as the need to diagnose the efficiency of the distribution of energy sources in the energy sector of both the member countries and the region as a whole. The research aims to eliminate this gap by making an adequate assessment of the ASEAN energy industry. Thus, the purpose of the study is to assess the alternatives to the diversification of energy carriers in the ASEAN member countries in the context of minimizing the risks associated with the creation of an energy portfolio.

3. **Materials and methods**

To determine the level of diversification of the energy sector, the study uses an indicator that reflects the ratio of the shares of major energy sources in the energy sector, which are mainly used in the economies of the ASEAN member countries (crude oil, natural gas, solid fuels (coal; coke and peat; biofuel; waste; solar, geothermal, hydro and wind energy). The indicator is calculated based on the Shannon-Wiener index (Lin and Raza 2020; Pavlović, Banovac, and Vištica 2018):

$$kde = -1 \log N \sum_{n=1}^N p_n \log(p_n) \quad (1)$$

where kde is the indicator of diversification of the country's energy carriers; N is the total number of energy sources in the country's energy sector; p_n is the share of the n-th energy source in the country's energy carrier network.

The maximum value of the indicator is 1; it is obtained when all particles are equal to $1/N$. The minimum value is 0; it is obtained when one of the particles is equal to 1, and the rest - 0. The higher this indicator, the more diversified the network of primary energy carriers of a particular state (groups of states that form a regional market); this corresponds to a higher level of energy security. The kde indicator does not require normalization and reduction to a single measurement scale; thus, it is directly used as a normalized non-dimensional indicator.

In order to identify possible changes in the energy market of the ASEAN member countries, three scenarios are proposed based on an increase in the share of renewable energy sources. The primary motive for the direction of the proposed scenarios is the relevance of renewable energy sources in the process of sustainable development, both at the level of individual countries and in the regional and global context. These scenarios provide for an increase in the share of renewable energy sources in the structure of the energy sector by 5, 10 and 20%. It is assumed that the probability of increasing the share of renewable energy sources according to the first scenario is 60%, the second - 30%, and the third - 10%.

On the basis of forecasting according to these options, an assessment of the risks of a structural crisis in the energy market of the ASEAN member countries was carried out. If X is a discrete probability distribution $X = x_1, x_2, x_3$, where x_1, x_2, x_3 are the possible consequences of the events according to the three scenarios aimed at increasing the share of renewable energy sources, and the probability of their occurrence is $P = p_1, p_2, p_3$, the mathematical expectation MX of possible consequences will be:

$$MX = \sum_{i=1}^3 p_i x_i; \sum_{i=1}^3 p_i = 1 \quad (2)$$

The mathematical expectation M (X) can be considered as the risk that is expected on average. An important absolute indicator of risk is also the standard deviation X, as a measure of the dispersion (variability) of possible losses about the mean MX:

$$X = \frac{1}{n} \sum_{i=1}^n x_i - M(X)^2 \quad (3)$$

The coefficient of variation (kVAR) is a relative indicator of risk, which can be calculated based on the formula:

$$kVAR = \frac{\sigma(X)}{M(X)} \cdot 100\% \quad (4)$$

Conceptually, when calculating absolute and relative risk indicators, any deviation from the mean is considered undesirable. According to neoclassical risk theory, only negative deviations are taken into account. In this case, the risk is assessed by the modified indicators: the absolute indicator of semivariance - an analogue of the mathematical expectation MX ; the absolute indicator of the square deviation - an analogue of the standard deviation $\sigma(X)$; the relative indicator of semivariance - an analogue of the coefficient of variation (kVAR).

The use of the absolute and relative indicators made it possible to quantitatively assess the risks of a structural crisis in the energy market of the ASEAN member countries, thereby creating a purposeful response to it. To identify the impact of a structural risk (negative, positive) on the achievement of energy security goals, each country should be guided by the appropriate risk assessment scale, which combines qualitative and quantitative gradations. Table 1 shows the scale for assessing the negative impact of risk on the achievement of the following goals: stable energy supply, operational safety, financial and economic performance.

Table 1. Parameters for assessing the negative impact of risk on the achievement of energy security goals

Impact of risk on energy security	Qualitative / quantitative assessments of risk				
	Very low	Low	Medium	High	Very high
	0.05	0.10	0.20	0.40	0.80
1. Instability of energy supply	Hardly noticeable	Up to 5%	By 5-10%	By 10-20%	Over 20%
2. Risks of operational activity	Low	Requires preventive action	Requires prompt intervention	Requires confirmation of the feasibility of the activity	Activity loses its purpose
3. Deterioration of financial and economic results	Not noticeable	Up to 5%	By 5-15%	By 15-40%	Over 40%

Source: own development based on the PMBOK (Dionisio 2017).

In order to rank risks by two criteria (probability/impact), an energy security risk assessment matrix was used (Table 2). The relative coefficient of partial risk (K_w) is calculated based on the formula:

$$K_w = p \cdot V, \quad (5)$$

where p is the probability of risk; V is the risk impact assessment.

Table 2. Parameters for assessing energy security risks of the country

Probability	Influence				
	Very low	Low	Medium	High	Very high
	0.05	0.10	0.20	0.40	0.80
0.9	0.05	0.09	0.18	0.36	0.72
0.7	0.04	0.07	0.14	0.28	0.56
0.5	0.03	0.05	0.10	0.20	0.40
0.3	0.02	0.03	0.06	0.12	0.24
0.1	0.01	0.01	0.02	0.04	0.08

Source: own development based on the PMBOK (Dionisio 2017).

In the course of the analysis, the risk areas were identified; they are determined by the coefficient K_w :

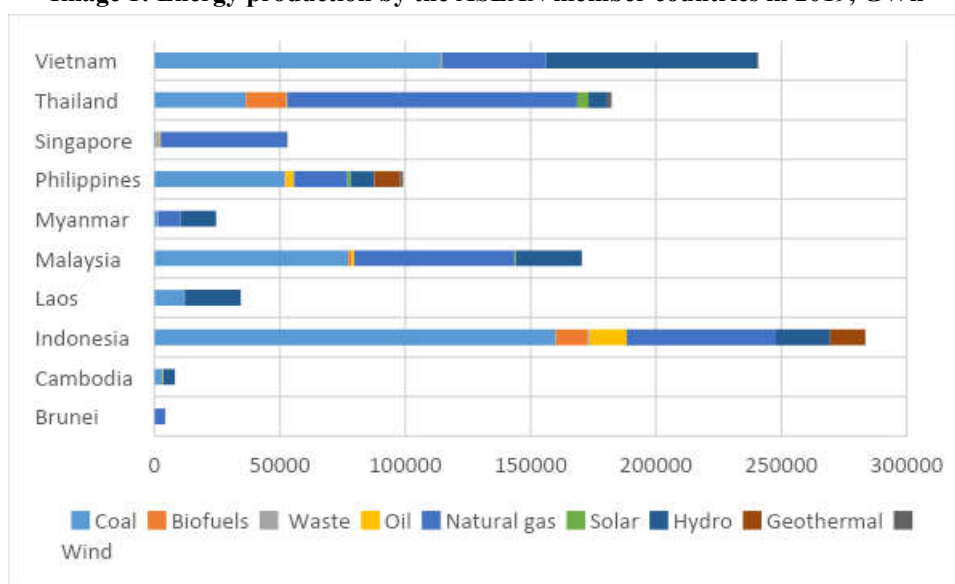
- low risk - up to 0.08;
- medium risk - K_w [0.08; 0.24];
- high risk - 0.24 and above.

The study is based on identifying the opportunities and risks of a structural crisis in the energy market of the ten member countries of the Association of Southeast Asian Nations. These are Brunei Darussalam, Vietnam, Indonesia, Cambodia, the Lao People's Democratic Republic, Malaysia, Myanmar, Singapore, Thailand and the Philippines; all of them are striving to meet the growing energy demand through safe, affordable and sustainable development.

4. Results

In the ASEAN energy market, energy is generated from a variety of sources (Image 1). In 2019, Brunei, Cambodia and Myanmar reported the lowest energy production rates. In these countries, the major sources of energy are coal and natural gas. At the same time, there is a load on the energy sector in Myanmar as it is forced to provide the population with sufficient energy supplies. Thus, the Ministry of Energy has initiated the construction of power plants of more than 1 GW capacity for a period of one year and a half. In Cambodia, the energy industry is negatively affected by a prolonged drought as a result of climate change. Due to the limited hydropower supply, there are regular delays in the supply of electricity and reduced imports from neighbor countries.

Image 1: Energy production by the ASEAN member countries in 2019, GWh

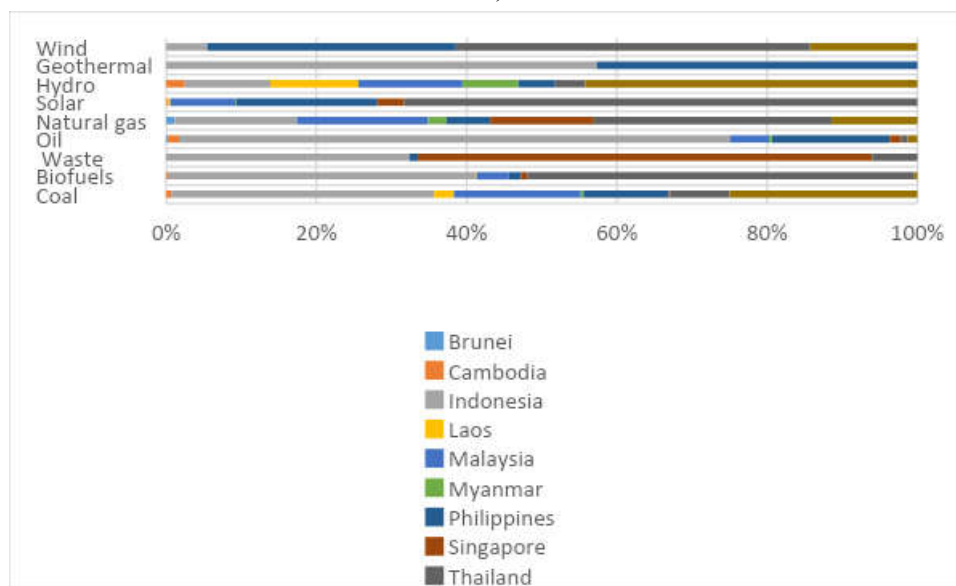


Source: own development based on statistical data (International Energy Agency 2020b)

The largest amount of energy was generated by Indonesia, Vietnam, Thailand and Malaysia. These countries mostly rely on coal and natural gas as the major sources of energy. At the same time, Indonesia uses almost all possible energy sources, both renewables and fossil fuels. Vietnam cooperates with Russian companies to produce the third largest volume of natural gas in the ASEAN region.

The structure of energy production in the ASEAN member countries (Image 2) shows that Indonesia is leading the way in the generation of energy from fossils. Waste-to-energy is mainly found in Singapore.

Image 2: Structure of energy production by the ASEAN member countries by energy sources in 2019, %

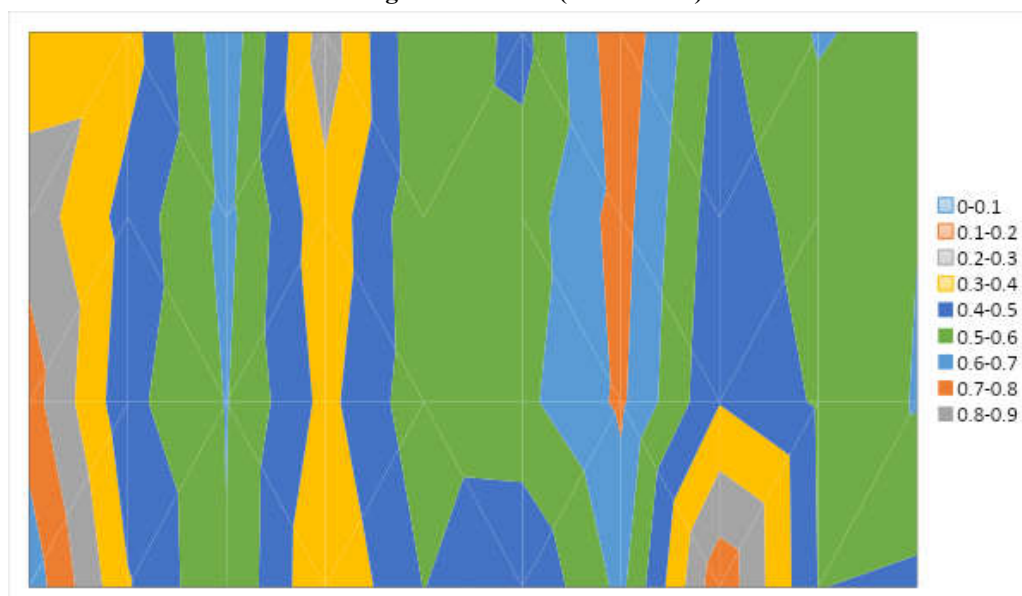


Source: own development based on statistical data (International Energy Agency 2020b)

Thailand has the most developed production of energy from renewable energy sources, especially solar and wind power. Vietnam specializes in energy production from hydro and wind power, as well as coal and natural gas.

To determine the level of diversification of the ASEAN energy market, each country was separately assessed (Image 3). At the same time, in addition to the current status (2019), three options for diversification were considered based on an increase in the share of renewable energy sources by 5, 10 and 20% in the overall structure of the energy sector of each country.

Image 3: The level of diversification of the energy sector of the studied countries according to the designed scenarios (coefficients)



Source: own development

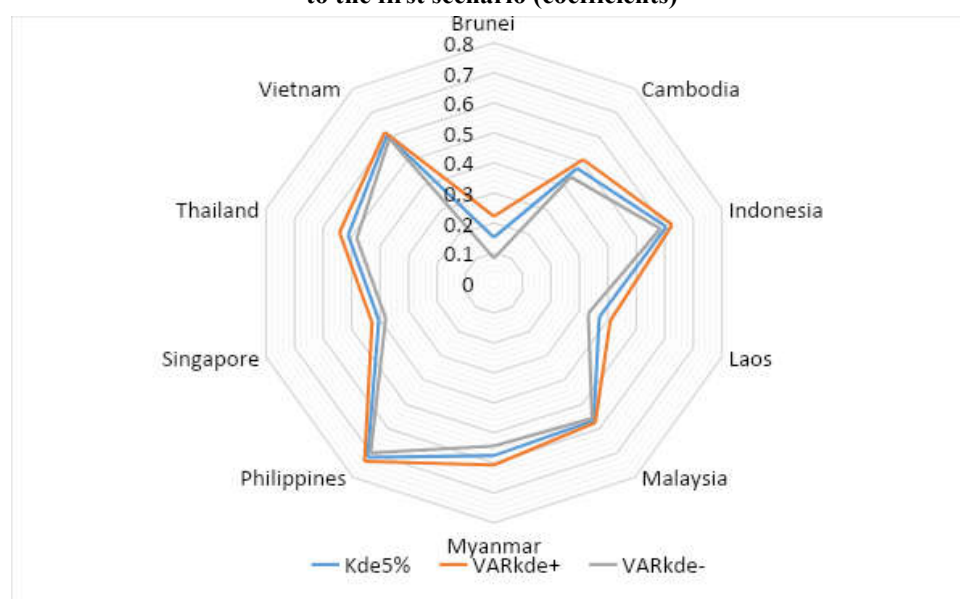
Based on the indicator of diversification of the energy sector in 2019, it can be argued that the ASEAN member countries are characterized by irregularity in this context. For example, Brunei has the least diversified energy sector represented only by oil and gas. Solar power in this country is at its infancy. The highest levels of the energy sector diversification were noted in the Philippines and Indonesia. In these countries, the energy sector is represented by a variety of sources that have fairly significant shares in its structure. In the Philippines, the level of diversification is almost 18 times higher than in Brunei. An increase in the share of renewable sources by 5% contributes to an increase in the level of diversification of the

energy sector in all studied countries. At the same time, the most effective result is observed in Brunei - an increase in diversification by 4 times, and in Myanmar - by 3 times. A similar situation occurs when the indicator is increased by 20%.

In Brunei, an increase in the share of renewable energy sources by 20% in the energy sector also has a positive result - a tenfold increase in diversification. At the same time, in some countries, as a result of an increase in the share of renewable energy sources by 20%, a paradoxical decrease in the level of diversification of the energy sector is observed. For example, in Cambodia, this could lead to a decrease in the level of diversification by 10%, and in Laos - by 21%. This is due to the fact that today in these countries the production of energy from renewable energy sources (in particular, hydropower), which make up a significant share in the structure of energy carriers, is quite developed. In Cambodia, energy production from renewable energy sources in 2019 was 58%, and in Laos - 65%. A greater increase in the share of renewable energy sources in the structure of the energy sector of Cambodia and Laos contributes to a decrease in the level of diversification despite the fact that this may affect the energy independence of the countries. Thus, the risk of a structural crisis increases.

To determine the risks of a structural crisis in the countries under study, possible deviations of the expected results were assessed according to the designed scenarios for increasing the share of renewable energy sources (Images 4-6).

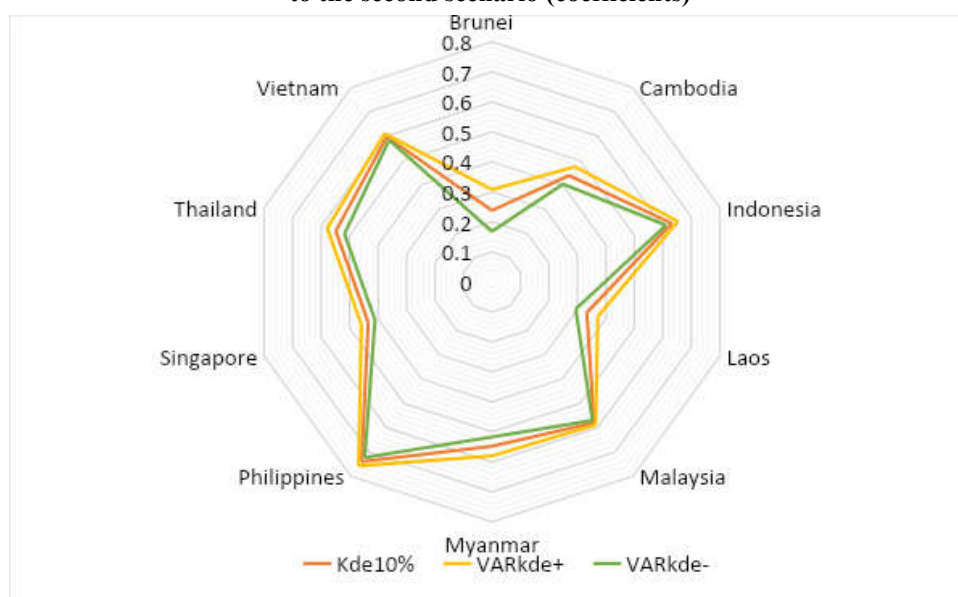
Image 4: The risks of a structural crisis in the energy market of the studied countries according to the first scenario (coefficients)



Source: own development

As a result of the positive deviation, the countries such as the Philippines, Indonesia, and Vietnam will remain the most diversified. The negative deviation from the expected result can significantly affect the level of diversification of the Brunei energy sector that is characterized by the lowest indicator. In Indonesia, the Philippines, Vietnam and Malaysia, the deviations have a minor impact on the level of diversification of the risks of a structural crisis in the energy market.

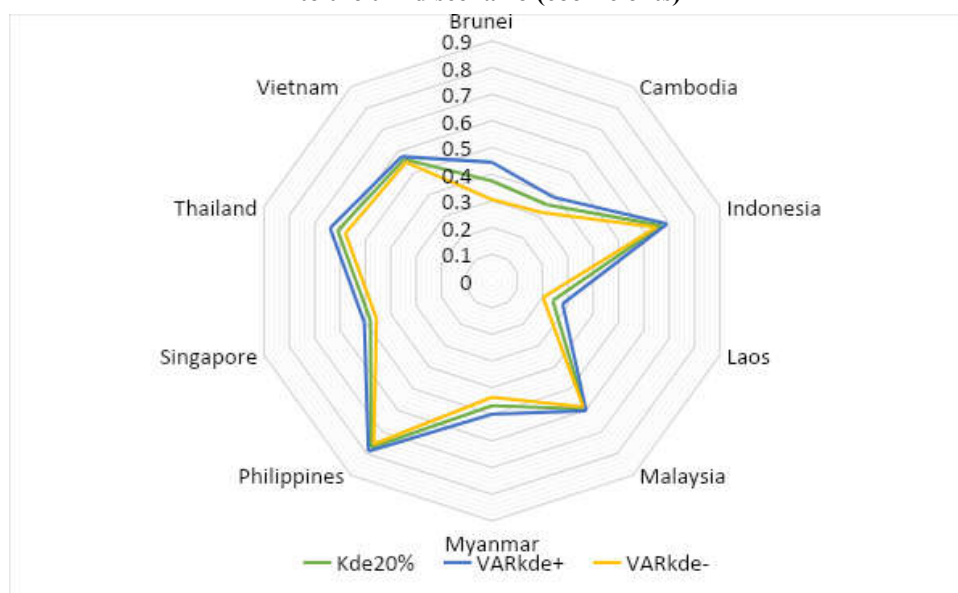
Image 5: The risks of a structural crisis in the energy market of the studied countries according to the second scenario (coefficients)



Source: own development

The positive deviation from the expected level of diversification of the energy market significantly increases its importance in such countries as Cambodia, Singapore, and Thailand. The highest levels are still observed in the Philippines, Indonesia, Vietnam, and Malaysia. As a result of the negative deviation from the forecast, the level of diversification of the energy market may significantly decrease in Brunei and Laos.

Image 6: The risks of a structural crisis in the energy market of the studied countries according to the third scenario (coefficients)



Source: own development

An increase in the level of diversification of the energy market due to a 20% increase in the share of renewable energy sources may be accompanied by significant deviations in Myanmar, Singapore, Thailand, Brunei and Laos. The reason for this is the well-developed hydropower industry, which has a significant share in the total energy production from renewable energy sources. Therefore, a notable increase can affect the development of a single structure of the energy market for renewable energy sources.

In the aggregate, according to the three scenarios, it should be noted that the most positive diversification of structural crisis risks in the ASEAN member countries is typically observed in the Philippines, Indonesia, Malaysia and Vietnam. In these countries, there may be slight

deviations from the expected result by 2%. The highest level of risks of a structural crisis in the energy market are observed in Brunei (35%), Laos (11%), and Cambodia (8%). However, it should be borne in mind that in Brunei, the risk justifies a tenfold increase in the level of diversification of energy sources, and in Laos and Cambodia, this indicator may have a negative downward trend.

5. Discussion

The quantitative assessments of the level of diversification based on the proposed methodological approach characterize the current state of diversification of the energy market in terms of its major aspects and, in general, in quantitative terms on a single scale within a certain qualitative level of diversification. The quantitative assessments make it possible to identify appropriate ways and strategies for increasing the level of diversification of the energy market in certain aspects in order to ensure (increase) the energy security of the ASEAN member countries (Alexiadis and Felsenstein 2012; Yang, Sheng, and Azhgaliyeva 2019). The qualitative assessments of the level of diversification based on the proposed methodological approach reflect the current state of diversification of the energy market in terms of its major aspects and in general, which is described by one of the following qualitative levels: critical, crisis, satisfactory, normal or high (Anbumozhi et al. 2020). The qualitative assessments make it possible to determine the need to increase the level of diversification of the energy market in the context of certain aspects, individual member countries, and the region as a whole (Andreev, Lomakina, and Aleksandrova 2020; Myzrova, Serdyukova and Labaznova 2020).

The study confirms that in order to make the region more energy efficient and sustainable, there is a need for concerted efforts in the energy sector driven by a significant increase in investment, including much more active private sector financing, especially the development of renewable energy sources. The proposed options (scenarios) implying the expansion of the use of renewable energy sources require a closer integration of regional energy systems and the sustainable use of the bio-energy potential of the region (Dunayev 2017; Nepal, Musibau, and Taghizadeh-Hesary 2020; Stratigea and Grammatikogiannis 2012).

The limitation of the research is the fact that new energy sources may emerge in a rapidly changing environment. Therefore, the forecast may deviate from the expected results in the long term. A possible increase in energy efficiency, especially in fast-growing sectors such as cooling and road transport, should be considered (Sakamoto 2012). The gradual withdrawal of fossil fuel consumption subsidies in order to encourage more rational energy consumption and make appropriate investment decisions may have a particular impact on the level of diversification of the energy sector (Kumaran et al. 2020; Sgouros and Mazis 2017).

The research can ensure a reliable energy supply to the region in an environmentally sustainable way in the long term, as well as reduce external dependence. At the same time, a single approach to the problems associated with connectivity programs, the reduction of the dependence on financing from private companies, partners or multilateral banks can be developed (Majid and Nasir 2018; Panfilova et al. 2019). The results obtained can be used to design programs to increase the share of renewable energy sources in the energy balance and energy policy, which would take into account the conditions of both a particular country and the ASEAN region (Fünfgeld 2019b; Mazis 2013).

The strategy of the ASEAN member countries in the energy market should be based not only on the results of the identification and assessment of risks and the developed mechanism for their management, but also on the threat response plan and threat control methods (monitoring) (Setyawan et al. 2020). This requires further research in the future.

The present study can be expanded towards the assessment of the energy market of the ASEAN member countries based on a two-stage analytical framework (Shadrina 2020). One of the stages is the assessment of the energy sectors of the member countries in relation to their economic growth and development, environmental sustainability and energy security. The second stage can involve the analysis of the readiness to minimize risks of national energy sectors by the following six dimensions: the structure of the energy sector, the regulation of renewable energy sources, institutions and management, capital and investment,

infrastructure and business environment, human capital (Ling and Yumashev 2018). In the future, the study can be based on the results of such a two-stage analysis.

6. Conclusion

The ASEAN energy market includes various energy sources. The major ones are coal and natural gas. At the same time, the countries producing the largest amount of energy have expanded the range of energy sources towards renewable energy. The analysis of the energy production in the ASEAN member countries showed that Indonesia is the leader in the production of energy from traditional energy sources and Thailand has the most developed energy production from renewable energy sources. Waste-to-energy is mainly found in Singapore.

The assessment of the diversification of the energy sector of the studied countries according to the described scenarios revealed that in the ASEAN member countries the indicators are very different. Brunei has the least diversified energy sector represented by oil and gas. The highest levels of the energy sector diversification were noted in the Philippines and Indonesia. According to the two developed scenarios for increasing the share of renewable energy sources, there is an increase (by 5 and 10%) in the level of diversification of the energy sector in all countries considered. In some countries, an increase in the share of renewable sources by 20% has prerequisites for reducing the energy sector diversification. In Cambodia and Laos, this is a result of the developed energy production from renewable energy sources, which already make up a significant share of energy carriers. Therefore, an increase in the share of renewable energy sources in these countries contributes to a decrease in the level of diversification and an increase in the level of structural crisis risks.

The assessment of possible deviations from the expected results according to the described scenarios for an increase in the share of renewable energy sources made it possible to single out countries affected by positive and negative deviations. According to the three scenarios, the most positive diversification of structural crisis risks is typically observed in the Philippines, Indonesia, Malaysia and Vietnam. In these countries, there may be slight deviations from the expected result. The highest level of risks of a structural crisis in the energy market are observed in Brunei, Laos, and Cambodia.

Based on the proposed scenarios for increasing the share of renewable energy sources in the structure of the energy market of the ASEAN member countries, it is possible to design programs to ensure reliable energy supply to the region in an environmentally sustainable way, as well as reduce external dependence. The study can be expanded towards the assessment of the ASEAN energy market based on the analysis of the current situation in the energy sectors of the member countries in relation to their economic growth and development, environmental sustainability, and energy security.

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BALI AND THE NEXT PROPOSED TOURISM DEVELOPMENT MODEL IN INDONESIA

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Abstract

The Indonesian government is currently boosting its tourism by using the success of the island of Bali as a model, the project is called Ten New Balis. This article examines previous studies and statistical data to presents a deep analysis of macro-environmental factors of tourism in Indonesia related to Bali as a development model. The study is based on Scopus articles associated with Indonesia and Bali tourism development articles and statistical data collected from the statistics bureau's Indonesian office, BPS-Statistics. The thematic framework analysis and descriptive analysis describe complementary insight of tourism planning and development issues. Proposed future tourism development planning could be seen clearer by using mixed-method analysis. Extending different research articles databases will give a good result comparison.

Keywords: priority destinations, tourism planning, tourist account, tourism development, rural tourism

JEL classification: L83, O500, O21, O180, R1, R5

1. Introduction

The tourism industry is one of the most important economic sectors globally, which has shown remarkable growth in recent decades (Dwyer et al., 2000; Selimi et al., 2017). Accordingly, this sector has become an essential economic field that attracts researchers and academics, as tourism represents a complex phenomenon with different economic, social, geographical, environmental, technological, and other dimensions (Rodríguez-Díaz & Pulido-Fernández, 2021). According to Neil Leiper, the Australian researcher who created Leiper's model to understanding tourism in 1979, tourism consists of a set of push factors and the pull factors, representing the economies of the tourism industry (Paul & Varghese, 2015; Yusof et al., 2012). The importance of the tourism economic dimension emerged at the local, regional, national, and global levels.

The exact manner can be seen in the Asia-Pacific Region (which consists of 13 countries), where the tourism industry plays a significant role in shaping the regional countries' economic strategies. Each country competes with the uniqueness and beauties of nature or culture to package these activities in a tourism product. Asia and the Pacific recorded and enjoyed the highest growth in arrival and above-average growth in tourism earnings by 2018 (World Tourism Organization, 2019). Covering 140 economies, the Travel & Tourism Competitiveness Index (TTCI) measures the set of factors and policies that enable the travel and tourism industry's sustainable development. Indonesia ranks 40 among 140 other countries (Calderwood & Soshkin, 2019).

In Indonesia, the tourism industry is projected to become one of the "core economies" and the third-largest contributor to foreign exchange after CPO/Crude Palm Oil and coal. The tourism business's potential in the future is considered very large (Bank Indonesia, 2018). Getting 20 million foreign tourists in its target, Indonesia must rely and focus on the domestic market because the predicted growth of international tourists who are still affected by the pandemic requires a solid domestic economic movement by domestic visitor trip. According to the United Nations World Tourism Organization (UNWTO), the growth of tourism travel after 2020 is still in the recovery zone and is still lower than in 2019 (UNWTO, 2020).

The processes of tourism development planning in this turbulence situation by many stakeholders must pay attention to various macro data to find the most appropriate approach to Indonesian conditions. The Indonesian Ministry of Tourism and Creative Economic/Kemendparekraf has disseminated and prepared preparations for almost all provinces to realize tourism as one of the primary sources of income and use Bali island as tourism for patron development. This study tries to determine the elements used as a baseline for tourism development planning in Indonesia for the target market, foreign tourists, and domestic tourists with world-class Bali tourism as a model.

Consequently, this paper aims to identify the Indonesian tourism industry's future strategies depending on the macro statistics perspective and add Bali as the outlook enhancer. The research using mixed methods to give a more comprehensive view. The results from mix method will be complementarity, which means the results from one way are used to enhance, elaborate, or clarify results from another process. The number of tourists, income, origins, favorite destinations, and 2019 Travel & Tourism/T&T Competitiveness Index are the selected variables and statistics for this study. This research started with an introduction section, followed by a literature review. After that, the research presented the results and discussed them, followed by a proposed reliable conclusion.

2. Literature Review

2.1. Indonesia & Tourism Nowadays

Indonesia is Southeast Asia's largest economy, rich in all types of natural resources and cultural diversity (Oberman et al., 2012). A young and dynamic democracy, it is urbanizing and modernizing rapidly. In contrast with most OECD countries and many emerging economies, around half of the population is under 30 years old. The working-age population ratio is set to rise during the next decade (United Nations, 2017). The data is in line with the number of visitors to various destinations in Indonesia, dominated by younger people (BPS-Statistics Indonesia, 2020a). Indonesia's economic growth is promising and takes place regularly, supported by political stability and security, making it a confident middle-income country (The World Bank, 2020).

The key to understanding these claims is seeing them as socially constructed or shaped by discourse (Fazito, Scott and Russell, 2016). Confidence in the national government is higher than in any OECD country, and its following with emblematic of Indonesia's success in creating a famous tourism brand (OECD, 2018). Based on data from the World Travel & Tourism Council/WTTC, Indonesian tourism is the fastest-growing, ranking nine globally, number three in Asia, and number one in the Southeast Asia region. (Indonesia.go.id, n.d.). Domestic and foreign tourist visitors still show that Indonesia's typical visitor is still in mass tourism activities (BPS-Statistics Indonesia, 2020e).

The development of tourism leads to the following economic benefits: GDP growth; unemployment decrease, i.e., creating workplaces (as well as for unskilled workers) in the

related business - accommodation, catering, trade, entertainment; increasing residents and state revenues; foreign investment attraction; promotion of the development and variety in other sectors (local crafts, manufacturing, and agriculture); infrastructure development (Barkauskas, Barkauskienė and Jasinskas, 2015). There is a strong degree of specialization in industry when employment and GDP are taken into consideration (Diniz and Upadhyay, 2010).

If mass tourism is to be chosen, then a diverse local workforce and production is an extensive portfolio of links to the broader economy and looking at tourism in this context (Biddulph, 2015). Mass tourism is considered a loose umbrella term for various types of large-scale and widespread tourism segments. Mass tourism is the role taken by or given to one or several types of tourism, and these together represent the masses in a certain considerable number (Vainikka, 2013). In this condition, discussing the choice of mass tourism or non-masses' tourism is no longer contextual, considering the challenges of tourism development and planning are managing innovation and its consequences. Furthermore, through innovation, they can retain their competitiveness (Omerzel, 2015).

These competitive standards are increasingly broader with variables and measures for comprehensive pillars of thought such as the Travel & Tourism Competitiveness Index/TTCI by the World Economy Forum/WEF. (Calderwood & Soshkin, 2019). By using sustainable community business capital as assets, all of which are important to manage, enhance and conserve, it is expected that the destinations will continue to attract visitors. Furthermore, it will feel connected and committed to experiencing while also contributing to sustainable community vision and robust economic growth in tourism (Richins, 2009). Moreover, attention to security and safety is also part of the thinking for tourism development, be it mass tourism or non-mass tourism (Priatmoko & Purwoko, 2020).

The developments in technology and transport infrastructures, such as low-cost airlines and more accessible airports, have also made many affordable tourism types. Using online and applications through the internet boosts tourist services sales and has facilitated lifestyle changes (Succurro, 2016). In the future, economic factors will depend more heavily on environmental factors, and sustainable (including rural) tourism will grow because of the worse state of the environment (Barkauskas, Barkauskienė and Jasinskas, 2015).

Recreational experiences connected to livelihoods can add another dimension and thus need particular attention for recreation-based ecosystem conservation. Moreover, it will also push the non-economic valuation of recreation-related to indigenous and local people's lifestyles should be considered seriously for a fuller appreciation of socio-ecological relations in tourism-dominated areas (Chakraborty, Saha and Ahmed Selim, 2020).

2.2. Tourism Development

Involving the host community in planning and maintaining tourism development to cater to the community's welfare is directly notable. The most common form is community-based tourism/CBT (Banik and Mukhopadhyay, 2020). Through local control of tourism businesses and activities, CBT is thought to contribute to cultural and environmental conservation and the redistribution of economic benefits among the most vulnerable groups, such as indigenous communities (Garcia Lucchetti and Font, 2013). Indonesia, which has many more rural areas than urban areas (Indonesian Ministry of Home Affairs, 2017), needs this approach by paying attention to tourism development down to the village level.

Visitors come to spend a certain amount of money starting from transportation expenses, buying products or services in tourism destination areas, such as accommodation, food, and beverages, souvenirs, and recreational activities (Succurro, 2016). Hence, the high transport integration is one of the success key of tourism business (Krabokoukis, 2020). It is necessary to pay attention to the values that support visitors' attitudes and behavior toward tourist destinations with an emotional element as part of planning. The dynamic stuff tends to impact tourist behavior that may not be captured by attitudes and cognitive beliefs related to environmental sustainability (Sneddon et al., 2016). Furthermore, the tourism industry's contribution to the economy can be identified through visitor activities (Khademi-Vidra and Bujdosó, 2020).

Biodiversity is also a severe concern for planning current tourism activities (World Tourism Organization, 2019). Biodiversity conservation and sustainable land use are indicators of sustainable environmental use (UNEP, 2017). Furthermore, attention to ecological resources needs to be done while prioritizing conservation and not destroying natural areas (Holladay and Ormsby, 2011). A cultural unity containing human, nature, and physical culture manifestation, including architecture, as the complexity of components, should be valuable capital in tourism development (Vitasurya, 2016).

Stipulation of destination forms' development also needs to pay more attention to local communities with a more pro-poor and comprehensive Tourism Value Chain/ TVC approach to involve local communities to work and maintain sustainability (Ndivo and Cantoni, 2016). Communities will work for tourism if tourism works for communities (Milne et al., 2012).

2.3. Bali and Indonesia Statistical Report

Since 2014, the authorities committed to replicate this success of Bali Island in "10 new Balis" to double tourist numbers to 20 million by 2019 (Ollivaud, 2018) by creating the so-called "10 Priority Destinations" project. The number of foreign tourists arriving in Bali soared from 2.5 million in 2010 to 6.2 million in 2019 (BPS-Statistics Indonesia, 2020d). Bali island recorded is one of the most popular tourist destinations for foreign visitors.

The changing volatility of the tourism marketplace and increasing constraints on Destination Management Organisations (DMOs) allocate scarce marketing funds efficiently and demand. Thus the prospective return on investment in destination development is estimated accurately (Dwyer, Forsyth and Spurr, 2016). Later, the number of tourists will affect the investment risk. However, for many destinations in Indonesia, the domestic focusing market strategy's allocation has long been a concern for local DMO. When viewed more broadly by taking into account the direct, indirect, and induced effects, in total, 12,241,600 jobs in Indonesia emerged with the travel and tourism industry in 2017 (LPEM-FEBUI, 2018).

An assumption has prevailed among tourism stakeholders and researchers that, nationally and within a state's borders, domestic tourism represents mainly transfers of expenditure, with minimal impacts on Gross Domestic Product and employment (Dwyer, Forsyth and Spurr, 2016). However, this does not apply to Indonesia with the number of domestic visitors who dominate the circulation of money and labor (LPEM-FEBUI, 2018).

Understanding that Bali will become a patron for tourism development in Indonesia requires a macro perspective to apply to other regions (Adhika and Putra, 2021). Bali's model will be a challenge that is not easy, considering other areas in Indonesia are relatively unfamiliar with the tourism business and have different characteristic (Berawi, Miraj and Sidqi, 2017). Bali tourism started in the Dutch colonial era, while other regions became concerned and active in the decades. The data on tourism in the Indonesian BPS-Statistics office also only shows macro figures and has not provided a comprehensive strategic picture of Indonesia's future tourism plans and conditions.

This paper focuses on exploring critical thinking about a proposed model for Indonesian tourism in the future. Previous research articles on Indonesian tourism related to Bali, statistical data, and concepts from world tourism organizations will provide a more comprehensive view. Starting from a content analysis of literature on tourism in Indonesia, followed by a descriptive analysis of the Indonesian BPS-Statistics report, and added reports from WTTC and WEF data to ensure robust discussion of the data presented.

Finally, we can say the Indonesian government's strategy by making Bali a model for developing priority destinations in other regions requires a deep understanding of various data applications. Tourism research, general and macro statistical data, and concepts from tourism institutions and the global economy can help provide a sharpened view for development planning.

3. Methodology

A mixed-methods study was conducted, combining qualitative and quantitative analysis. The qualitative research will be founded on an interpretive (constructivist) paradigm by building thematic constructs among previous research articles. NVivo is using to help to analyze qualitatively. NVivo is a qualitative data analysis software that allows the researcher to gather, organize, analyze, and visualize unstructured and semi-structured data (Kent State

University Libraries, 2020). The data that will be processed using thematic analysis are articles from the Scopus database. Scopus database is easy to navigate, can search both forward and backward from a particular citation, has a multidisciplinary aspect, and can be used for collection development and research (Burnham, 2006). From the articles recommended by Scopus, we extracted cited articles for thematic framework analysis using NVivo Pro 12. We did coding, categorizing, and synthesizing (Saldaña, 2013). The core categories and related themes are constructed related to the role model destination to give the country's tourism business and activities perspective. In this study, we use the Bali island tourism studies to develop tourism used by the Indonesian government.

Descriptive analysis was used to help describe the finding of the previous year's statistical data. Quantitative descriptive analysis characterizes the world or a phenomenon by identifying patterns in data to answer questions about who, what, where, when, and to what extent. Descriptive research can be precious in today's age of large datasets in which the volume of information may otherwise obscure recognition of essential relationships because it works as data simplification (Loeb et al., 2017). Descriptive statistics enable data to be presented in a more informative manner, making data analysis easier. Good descriptive research relies primarily on low-inference, low-assumption methods that use no or minimal statistical adjustments (Loeb et al., 2017). The statistical data obtained are the number of visits, income, tourists' origins, favorite tourism destinations, and travelers' destinations. In this study, we use Indonesian BPS-Statistics under the Tourism Chapter data, we describe and connecting all interpreted findings.

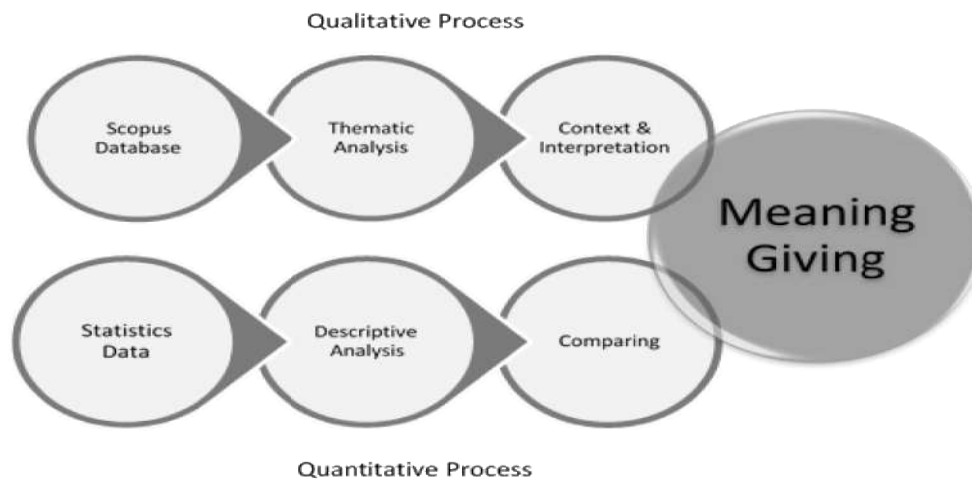
We also use a measurement from the 2019 T&T Competitiveness Index released by the WEF, which contributes to the development and competitiveness (Calderwood and Soshkin, 2019) to add a descriptive interpretation of the conditions of Indonesian tourism. Its index comprises four subindexes: Enabling Environment, Travel & Tourism (T&T) Policy and Enabling Conditions, Infrastructure, and Natural & cultural resources and has subindex as seen in Figure 1 below.

Figure 1. The T&T Competitiveness Index 2019 framework



Source: Calderwood and Soshkin, 2019

The combination of qualitative and quantitative analysis results is then used to provide the proposed finding as meaning-giving. The whole process in this methodology can be seen in Figure 2 below.

Figure 2. Mix method research process

Source: Authors Analysis, 2021

As various existing issues and news from major credible media are identified with clear affiliation (Cassidy, 2007), we use it to assist data enrichment and meaning giving. In the discussion, we added information on the socio-economic capital and environmental phenomena in Indonesia and future tourism trends with various literary sources according to the thematic finding. Finally, in the results, we offer a view of Indonesia's tourism development plan at a macro scale based on interpretation of literature content analysis and descriptive statistics analysis construction.

4. Result

4.1. Qualitative Results

Thematic analysis is a qualitative research method that can be widely used across various epistemologies and identify, analyze, organize, describe, and report themes found within a data set (Nowell *et al.*, 2017). Based on the focus of the Literature Review conducted is about "Indonesia" and "Bali" as patron for "Tourism" "Development," we use these keywords to search for related literature on the Scopus database. We use data for the last five years, from 2017 to 2021, because we consider the five-year period sufficient as a generalization of research and discussion on tourism. From this data, 24 articles recommended by Scopus were obtained for thematic framework analysis using NVivo Pro 12.

We then coded the entire article with the help of the NVivo Plus 12. After the repeat analysis stages and node groupings were carried out, the remaining words were classified. We started developing a theme. Furthermore, using the thematic analysis results above, we found that the main themes of concern to researchers regarding tourism development planning in Indonesia which Bali as the core issue. These themes can be seen in Table 1 below. Table 1 presents the three categories and their related articles. Column three provides a more meaningful interpretation associated with each category/theme. It is the synthesis of the arrangements that form the basis of Bali tourism-related understanding.

Table 1. Core categories, related themes, and interpretation of Bali tourism

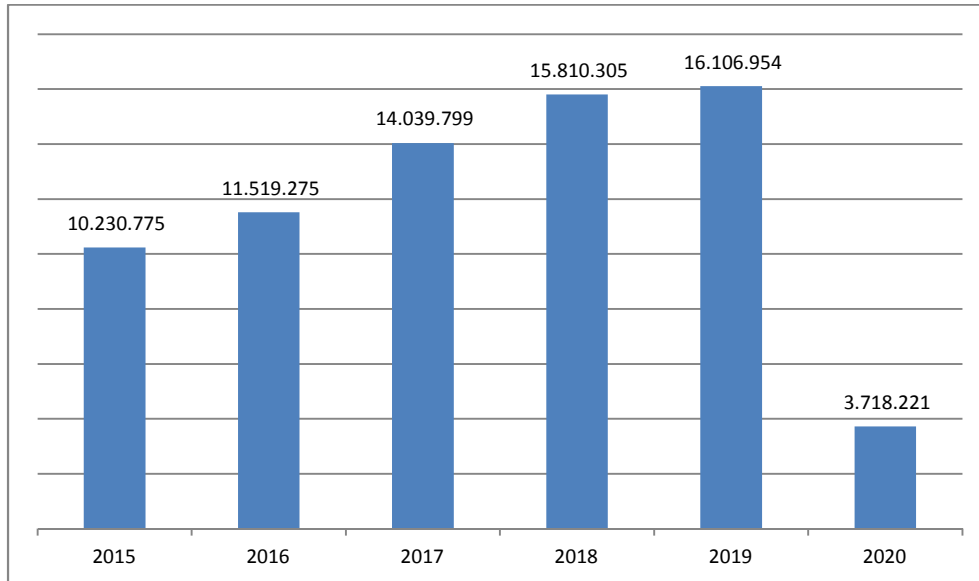
CORE CATEGORY	RELATED THEME & WORDS	INTERPRETATION
Spatial Development	agglomeration	Bali-like project
	Bali	
	coastal	understanding spatial capital
	village	
	urban	natural resources concern
	conservation	
	ecotourism	
Regional Development	land-water use	interconnected area
	global	
	national	
	locality	interconnected activities
	culture	
	traditional value	
Tourism Impact	disaster mitigation	local economy growth
	community development	
	infrastructure	
	dynamic process	comprehensive impact view
	socio-economic	
	politic	

Source: Author Analysis, 2021

4.1. Quantitative Results

The most credible data source for data on tourism demand and the supply of tourism industries in Indonesia is national or regional BPS statistics, the Indonesian government statistics board's office. Its data is used by many international bodies such as World Bank, UNWTO, WEF, OECD, and WTTC. Data on foreign and domestic visitor and economic indicators can be seen in the report by BPS-statistics. Statistical data indicators as control are also carried out in looking at tourism conditions at a macro level (Constantin *et al.*, 2016; Dwyer, Forsyth and Spurr, 2016; Antolini and Grassini, 2020; Sun, Cadarso and Driml, 2020).

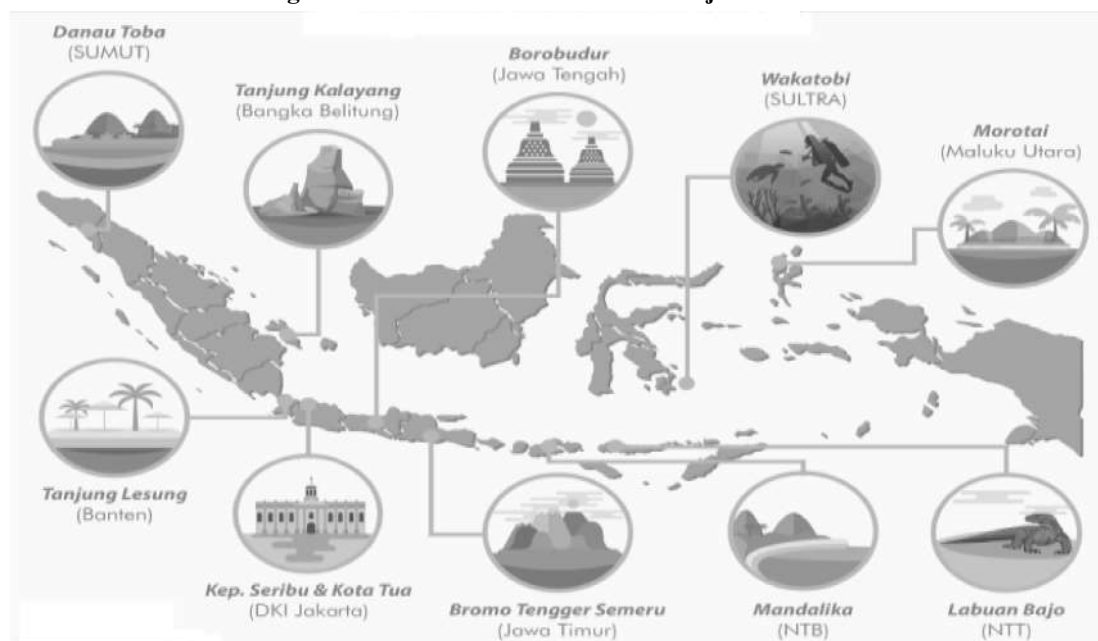
The growth of foreign tourist arrivals also shows a convincing number from 2015 to 2019, as seen in figure 3 below. Of course, during a pandemic, there was a significant decrease in foreign tourist arrivals in 2020, as in other countries as well. This very considerable decline cannot be used as a long-term baseline because the pandemic's world situation begins in the middle of 2020.

Figure 3: International Tourists Arrival in Indonesia

Source: BPS-Statistics Indonesia, 2020c, 2020b

These foreign tourists entered the 29 entry ports in Indonesia. The most for AirPort Entry is Ngurah Rai (Bali Island), Soekarno-Hatta (Jakarta), Kualanamu (North Sumatra), Juanda (East Java). Seaport Entry through Batam (Riau Arch.), Tanjung Uban (Riau Arch.), Tanjung Pinang (Bintan island). Land port entry by Atambua (East Nusa Tenggara), Jayapura (Papua), Entikong (West Kalimantan). To reach the target of 20 million foreign visitors, the government accelerated transport infrastructure development and stepped up its promotion efforts. In 2017, tourist arrivals reached 14 million, and other destinations are becoming popular, such as Borobudur temple in Central Java and Banyuwangi in East Java.

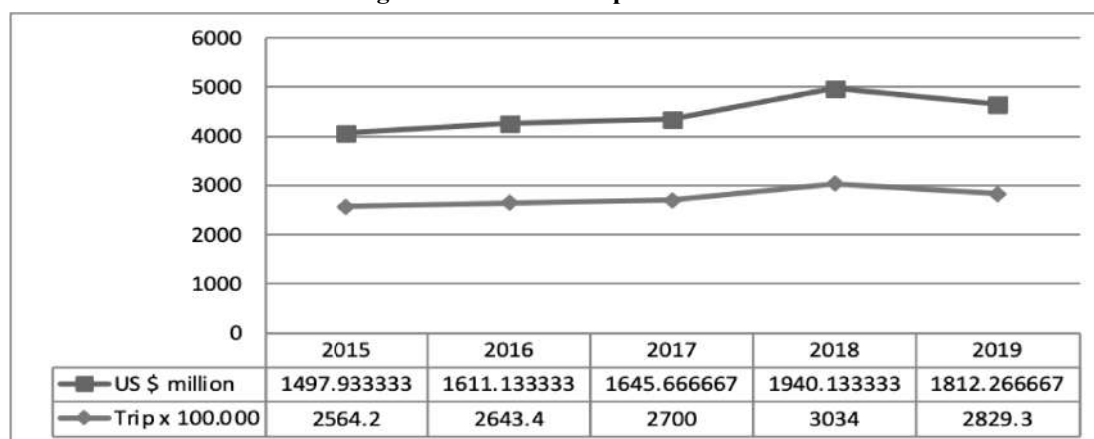
Duplicating Bali's performance into ten new destinations is a strategy for the government to accelerate Indonesia's tourism business growth. In realizing that, the plan to develop ten new destinations in the same class, called ten new Balis, was made for massive infrastructure development. The infrastructure includes roads, airports, and transportation connections, and other supporting facilities. The priority destination locations name are: Lake Toba in North Sumatra, Tanjung Kelayang in Bangka Belitung, Mandalika in West Nusa Tenggara, Wakatobi in Southeast Sulawesi, Morotai Island in North Maluku, Seribu Islands in Jakarta, Tanjung Lesung in Banten, Borobudur in Central Java, Bromo Tengger Semeru in East Java, Labuan Bajo in East Nusa Tenggara. The location and theme of the ten priority destinations can be seen in the infographic figure 4 below.

Figure 4: Indonesia's 10 New Balis Project locations

Source: <http://indonesiabaik.id>, edited 2020

In developing these ten destinations, it must be kept in mind that the concept of the Bali tourism industry that integrates natural capital, culture, facilities, and community is a requirement for the success of a destination. Furthermore, the determination of the ten locations as a "core-periphery" which aims to bring the effect of the surrounding area in the tourism business can occur (Xi *et al.*, 2015). Moreover, suppose understanding its "core-periphery" spatial value is not fully understood and connected with integrating various aspects of tourism as practiced by Bali. In that case, it will cause residents to separate themselves from tourism activities (Wang, Xu and Huang, 2020).

For domestic tourists, the government is targeting 275 million trips that will visit various destinations in Indonesia. The assumption of this figure relies on the conditions before the Covid-19 pandemic. The activity of domestic tourists encourages economic activity and equal distribution of income with the expenditures made. Meanwhile, the number of domestic tourist trips and the income derived from tourism-related activities (transportation, accommodation, catering, shopping, etc.) are recorded in figure 5 below.

Figure 5: Domestic Trip & Revenue

Source: BPS-Statistics Indonesia, 2020a

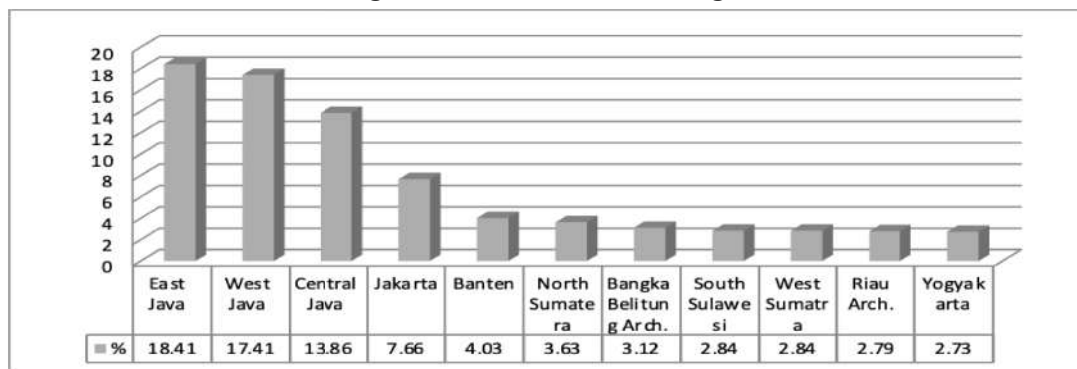
The picture above shows the movement of the number of trips and the total expenditure to make domestic tourists' trips over the past five years. Domestic tourists' development pattern is seen from the number of trips and spending showing a positive habit that tends to increase. In the past five years, from 2015 to 2018, the number of trips has grown by 21.34 percent. Domestic tourists' total expenditure also increased by 63.64 percent before considering the

development of inflation (BPS-Statistics Indonesia, 2020a). However, there was a 6.75% decrease in the number of tourists in 2019 compared to 2018 due to increased airplane ticket prices. The drop is getting more significant with the Covid-19 pandemic, which affects spending for travel & tourism. The total decrease in 2020 had reached 46.6% (World Travel & Tourism Council, 2021)

The Association of Indonesian Tour and Travel Agencies (ASITA) stated that about 60 percent of the people who want to travel are influenced by the price of airline tickets (Fitra, 2019). With the increase in airplane tickets in the past, there may be adjustments in transportation modes, trips, and changes in a favorable destination. Also, the existence of new toll roads will open new opportunities to increase visitor trips. The number of visitors in 2020 has not been obtained comprehensively. Still, there has undoubtedly been a drastic decline due to travel and gathering restrictions related to the pandemic. The drastic decrease should be examined so that it is expected that it will not significantly affect the amount of money spent by tourists. Making tourists more immersive and also adopt radical innovation in tourist destinations can increase spending, which will be helpful for the community (Lincaru *et al.*, 2020).

As the island with the densest population in Indonesia, Java Island is still the most significant domestic tourism trip. In Java Island, tourists from East Java Province recorded 18.41% of all tourist trips in Indonesia. Furthermore, West Java residents 17.41% and Central Java recorded 13.86%. Meanwhile, From outside Java Island, North Sumatra Province visitors are the most cities in the trip number reached around 3.63% of all tourist trips in Indonesia. Then it was followed by Bangka Belitung Arch., South Sulawesi, and Riau Arch. provinces which were 3.12%, 2.84%, and 2.79%, respectively. This condition is almost the same year by year which is also still dominated by provinces in Java. See figure 6 below.

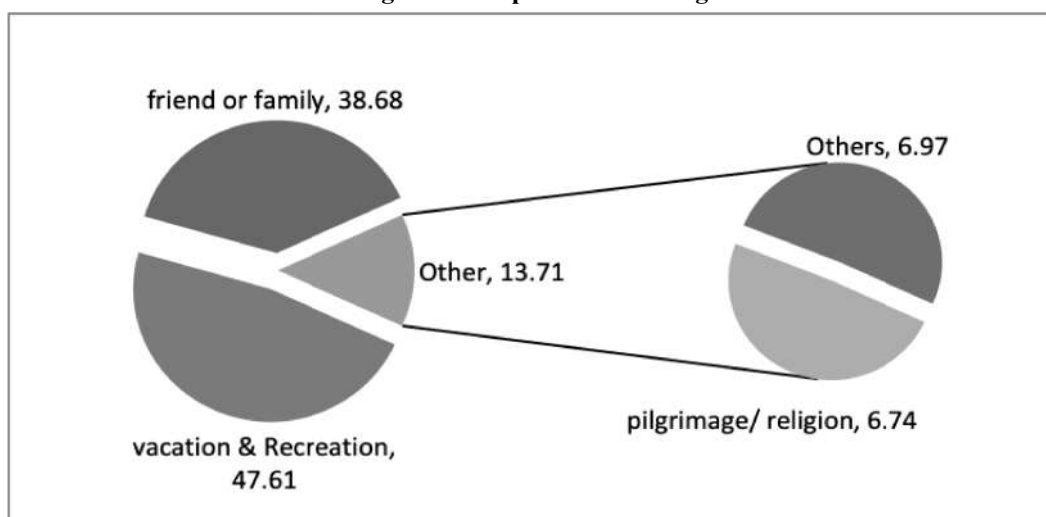
Figure 6: Domestic Visitor's Origin



Source: BPS-Statistics Indonesia, 2020a

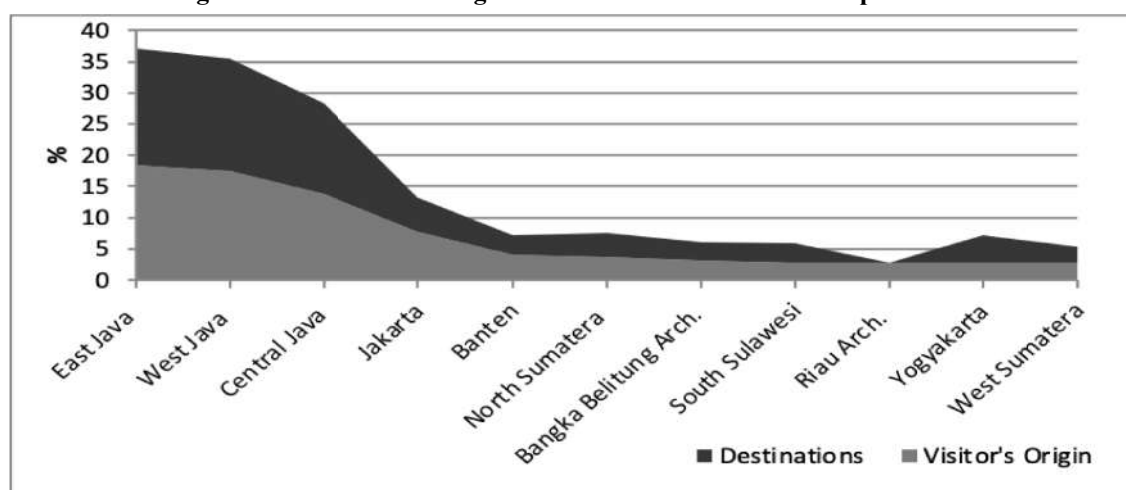
The total percentage listed in the BPS-Statistics report is 79.32% of all data obtained. The possibility the rest of the 20.68% of tourist's origins not written in the BPS-Statistics data are scattered too much from various places. Still, the value is considered not too significant to be included in the report. East Java Province is still the highest destination. The 2019 Domestic Tourist Survey results in the number of trips of the Indonesian traveler, reaching around 18.64%. West Java and Central Java occupy the second and third positions, respectively, about 18.06% and 14.36% as domestic tourist destinations. This condition is almost the same pattern that occurs nearly every year. North Sumatra Province reaches around 3.96% of all trips made by domestic tourists. Bangka Belitung Arch., South Sulawesi and West Sumatra provinces followed, respectively, 3.04%, 3.01%, and 2.55%.

The purposes of domestic tourists in traveling or visits are diverse. In several years until 2019, the visitor's most travel aim is vacation and recreation—the visitor's proportion of domestic tourists who leisure and entertainment reach around 47.61%. Tourists aiming for visiting friends or family are also quite a lot to run about 38.68% of Indonesia's whole domestic tourist trips. However, there was a slight decrease compared to the previous year. Then domestic tourists who aim for pilgrimage/ religion reached around 6.74%. Furthermore, 7% of tourists do various things from these three intentions: shopping, sports, health, training, MICE, business, and others, as seen in Figure 7 below.

Figure 7: Purpose of Traveling

Source: BPS-Statistics Indonesia, 2020a

Data from visitor origins and destination destinations shows that regions that have managed and created many tourist destinations are likely to get significant visitors (see Figure 8).

Figure 8: Most Visitor Origin and Favorite Destination Comparison

Source: Authors Anlysis, 2021

Despite Java being the statistically most significant population, they will travel to other areas out of Java if there is no destination. Furthermore, the central government's idea of building priority destinations and its infrastructure to capture foreign tourists must align with local governments concerned with domestic tourists. Greater coordination would ensure that tourism serves regional development needs (OECD, 2018).

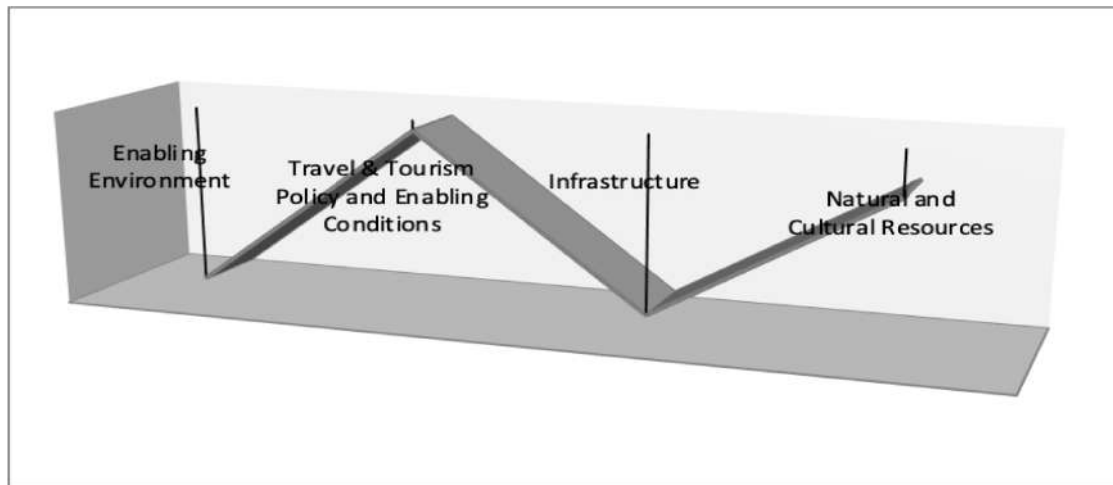
4.1. T&T Competitiveness Index

Apart from the data above, the WEF noted several things about the 2019 T&T Competitiveness Index. In the index covering 140 economies, the T&T Competitiveness Index measures the set of factors and policies that enable the sustainable development of the travel and tourism industry, which contributes to the development and competitiveness of a country put Indonesia ranks 40 among 140 countries other (Calderwood and Soshkin, 2019).

As for the potential and assessment of the index pillars, there are strong and weak points on tourism potential in Indonesia. In the Enabling Environment, this includes matters of the business environment, safety and security, health and hygiene, human resources and labor market, Information and Communication Technology/ICT readiness. Travel & Tourism Policy and Enabling Conditions aspect include prioritizing travel & tourism industries, international openness, price competitiveness, environmental sustainability. Water, ground

and port transport, and tourist service infrastructure support are also crucial for Indonesia. Another important thing as determination in global tourism competition is Natural and Cultural Resources. The low and high indexes condition is shown in Figure 9 below.

Figure 9: Indonesia High and Low Indonesia T&T Competitiveness Index 2019



Source: Calderwood and Soshkin, 2019, interpreted & edited 2020

Based on the 2019 T&T Competitiveness Index, tourism development in Indonesia requires two main steps: fixing the weakest points (Environment and Infrastructure) and utilizing strength points (T&T Policy and Natural & Cultural Resources). The environment has become a significant issue even for Bali, which has become a patron for developing priority destinations. An example of a change in traditional Balinese rice field irrigation is called the Subak system. The Subak is a traditional irrigation system which is a manifestation of Bali's Philosophy since the 9th century and has been ranked in the world heritage list (Zhang and Stewart, 2017). Many areas with the Subak system have turned into hotels and accommodation facilities, making it decrease by 35% from 2012 to 2017 (Lanya et al., 2018). Furthermore, it is known to discuss among stakeholders about the future of the local heritage and its presence to protect from tourism impact (Joukes, Costa and Diniz, 2018). The availability of internet networks and the readiness of citizens to interact with ICT-based technology also need to be a concern for other destinations that will be prioritized (Stamboulis and Skayannis, 2003). As for issue infrastructure, it is clear that it is described in the initial explanation of this article with the many facilities, roads, and ports built by the Government of Indonesia.

Indonesian President Joko Widodo recently signed Law No. 11 of 2020 on Jobs Creation (the "Omnibus Law"). The stated aim of the Omnibus Law is to bolster investment and create jobs by streamlining regulations and simplifying the licensing process to improve the ease of doing business in Indonesia. The omnibus law concept offers problem-solving caused by overlapping and too many rules (over-regulation) (Putra, 2020). Thus the existence of the omnibus law will support Travel & Tourism policy and enabling conditions in Indonesia.

5. Discussion

Results from the qualitative and quantitative analysis complement each other has given a comprehensive phenomenon. Core themes from previous studies extracted from the Scopus Database on tourism development in Indonesia using Bali as patron provide deeper insight for statistical data that has been analyzed descriptively. From the results above, we can propose several strategies for the obtained macro phenomena. Some proposed thoughts for tourism strategies development are as follows:

5.1. Foreign Tourists and 10 New Balis

The results of thematic analysis from previous studies extracted from Scopus show that Bali Island has become a concern and inspired for the tourism in Indonesia. The results of the descriptive analysis also show that foreign tourists make Bali their leading destination when visiting Indonesia. Thus, Bali, which has been an attraction to foreign tourists for years, needs

to be patterned to increase and expand the tourist market share. As the Bali-like project offers various interests, the ten priority destinations around the Indonesian archipelago will attract more foreign tourists. However, understanding to practical implication for region development should be in the framework of the economy innovation need (Napolskikh and Yalyalieva, 2019).

What needs to be planned further is to prepare the local community to benefit from developing international-class tourism destinations agglomeration like Bali. In the minimum scope, residents around destination development locations should be provided with advanced tourism knowledge and primary lifetime incentives (Purbasari and Asnawi, 2014; Manaf et al., 2018; Purbasari and Manaf, 2018; Putri and Adinia, 2018). At least they are provided health insurance and higher education scholarship so that the community's next role is to gain prosperity rather than escape from poverty. Schooling and enrollment in higher education are significant and positively related with GDP per capita (Bajrami and Leka, 2020). Awareness should be prioritized because all this new interest in the environment and local cultures has created a dynamic economic engine that can spur healthy economic growth in under-developed areas and result in unsustainable growth followed by rapid downturns (Wood, 2002).

5.2. Domestic tourist and Understanding Spatial Capital

The visitor groups who were falling behind, distressed, and recognition seekers tend to be mostly absent from the travel experience because of the lack of money (Dávid et al., 2020), so creating tourism destinations and attractions for locals become notable since distance affect cost. Making the village, coastal, or even urban area a part of community-based tourism development is also a proven solution from previous research. During a relatively short period, community-based tourism managed to become very popular and actively visited. Community-based tourism is in line with the concept of spatial development found in qualitative data interpretation analysis. Moreover, landscape and natural beauty are significant factors that should be maintained carefully because its linked to visitors and community satisfaction (Nemes et al., 2019).

With many visitors, the involvement of labor and production factors in the area will grow (Arkhipova, 2020; Chairat and Pechsong, 2020). Furthermore, there are several ideas that tourism will be in small groups in the future. For Indonesia, with a population of 269,603,400 (The World Bank, 2020) with revenue still in the Lower-middle income category (the US \$ 996-3,895) (Calderwood and Soshkin, 2019), mass tourism is still needed to provide a more massive spread of money and extensive use of labor. Moreover, what should not be left out is improving hygiene and safety and health protocols concerned with disease/ pandemic prevention.

5.3. Environment and natural resources concern

The community's economic advantages are expected to be conditioned to strengthen its cultural, natural, and biodiversity identity in its region. The mix of geographical, natural, climatic and social conditions is also a specific local factor that can be act as ultimate capital for tourism activities (Kovács, 2014). In the future, tourism business uniqueness will become a competitive advantage which is difficult to compete with other countries. Linking existing jobs to tourism is also progressively necessary since it can increase added value and realize bio-diversity concerns (Pongponrat, 2011; Chakraborty, Saha and Ahmed Selim, 2020; Zen et al., 2020).

For the moment, we can say that the problem of sustainability is how to alleviate poverty without negatively affecting the natural environment in such a method that future economic prospects would not damage. So, the entire ecosystem keeps in a safe condition (Magda, 2013). This opportunity matters because Indonesia is an excellent place for biodiversity (Cleary and DeVantier, 2011). If these are managed, maintained, and adapted to local conditions, it will be a great advantage. Additional focus on the planned development of priority tourism destinations in the locality is ethnic culture, economic and business growth equalization, and protection of natural biodiversity. Concentration of large firms around urban

areas should be avoided so to cope with environmental problems and to maintain fair competition (Akbasogullari and Duran, 2020).

5.4. Infrastructure and interconnected area

One of the main issues of regional autonomy in Indonesia is the infrastructure development gap between urban and suburban areas (Suparwoko, 2012). The government should prepare physical infrastructures such as a new airport, new toll roads, and new tourist facilities in these various destinations. Furthermore, reducing the transportation cost in the region is expected to attract firms and increase the amount of labor, as well as revitalize the regional economy (Sakamoto, 2012). It is also essential to note Indonesia's top ten destinations consider the infrastructure connectivity. Sustaining the economic development linked to tourism constitute an important driver and one of the prominent key is efficient infrastructure (Cutrini and Valentini, 2017).

Data have shown that almost half (47.61%) of trips are for vacation/ recreation and leisure. It means that the need for tourism products is vital to continue to be created. Besides that, the purpose of travel related to friends & family visit also occupies an influential position (38.68%). Given Indonesia's culture, it likely becomes an obligation for the host to please guests or families who come; thus, the reasons for tourism & facilities development are needed. Restaurants, cafes, souvenirs, local snacks, and various local specialty products are essential to be adequately managed. Furthermore, technology adoption can also help to reduce regional inequalities (Alexiadis, 2020). Understanding these interconnected issues will put future planning align to many previous types of research.

5.5. Cultural resources and interconnected activities

Bali's tourism activity relies on the uniqueness of its culture, natural beauty, and the attitude of its citizens towards tourism (Putra, Adhika and Yana, 2021). The focus on it should become a model for the development of tourism activities elsewhere in Indonesia. The determination of cultural uniqueness and traditional values will position 10 New Bali's destinations to get a different market instead of competing.

It should not be forgotten is to prepare the capacity building for all stakeholders in the regions to realize that there are around 280 million domestic visitors who are a potential market that requires satisfying tourism services. Another interesting finding is that the number of pilgrimage/ religion tours is quite large (6.74%), and the figure has never decreased from year to year. Indonesia, which has many religious sites, needs to continue improving and promoting new locations to shape and capture this type of tourist. Research also shows that tourist sites related to pilgrimage/ religion can quickly improve residents' economic conditions (Alatas, 2020).

Furthermore, when hundreds of millions of visitors become marketing targets, disaster mitigation becomes essential. The study results show that public mitigation has positively less total damage from the disaster; however, the policymakers are advised to improve mitigation to control disaster (Akhter et al., 2020).

5.6. Local economy growth

Dynamic process and socio-economic benefits appear in the related themes of previous research. The research is also confirmed by statistical data, which shows that the number of tourist visits is correlated with the amount of income and economic benefits. The challenge of getting the same number of visitors or even a lot more before the Covid-19 pandemic becomes more severe for the next two years after 2020. Many parties have had to recover their decreased economy before thinking twice about traveling. So for Indonesia, which has the most significant visitor from China before pandemic will be affected for the future visitor shape.

However, optimism that the tourism business will continue to grow remains. Improving the quality of tourism products can encourage tourists to pay more because it relates to satisfaction (Žabkar, Brenčič and Dmitrović, 2010). When visitors want to spend more, there will be a potential increase in revenue from the previous one. Along with other factors such as perceived value, tourist satisfaction can provide destination marketers with greater insight into

tourist loyalty behavior (Song, Su and Liaoning Li, 2013). A product's quality will also determine someone to pay more (Spáčil and Teichmannová, 2016).

The findings of tourism impact in thematic analysis led to the understanding that a strategy is needed to better understand the importance of the local economy. Implementing a slow tourism strategy so that visitors do not just come, take pictures and leave without spending a penny also needs to be designed. Slow tourism is a concept to hold visitors in a destination longer so that there are a more profound linkage and engagement with the surrounding environment (Pécsek, 2018). Furthermore, it will encourage more lavish spending with additional benefits in the form of concern for the destination environment due to creating unique co-creation of experiences, allowing tourists to become more physically and emotionally engaged in planning their vacations (Mathis et al., 2016).

5.7. Comprehensive development view

The role of government as a facilitator and catalyst in collaboration with local small-medium enterprises improves the local economy and social impact (Zapata et al., 2011). Furthermore, the government should support capacity building and give financial and technical assistance (UNEP, 2017), including more empowered non-capital-intensive enterprises. It also maximizes local skills and technology, discourages enclave practices, encourages flexible public-private partnerships, and creates and strengthens institutions and develops revenue-sharing policies for communities (Mandić, 2019).

New visitor's travel routes also need to be continuously developed by the local government and synchronized with the central government's Priority Destinations policy so that prospective tourists can plan for their trips. Thus a bottom-up approach and participatory process is required to establish a new economic paradigm (Stilianos and Christos, 2011; Papadopoulou, Papalexiou and Hasanagas, 2012; Horvath and Magda, 2017). The increase in consumption, investment, and government expenditure in the tourism industry positively affects economic growth (Hariyani, 2018). In other words, tourist facilities built to target foreign tourists should have an alignment version for domestic tourists at affordable prices. It also avoids too high a difference in inflation between regions because of deviations of the inflation rate, the speed of reaction of implementing correction measures, and the output cost of implementation that will affect other sectors (Kuncoro, 2020). Moreover, it will encourage the growth of trips and more widely destination option.

6. Conclusions

Using qualitative interpretation from thematic analysis and descriptive data analysis can help to see the prospects for a country's tourism development plan more fully comprehensive and scientific. Putting aside the very casuistic 2020 data due to the Covid-19 pandemic, the opportunities for tourism in Indonesia are still very bright. Stable and optimistic growth data shows tourism and various related activities will be pillars of the national economy. The creation of priority destinations using Bali as a model to increase the number of foreign tourists supported by massive infrastructure must also be synchronized with regional tourism development so that local people also get a good impact, especially from domestic tourists. Special economic zones like priority destinations are expected to succeed and boost economic growth (Khan and Haasis, 2020).

Attention to visitor demographic elements also needs to be increased because their services are also different. The needs that are understood and planned from the beginning of developing a tourism business will encourage better economic activity. This understanding of the origin of tourists and demographics also brings positive relationships for the people who run businesses. Socio-economic and environmental capital will push creative industries backed by supportive policies will become prominent issues to get higher added value for community (Lincaru et al., 2020). Furthermore, the government's economic policy should consider the local wisdom to overtake the related problems (Kuncoro, 2020), including tourism business activities. Another crucial thing that needs to be considered in any tourism development is that competitive advantages in culture, customs, local wisdom, and biodiversity must be maintained as a strong determination with competitors. Moreover, the

environmental damage that has occurred in Bali due to the impact of tourism can also be anticipated for other areas that will become priority destinations.

7. Limitations and Recommendations

The mixed methods, thematic and descriptive, allowed us to give rigorous perspective about specific topics. The Nvivo application help to build qualitative analysis to approximate the reality of the content and trend, and in this way, reduce the time needed to carry out the research. However, it is a method of approximation, and of course, it can be developed more. The approximation of qualitative analysis is then strengthened by quantitative descriptive analysis, thereby reducing the gaps in its studies.

The source for this study was a single database resource, which in our case was Scopus. It would be interesting to extend this work in the future and study another source in the same way. By comparing the results of both studies, the proposed view could be more evaluated. It would also be interesting to do a similar investigation using the most considered successful tourism destination as this one on different countries to understand the results and determine the difference in tourism future planning based on the previous related researches.

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COULD A NEW AGRICULTURAL AUCTION MARKET IMPLEMENT A GOOD MARKETING MIX?

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Abstract

As a new marketer, the Sleman auction market must compete with existing traders to meet consumer demand. One way to solve this problem by implementing a good marketing mix. This study aims to find out the implementation of the marketing mix in the Sleman auction market. The study was conducted in the Sleman Regency, Indonesia, from January to March 2020. The study used primary data from interviews with all auction market traders using a questionnaire and observation of various auction market activities. The data in this study was analyzed by the Likert scale. The study showed that implementing the marketing mix in the Sleman auction market was categorized as high. This is possible due to the managers' professionalism, support from external parties, complete infrastructure, and good relationships with other stakeholders. However, the Sleman auction market managers must increase the promotion using social media, improve auction market service training, increase the number of contract workers, transparent when delivering information to traders, and fix the Standard Operating Procedure.

Keywords: Chili, Likert, Marketing Mix, Sleman Auction Market

JEL classification: D12, D44, Q13

1. Introduction

Consumer behavior is challenging to predict because it can change rapidly, similar to how each actor has changed their lines, props, and costumes necessary to perform a film (Solomon et al., 2006; Anastasiou, 2020). Consumer behavior was influenced by various factors like individual, psychological, social, and marketing mix (Al Jeraisy, 2008). Engel et al. (2001) designed a model of consumer behavior when selecting a product or service influenced by the environment, individual, and psychological process. This model is strengthened by Kotler and Keller (2016), which stated that consumer decisions are influenced by marketing stimulus (marketing mix), other stimuli (economics, politics, technology, and culture), and consumers characteristics (individual, culture, social, and psychology). The model was dubbed the "black box" model that describes consumers' characteristics and decision-making processes.

When examined in-depth, each variable in consumers' behavior contains some items, such as the economic factors, including price, distance, and product grades (Asebe et al., 2007; Tadesse and Bahiigwa, 2015; Hendrarini et al., 2020). Individual factors that influence consumer purchasing intentions consist of age, gender, education, income, marital status, product knowledge (price, quality, and availability), and information accessibility (Kuhar and Juvancic, 2010; Gyulgyulyan and Bobojonov, 2019; Kumar and Kaushal, 2019); and social factors include advice from reference groups, culture, and religion (Noel, 2009; Kaewwongwattana et al., 2015; Domonko et al., 2018). The physical environment will also

influence consumer decisions (Stankevich, 2017). Because of these various factors, marketers will have to determine the right strategies for attracting consumers.

Since it is too complex, marketers will have a tough time identifying any factors that affect consumers' purchasing decisions. However, marketers should focus on optimizing the marketing mix because of its capabilities to boost product sales and marketers' comparative advantage (Badi, 2018; Wahyuningrum et al., 2019). It comprises four variables: product, price, place, and promotion, or the so-called 4P, which marketers use to generate appropriate consumer responses with what they want (Kotler and Keller, 2016).

New marketers would naturally pay attention to the marketing mix. One of them is the chili auction market in Sleman Regency, Yogyakarta Province. This auction market was founded in 2017 and is located in an urban area. This is different from other agricultural markets, primarily located in villages and near farmers (Akbasogullari and Duran, 2020; Nugroho et al., 2020). Farmers in Sleman Regency have relied on the chili auction market as the primary sale institution due to economic (products, prices, and access) and social (social interaction and extension) factors (Dewi et al., 2021).

The auction market's consumers are chili traders from all over the Sleman Regency. As a new marketer, the Sleman auction market must compete with existed traders. This auction market must win the competition because it will provide farmers with many benefits. According to some studies, the auction market has been proven to have many advantages, including the ability to sell farmers' products in large amounts at a reasonable price, to connect farmers with consumer demand, to create a national minimum price scheme, to improve the price discovery process, and to increase logistical efficiency by reducing transaction costs (Meulenberg, 1989; Meulenberg and Viaene, 1993; Heezen and Baets, 1996; Tourte and Gaskell, 2004; Prabhavathi et al., 2013).

The auction market must pay attention to the type, quantity, and price of products and the rules to improve its performance (Vieira, 2015). Consumers will abandon the agricultural auction markets if they cannot offer optimal service and fulfill their desire (Nugroho et al., 2020). According to several studies, this desire will be influenced by the trust in the auction market, completeness of product information, negotiating mechanism, and shipping costs (Clark and Ward, 2008; Martinez and Kim, 2012; Chen et al., 2016; Nalinipriya et al., 2019).

Our study tries to find out the implementation of the marketing mix in the Sleman auction market. It's critical for new marketing organizations, especially in agriculture, to learn about how to stay competitive and attractive to consumers. Moreover, agriculture is the primary source of livelihood for people in developing countries (World Bank, 2007). However, Indonesian farmer often receives unreasonable prices, resulting in low welfare (Mukhlis et al., 2020). The development of the Sleman auction market will give an excellent opportunity for farmers to strengthen their bargaining power and earn a decent income (Dewi et al., 2021). Until now, there were no studies that tried to evaluate the performance of the agricultural auction market through the marketing mix when this organization was just established. However, it is essential to provide advice to help this auction market develop. In terms of the science concept, this study is expected to provide perspective for marketing institutions that have just been formed to better understand consumer desires, especially in developing countries.

2. Methods

2.1. Data Collected

The study was conducted in the Sleman Regency, which has a new agricultural auction market and contributes to nearly 20% of the overall chili production in Yogyakarta Province (Special Region of Yogyakarta Province Central Bureau of Statistics, 2021). This study was conducted for 3 (three) months from January to March 2020.

The study used primary and secondary data. Primary data was obtained through interviews using a questionnaire and observation of various auction market activities. A closed-ended questionnaire consisting of one section was used for the present study: The section included questions about consumer perception on marketing mix (product, price, place, and promotion) that conducted by the Sleman auction market.

The population in this study were all traders who bought chili at the auction market. According to data from auction market managers, 26 traders already participated in auction activities until the end of 2019. All traders were interviewed about their perceptions of the auction market, or we used the census method. This method is a complete enumeration of all things in the population. There is no element of chance left, and the highest accuracy is achieved. This can be done when the population is a small one (Kothari, 2004). The secondary data came from the Sleman agricultural office and documents from the Sleman Central Bureau of Statistics.

2.2. Data Analysis

The data in this study were analyzed using the Likert scale. The Likert scale is used to assess a person's or a group's beliefs, viewpoints, and expectations about the study variables. These variables are converted into indicators that are used to create statement items. Each item's response will range from highly positive to highly negative. It can take the form of words and is given a score based on the researcher's determination.

In this study, the Likert analysis was used to determine how the marketing mix (product, price, location, and location) implemented in the auction market. Likert scales are often used to assess attitudes measurement. An individual is asked to provide value to express his attitude towards a statement. This value concerns individual reflection of reality or human psychic disposition as feelings, desires, and conative dispositions (Likert, 1932). The use of Likert scales has grown in popularity, especially in the service sector, where consumer surveys are commonplace. Likert scales are also used in psychology, sociology, health care, marketing, and quality control (Gob et al., 2007). According to Likert (1932), one of the most important aspects of a Likert study is the need to do validity and reliability tests. Validity is the most critical criterion and indicates the degree to which an instrument measures what it is supposed to measure. In other words, validity is the extent to which differences found with a measuring instrument reflect actual differences among those being tested. Meanwhile, a measuring instrument is reliable if it provides consistent results. A reliable measuring instrument does contribute to validity, but a reliable instrument needs not be valid (Kothari, 2004).

Traders will rate the condition of the auction market on a scale of 1 until 4 on multiple questions for each indicator. Scale 1 for strong disagreement, scale 2 for disagreement, scale 3 for agreement, and scale 4 for a strong agreement. The data were converted from ordinal to intervals with the Method of Successive Intervals. This method is a psychological scaling technique in which stimuli are divided into successive intervals based on the degree of some defined attribute they are judged to possess (Edwards and Thurstone, 1952).

The measures of the Likert analysis are as follows:

1. Calculating each scale score and the overall score (Table 1).

Table 1. The Likert analysis calculations in this study

Category	Calculation
The score for scale 1 (strong disagreement)	$= \sum SD \times 1 = A$
The score for scale 2 (disagreement)	$= \sum D \times 2 = B$
The score for scale 3 (agreement)	$= \sum A \times 3 = C$
The score for scale 4 (strong agreement)	$= \sum SA \times 4 = D$
Total score	= E

2. Calculating the ideal score.

- The ideal score is the total score if all respondents choose the highest scale (scale 4). Therefore, the ideal score is determined using the formula below.

$$\begin{aligned} \text{The ideal score} &= \sum \text{respondents} \times 4 \\ &= 26 \times 4 \\ &= 104 \end{aligned}$$

3. Calculating the marketing mix.

$$\text{Marketing mix} = \frac{\text{Total score}}{\text{Ideal score}} \times 100\%$$

$$= \frac{E}{104} \times 100\%$$

4. Comparing the marketing mix with the criteria in table 2.

The distribution of criteria is calculated using the following interval formula.

- Minimum score = total respondents x the lowest weight
- Maximum score = total respondents x the highest weight
- Lowest score = $\frac{\text{Minimum score}}{\text{Maximum score}} \times 100\%$
- Highest score = $\frac{\text{Maximum score}}{\text{Maximum score}} \times 100\%$
- Interval class = 4
- Interval gap = $\frac{\text{Highest score} - \text{Lowest score}}{\text{Interval class}}$

Table 2. Criteria of the marketing mix

Score (%)	Criteria
25.00% - 43.75%	Very low
43.76% - 62.50%	Low
62.51% - 81.25%	High
81.26% - 100.00%	Very high

3. Findings and Discussion

3.1. The Sleman Auction Market's Mechanism

The fluctuating chili price is the main problem for chili farmers in Sleman Regency. The abundant production during the harvest season results in a drop in the market price of the agricultural products (Syahril et al., 2019). Then, the Puncak Merapi Horticultural Farmers Association initiated an auction market at the end of 2017 to solve this problem. This auction market partnered with the Sleman Agricultural Office and the Indonesian Central Bank. Both institutions aided in constructing an auction market building, provided tricycle motors, conducted management training for market managers, and assisted in the socialization of chili cultivation to farmers. This type of external parties' assistance is desperately needed by market participants (Balomenou and Maliari, 2013; Chairat and Pechsong, 2020). According to Khusaini et al. (2018), government spending on infrastructure has been shown to drive economic and regional growth.

More farmers are selling their chili to the auction market over time due to price transparency and direct payment systems. Likewise, the number of traders who participated in the auction market is growing because the auction system is simple, and traders do not need to go to the auction market. Traders only need to contact the market manager by text messaging (WhatsApp or message) or phone calls to submit a price bid for each type of chili.

The following are the mechanisms used in the Sleman auction market:

1. The auction market managers send information on the quantity, quality, and type of chili available to auction market participants (traders) by text messaging or phone calls,
2. Auction market participants offer a price to the auction market managers by text messaging or phone, only one bid is allowed, and it must be done before 8 p.m.,
3. The managers recapitulate the price and choose the highest bid to be the winner,
4. Managers write down an auction winner on the announcement board so that farmers or auction buyers can see it,
5. Winners pay in cash or via bank transfer to market managers, using the direct or defer payment systems (for up to three days after the transaction). The winning bidder shall pay the auction price plus US\$ 0.03 per kg (additional money for auction market cash),
6. Chili can be collected directly by traders or using an expedition that transports it to other areas, and
7. If the auction winner does not buy all of the chili available, other traders can buy the remaining chili at the winner's price plus US\$ 0.03 per kg.

3.2. Implementation of the Marketing Mix

As described in the method, before conducting a Likert analysis, we need to test the validity and reliability of the model in this study. Tables 3 and Table 4 demonstrate the results of the validity and reliability tests.

Table 3. The validity test results for the marketing mix

Indicator	Item	R stat (>0.388)	Conclusion
Product	Quantity information	0.428	Valid
	Quality information	0.837	Valid
	Accuracy information	0.865	Valid
	Product type	0.640	Valid
	Packaging makes transport easier	0.752	Valid
	Packaging maintains product quality	0.693	Valid
	Product quality is good	0.887	Valid
	Product stills good after transportation	0.291	Invalid
	Better quality than middlemen	0.439	Valid
	Products are always available	0.616	Valid
Price	The auction price follows market price changes	0.825	Valid
	The auction price depends on the season	0.469	Valid
	The auction price following the buyer's expectation	0.693	Valid
Place	Easy to reach by various modes of transportation	0.561	Valid
	Easy to find	0.711	Valid
	There is a signboard	0.468	Valid
	It can be accessed on Google Maps	0.606	Valid
	There are human resources that help in transportation	0.476	Valid
	There is workers cost	0.522	Valid
	Good parking facilities	0.700	Valid
	A good place to load products	0.563	Valid
Promotion	Promotional information from social media	0.524	Valid
	Promotional information from the news	0.745	Valid
	Discounts	0.695	Valid
	Tells about the transaction experience	0.696	Valid
	Sources of information from farmers	0.528	Valid

In table 3, it is known that there is an invalid statement, so it is not used in further analysis. This occurs because the R-stat is less than the R-table (Gujarati, 2004). Meanwhile, valid items indicate that the prepared statement can be used to assess the Sleman Auction Market's marketing mix.

Table 4. The reliability test results for the marketing

Variable	Indicator	Cronbach Alpha	Conclusion
Marketing mix	Product	0.916	Reliable
	Price	0.647	Reliable
	Place	0.700	Reliable
	Promotion	0.676	Reliable

Based on table 4, it can be seen that Cronbach Alpha value of the marketing mix is more significant than 0.6 (Gujarati, 2004). As a result, this indicator can be used to help assess the marketing mix.

Next, we conducted the Likert analysis to meet the study's aim. The Sleman auction market has a high level of marketing mix implementation (Table 5). The indicator with the highest score is the price that accordance with the traders' expectations. The chili price in the Sleman auction market follows the fluctuating chili price in the market. This price will rise in the first week of every month and is US \$ 0.03 - 0.07 per kg more than the market price. At this moment, traders will reduce the amount bought due to a lack of funds. In microeconomics, as prices rise, consumers typically reduce the number of products they buy due to budget constraints (Pindyck and Rubinfeld, 2013). This condition should encourage banks to lend to market participants to boost the auction market performance (Abd. Majid et al., 2018).

Traders also try to buy chili directly from farmers, but farmers will refuse to sell chili and recommend traders to buy chili in the auction market. And if there are farmers who sell to

intermediaries, it is because they have a debt to the middlemen and agreed to sell chili to them in the harvest season. Meanwhile, the auction price is US \$ 0.01 - 0.23 per kg lower than the market price in the second week until the end of the month. Every chili price that forms in the auction market would be subject to a margin of US\$ 0.03 per kg by the managers. The margin will be used for cash in the auction market and wages of the auction market managers and workers.

When viewed as a whole, the prices formed in the auction market are significantly lower than market prices, resulting in profits for traders. This occurs because of the short marketing chain from farmers to the auction market. So, there are no marketing costs or profits from other institutions (intermediary or collective traders).

Table 5. Implementation of the marketing mix in the Sleman auction market

Item	Score	Percentage	Average (%)	Category
Product				
Quantity information	81.00	77.89	74.52	High
Quality information	78.00	75.00		
Accuracy information	76.00	73.08		
Product type	81.00	77.89		
Packaging makes transport easier	80.00	76.92		
Packaging maintains product quality	81.00	77.89		
Product quality is good	70.00	67.31		
Better quality than middlemen	77.00	74.04		
Products are always available	73.50	70.67		
Price				
The auction price follows market price changes	88.00	84.62	78.02	High
The auction price depends on the season	79.00	75.96		
The auction price following the buyer's expectation	77.00	74.04		
Place				
Easy to reach by various modes of transportation	90.00	86.54	75.00	High
Easy to find	86.00	82.69		
There is a signboard	65.00	62.50		
It can be accessed on Google Maps	62.00	59.62		
There are human resources that help in transportation	79.00	75.96		
There is workers cost	73.00	70.19		
Good parking facilities	86.00	82.69		
A good place to load products	83.00	79.81		
Promotion				
Promotional information from social media	69.00	66.35	57.89	Low
Promotional information from the news	54.50	51.97		
Discount	46.00	44.23		
Tells about the transaction experience	65.00	62.50		
Sources of information from farmers	67.00	64.42		

The problem related to the price is that traders often bid very high prices for chili but only buy limited amounts. Other traders are forced to follow these prices, but they buy in limited amounts too. As a result, chili in the Sleman auction market was not completely sold, forcing market managers to sell the next day. This condition is detrimental to both parties due to the fluctuating chili price and declining quality. Also, traders who dare to bid high prices are often unable to pay, and chili either fails to sell or is sold for a lower price because the quality has declined.

The place is the indicator with the second-highest implementation. This indicator is made up of 3 main items: location, worker, and facilities. First, the Sleman auction market is located in a strategic place. This is critical for agriculture to improve its business performance and facilitate access to information and stakeholders (Jaworski et al., 2017). The Sleman auction market is centrally located in the regency, making it easily accessible from all parts of Sleman. The auction market is close to the highway, easier to be reached by various transportation such as cars and trucks. The auction market position can be found in the Google Maps application, although most traders (92.31%) have known the auction market location since it was established. The majority of traders (96.15%) also said a sign indicating

the location of the Sleman auction market, even though it was located inside the auction market ward and was not visible from the highway.

Second, the Sleman auction market managers provide workers to help traders in hauling chili in the auction market. Traders do not need to pay them for their services because the wages have been paid by the auction market managers from cash funds. Due to the limited number of workers, the hauling process takes a long time, especially during the chili harvest season. Finally, traders will bring their workers to expedite the hauling process. As a result, traders must incur additional costs to pay their workers.

Meanwhile, traders have benefited from the efforts of the recording and weighing workers. If a mistake is made, the auction market's workers will immediately correct it. Also, the marketing workers have given friendly service to the traders.

Third, the Sleman auction market also has various facilities such as two rooms that can load 5 tons of chili and a large parking lot. However, managers must pay close attention to the tidy arrangement of vehicles to make transportation in the Sleman auction market smoother. Also, there are facilities to support auction market operations, such as computers, scales, blowers, crates, and three-wheeled vehicles. This is in line with the findings of Dovbiy et al. (2017), who stated that infrastructure development is critical to the development of a competitive and balanced agricultural business.

The product is another indicator with a high implementation score. This indicator is made up of 4 main items: information, types, quantity, and quality. First, the auction market managers regularly convey information about the type, quantity, and quality of products to traders via WhatsApp, message, or phone call. This is in line with Subejo et al. (2020) research findings, who found that developments in information and communication technology in agriculture can facilitate access to market information.

Second, curly chili and cayenne pepper are two varieties of chili available in the Sleman auction market. The managers have communicated the chili amount to be auctioned every day. Almost all farmers in Sleman sell chili to the auction market. This is because there are 13 gathering points spread over several sub-districts in the Sleman region. Farmers who live far from the auction market will quickly sell chili to the auction market thanks to the gathering points (Dewi et al., 2021).

Third, chili is always available in the auction market during the year to satisfy the needs of traders. One of the most popular market wishes is for farm goods to be available during the year (Chan, 2011). The amount of chili produced during the lean season (February-June) is minimal, less than 1 ton, while the amount produced during the harvest season (July-January) can exceed 4 tons every month (Table 6).

Table 6. The average quantity of chili in the Sleman auction market every month in 2019

Month	Type of Chili		Total (kg)
	Cayenne (kg)	Curly (kg)	
January	834	616	1,450
February	274	72	346
March	141	89	230
April	33	191	224
May	68	101	169
June	462	89	551
July	950	822	1,771
August	1,258	1,048	2,306
September	1,663	2,415	4,078
October	1,462	2,694	4,156
November	841	1,531	2,373

Fourth, there are 4 (four) grades of chili: SP, SP1, SPK, and SX. The first grade of chili is the SP or the best quality, with lengths of 10-15 cm and a flawless red hue. Next, the SP1 grade is chili with a length of 8-10 cm and a ripeness color of 90-100%. Meanwhile, grade SPK has a characteristic ripeness form of 60-90%, a curved fruit shape and a length of 6.5-8 cm. Finally, the SX grade is the lowest standard and is less than 6.5 cm in length, resulting in a low sale price. Each grade has a different price; in February-March 2020, the price of SP is 0.87 US \$ per kg, while the price of SP1 is 0.73 US \$ per kg. Traders said the chili standard in the Sleman auction market was higher than the chili offered by collective traders, so they

were delighted. Sorting and grading are strictly enforced in the auction market, whereas collective traders only sort without grading. This process is crucial because it can influence market value, the consumer's preference and choice. The better the agricultural product makes, the higher the value and the more preferred by consumers (Hozouri and Shahbazi, 2020; Bhargava and Bansal, 2021).

However, before selling chili outside the region, traders still sort and re-grade it. This is because various grades of chili are often blended. The auction market managers warned workers to be more cautious, but there are no consequences for those who make mistakes. Chili is also packaged in cardboard boxes weighing 30 kg each. This packaging makes the distribution more manageable and can maintain quality. After neatly packing it, traders will immediately send it to other areas, especially to the islands of Sumatra and Kalimantan.

Even though it has a high level of implementation, the product indicator still has some weaknesses, such as the fact that the managers only send the information to a few traders who actively participate in the auction activities during the lean season. This made traders feel dissatisfied because they were treated unfairly and not according to the standard operating procedure (SOP). This complaint has been conveyed to the auction market managers and the Sleman agricultural office, but the auction market managers have yet to respond or fix it.

Promotion is the indicator in the marketing mix with the lowest implementation score. Sleman auction market managers have never promoted using various information media and discounts. Promotion is only done personally by market managers, farmers, and traders. Currently, the majority of traders (84.61%) got information about the auction market from farmers. After completing an auction market buy, the trader informs to another trader. Hsu (2009) stated that good positive word of mouth would attract consumers to participate in auction activities. It will also expand network marketing and increase auction market income (Makni, 2014). The auction market managers also never give a discount because they must pay chili to the farmers according to the auction price. As a result, if a discount is made, the auction market will lose profits.

4. Conclusion

This study demonstrates that a newly formed marketing organization can perform well. From the perspective of a consumer, the Sleman auction market has a high level of marketing mix implementation. Price, place, product, and promotion were indicators with a range of values from high to low. This is possible due to the managers' professionalism, support from external parties, complete infrastructure, and good relationships with other stakeholders.

However, we also give recommendations for developing the Sleman auction market, among others: First, managers must increase promotion by conducting online promotions through social media and the "Panenin" app and offline promotions to chili trader associations around the Sleman Regency. This must be achieved for a large number of traders will participate in the auction market. As a result, traders' price rivalry is becoming more intense, making the auction market more competitive. Second, managers must also improve auction market service training and entrepreneurship, especially in administration and service quality. The auction market managers can collaborate with the Sleman agricultural office to coordinate this training (Vlachos and Malindretos, 2012). Improved service and entrepreneurship skills will increase the competitiveness of the agro-industrial enterprise and the level of economic development (Korres and Kokkinou, 2011; Sahin et al., 2011; Dovgal et al., 2017). Third, managers need to increase the number of contract workers, especially during the harvest season. This worker will be in charge of helping traders. Fourth, the auction market managers should be transparent in conveying information not to arouse jealousy and suspicion of traders. Finally, managers must also strengthen SOP, especially about trader obligations and rights.

Our study still has limitations, such as looking at the auction market's performance only from consumer's perspective. We believe further research is needed on the performance of the auction market in terms of suppliers (farmers) and the impact of this auction market on the economy.

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INTEGRATION PROCESSES IN THE ECONOMIC SPACE OF RUSSIA'S NORTHERN REGIONS

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Abstract

The article reveals the essence, provision factors, and development stages of the spatial integration of regional economies on the basis of a critical analysis of the scientific literature. The author studies the features of integration/disintegration processes in the economic space of Russia's European North in the post-Soviet period. The paper shows that cooperative relations of the region with other entities of the Russian Federation, which have been preserved since the USSR, can become an objective basis for the development of integration processes. However, they are constrained by a significant export orientation of the Northern region's economy, negative demographic and migration processes that limit the integration development in the region's labor market, and a decline in the level of spatial transport connectivity. The author substantiates conceptual areas, priorities, and tools for ensuring the spatial integration of the Northern region's economy at the intra- and interregional levels.

Keywords: economic space, spatial integration, disintegration, connectivity of space, European North of Russia.

JEL classification: R12

1. Introduction

The country's economy during the USSR period could be characterized by a high development level of interregional economic cooperation and integration of its constituent regions. In particular, according to statistics, the share of inter-republican exchange in exports in most USSR republics exceeded 90% in 1989, and imports – 70% of the total volume of products (including exports and imports, except the RSFSR where these figures were 68.5 and 49%, respectively).

At the same time, the collapse of the Soviet Union and “shock” market transformations of the 1990s led to a significant disruption of existing interregional technological, cooperative, social, and other ties, as well as to an increase in disintegration processes in the national economic space. Thus, the share of interregional turnover in the GDP, as a key indicator of the country's economic space integration, significantly decreased during market transformations: from 22% in 1990 to 12% in 1999. Even during the recovery and growth period of the Russian economy in the 2000s, this indicator did not grow significantly (2009 – 13%, 2016 – 13.2%) (Granberg, 1999; Gusev, 2011, etc.). As a result, once-stable spatial systems, such as economic regions formed on the basis of the national division of labor and cooperation, lost their positions significantly (Minakir, 2002).

In this situation, certain macro-regions of the country are more integrated into the world economy, rather than the national economic space (due to a small capacity of the domestic market too). At the same time, in the post-Soviet period, the Russian economy has further strengthened its export bias, focused on the supply of mineral resources to international markets (Rastvortseva N.S., Chentsova S.A., 2015). Thus, in 1995, mineral products accounted for 42% of Russia's exports, while they accounted for 63% in 2019. This was caused, first, by an accelerated growth of crude oil exports (by 1.8 times), petroleum products (by 2.3 times), and natural gas (by 1.13 times). The focus on the export of mineral resources has led to stagnation and crisis in the manufacturing industry. The focus on mineral resources export led to stagnation and crisis in the manufacturing industry's sectors.

These processes had a negative impact on the country's socio-economic and spatial development. It led to locational compression of the economic space, degradation of elements of the settlement and production framework outside of cities and large industrial centers. Its

ultimate consequence was an increase in disintegration processes and actualization of objectives to involve these territories in national technological value-added chains.

Russia is a northern country (nearly 65% of its area belongs to the Northern zone and its equated localities). The Northern regions that have a huge natural-resource, transit, and geostrategic potential, in accordance with the current legislation, include:

- 13 RF entities that belong to the regions of the Far North and its equated localities (Karelia, Komi, Yakutia, Tuva republics; Arkhangelsk, Murmansk, Magadan, Sakhalin oblasts; Nenets, Khanty-Mansiysk, Yamalo-Nenets, Chukotka AO; Kamchatka krai);
- 11 entities that partially belong to the regions of the Far North and its equated localities (Altai, Buryatia republics; Amur, Irkutsk, Tomsk, Tyumen oblasts, Zabaykalsky, Krasnoyarsk, Perm, Primorsky, Khabarovsk krais).

Researchers usually consider the Vologda Oblast a part of the Northern territories of European Russia, because, historically, it belonged to the North within the system of the USSR economic zoning (for example, it was a part of the Northern Krai (1929–1936), the Northern Economic Region (1982–present)).

The object of this study is the territories of *European North of Russia (ENR)*, which is one of the largest regions of the country's European part (1,466 thousand square kilometers). The importance of this region for the country's spatial development is explained by the fact that Arctic municipalities of Russia's European North, according to the Spatial Development Strategy of the Russian Federation until 2025, are geostrategic territories, and the region itself is a buffer zone where trade and other cooperation with European countries (Germany, Finland, Sweden, Norway, etc.) take place (Kozhevnikov S., 2020). Here (from the Kara Strait), the Northern Sea Route originates. It is one of the major international sea transport arteries, which will become even more important in the future (Fig. 1).

Figure 1. Territories of European North of Russia (ENR) *



*ENR includes Vologda, Arkhangelsk, Murmansk oblasts, Republic of Karelia, Komi Republic, and Nenets Autonomous Okrug

In the Soviet period, the Northern territories were a separate and strategically important object of the state administration. Thus, several strategic and program documents were approved and implemented for its development, and special administration structures were established (for example, GOELRO plan (the state plan for electrification of Soviet Russia after the October Revolution of 1917); a joint resolution of the Council of People's Commissars of the USSR and the Central Committee of the Communist Party "On measures to develop the Northern Sea Route and the Northern economy"; a List of regions of the Far North and its equated localities was approved; Regulation on the Commission for Arctic and Antarctic Affairs under the Cabinet of Ministers of the USSR and personal composition of this Commission, etc.), organizational, financial instruments and infrastructure were created that helped to develop and "settle in" the Northern territories (including "northern" wage allowances, longer holidays for employees; housing, social, and transport infrastructure facilities were actively constructed with the participation of the government, etc.).

However, in the 1990s, the state's role in the development of these territories significantly decreased. Many compensatory mechanisms began to lose their scale and efficiency. Negative trends in the economic space of Russia's Northern territories were growing, and they were mostly noticeable in its polarization and the activation of all disintegration processes;

increasing level of differentiation of these territories in terms of potential and development level.

Thus, researchers (Baburin, Tikunov, et al., 2018) used the method of microgeographic analysis of potential density characteristics to propose a classification of the Russian Arctic territories (5 types), which significantly differ in terms of socio-economic potential, opportunities, and prospects for development. It requires the strengthening of the state's role in ensuring sustainable development of these territories.

The government's interest in the Northern territories emerged again only in the mid-2000s. However, currently, its focus is on the development of the Arctic zone of the Russian Federation – not an entire territory of the North (including nearby and middle zones). In this regard, a relevant scientific and practical task is to assess consequences of the spatial transformation of Russia's European North in the post-Soviet period and to develop tools to improve its internal connectivity and integration into the economic space of the country by using specialization and cooperation advantages.

The purpose of the work is to assess the state and substantiate the tools for improving inter- and intraregional integration of the Northern region's economic space.

Achievement of this purpose includes the solution of the following objectives:

1. To study theoretical approaches to understanding the essence, prerequisites, and factors for ensuring the regional economy's spatial integration.
2. To explore the features of integration and disintegration processes in the economic space of Russia's European North in the post-Soviet period.
3. To substantiate priorities and tools for ensuring spatial integration of the economy of the Northern region at the intra- and interregional levels.

In our opinion, natural-resource, human, and production potential of these territories will be efficiently used for solving Russia's national economic problems only if the role of the state in the management of these territories increases together with the modernization of territorial and economic systems of the North, which developed in the Soviet period, key sectors of its economy develop on the innovative basis, and the search for new areas of specialization occurs. It, however, requires adjusting the priorities of the country's spatial development, finding new growth sources not only for cities, but also, first, for medium and small towns, as well as rural areas.

2. Literature Review

After the period of disintegration and acute competition of Russian regions for attracting financial, personnel, investment, and other resources in the 1990s, it gradually became clear that such relations do not contribute to a successful solution of regional problems, because they lead to enclavization and isolation of these territories' economic systems.

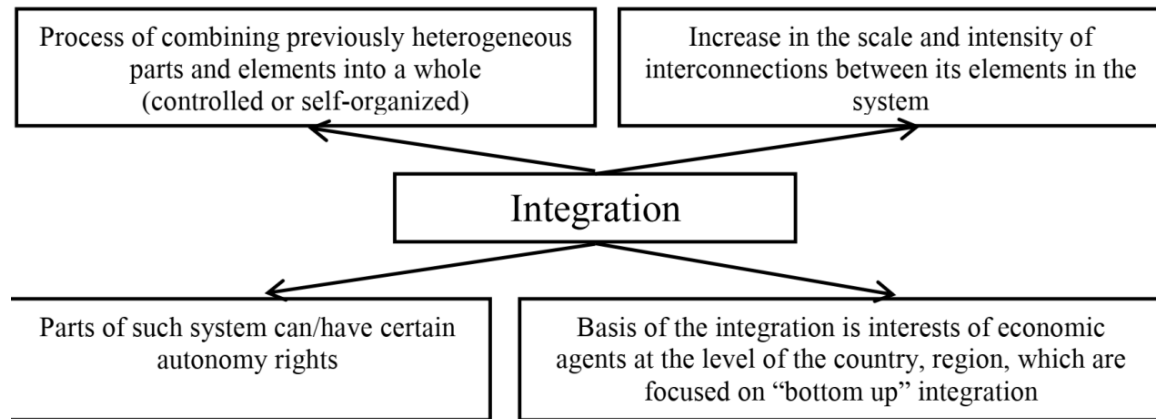
According to researchers (Polterovich, 2015; Knyazev, 2018), unlimited competition entails high costs and, as a rule, it is inefficient in modern conditions. At the same time, the competition itself gradually evolved and the role of cooperation elements, which is characterized by the coordination of parties' efforts, significantly increased. This type of cooperation leads to the saving of participants' financial and other resources; acceleration and expansion of innovative transformations; combination of efforts and means of countering competitive attacks from other territories that do not participate in specific cooperative interactions (Vazhenin, Vazhenina, 2020).

Thus, the economic science more often embraces an opinion (Abalkin, 2002; Baklanov, 2002; Minakir, 2004; Lazhentsev, 2010; Deutsch, 2012; Uszkai, 2015 et al.) that it is necessary to focus not just on a competition, but on a cooperation and coordination of regions' efforts to develop and integrate as socio-economic spatial systems. These circumstances indicate that one of the current key tasks of federal and regional authorities is to ensure the spatial integration of the RF regions' economy. It should be noted that this task is difficult because, in the Russian spatial science, there is a rather low level of the development of the theory and methodology of regional integration in market conditions; so far, there is no unified interpretation of the essence of this category and factors that ensure a practical spatial integration. We will try to answer these questions in this article.

The “integration” category is currently broadly studied in social sciences. It is understood in philosophy as the development related to the merging of heterogeneous parts and elements into a whole. These processes can occur within an existing system and lead to an increase in the level of its integrity and organization; or within the formation of a new system from previously unrelated elements.

The main “generic” features of the “integration” category, identified by the analysis of scientific literature and practice, are presented in figure 2.

Figure 2. The main “generic” features of the “integration” category



Source: own compilation.

As noted by classic authors of studies on these processes (for example, Balassa, 1961), practical integration means all phenomena that lead to the strengthening of economic ties or between territories’ economies in a way that the result is a harmonious whole. In other words, it is usually considered a process that helps a single economic structure to form because of changes in real and regulatory spheres (integration processes in the real sphere are associated with a free flow of commodities and services, factors of production, and information; in the regulatory sphere – adjustment of institutions, structures, and applicable legal norms in individual markets).

According to H. Marcuse (1997), the integration reflects “the creation and maintenance of intensive and diverse interaction patterns” mostly by removing barriers to free mobility and establishing positive and non-hierarchical relationships. Spatial integration allows using all advantages of a territorial division of labor and cooperation (sharing resources, pooling capital, creating favorable conditions for economic activity (Arent A., Bojar M., et al., 2015).

At the same time, according to the researchers (De Boe et al., 1999), there are two main approaches to the analysis of integration:

- integration between different spheres (industries) in a territory;
- integration between different territories in a sphere (industry).

These approaches were recorded in the EU policy documents. However, they do not explicitly mention spatial integration, but instead use the concept of “territorial cohesion”.

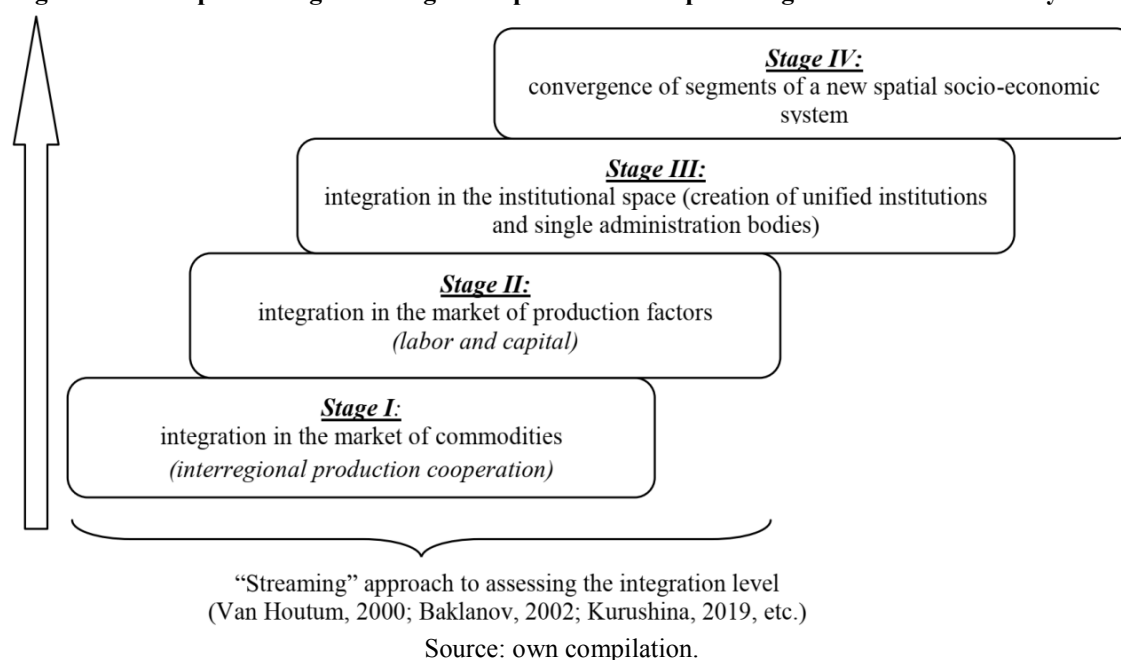
Also, there is no unified approach toward forms and models of integration in the literature. However, it is possible to draw a clear distinction between its two major forms: mechanical and organic. “Mechanical” integration refers to a characteristic of a spatial system’s structure, and it is a measure of its internal homogeneity; it occurs if regions are characterized by, approximately, the same level of key development indicators (for example, gross regional product per capita, unemployment, infrastructure development, etc.). At the same time, organic integration is characterized by the presence of stable, balanced flows between a system’s elements, and it is a measure of the intensity of relations between subsystems.

There is also a classification of integration processes according to a degree of rigidity of relations between a system’s elements: in “hard” integration, relations between parties are regulated by government documents/internal corporate regulations; in “medium” integration – by economic agreements; currently, “soft” integration plays a major role – it makes socio-cultural, historical, and other relations without legal obligations of participants important (Polanyi, 2002; Cechella C, 2010).

In this research, we understand spatial integration of regional economies as a controlled multi-factorial process of increasing connectivity and convergence of regional space segments because of increasing scale and intensity of contacts (economic, social, cultural, etc.) between its elements.

Within the communicative approach to the interpretation of space, the following stages of regions' spatial integration development can be distinguished (Fig. 3). As a result, at the "mature" development stages, there is usually a convergence of segments of a new spatial socio-economic system (Çolak O., 2015). At the same time, according to the European Union study (Alexiadis, 2020), the process of regional convergence here is currently limited by significant differences of regions (NUTS-2 EU-27) in the level of their scientific and technological development, and technology implementation.

Figure 3. Development stages of integration processes in a spatial regional socio-economic system



The results of the critical analysis of theory and practice allowed us to identify the following prerequisites and factors that positively affect spatial integration of regional economy (Voronina, 2014; Tinbergen, 2006; Frolov, Mirzoev, 2014):

- geographical proximity of territories (territorial proximity and common borders (Lanaspa Santolaria L., Olloqui Cuartero I., et al., 2015);
- social, economic, cultural, and other similarities of territorial systems, existence of traditional historical links between regions;
- functional and resource complementarity of territories (resources: natural, human, personnel, investment, economic-geographical and geostrategic location);
- general infrastructure of territories (transport, energy, financial, information, etc. (Dionelis C., Mourmouris J., et al., 2012; Hirobata Y., Miyata Y., et al., 2011);
- spatial proximity (measured by economic distance);
- absence of cultural and political contradictions between a system's elements;
- similar problems of territories' socio-economic development (for example, for the Far North territories);
- high capacity of regional markets, stimulating development of production and trade relations;
- efficient administrative bodies.

Integrated management of these factors is an objective basis for the development of integration processes in the economic space.

3. Research methods

The most common method of assessing integration processes in space from the perspective of the “metabolism” function of a socio-economic system (stage 1 and 2), according to A.M.

Libman and B.A. Heifetz (2011), is the assessment of absolute and relative indicators of flows of production commodities and factors (labor, capital). This classical functional approach to spatial integration, called the “flow approach” by Van Houtum (2000), is most often analyzed by the authors.

At the same time, we should agree with B. Balassa (1961) that such interchange characterizes only initial stages of economic integration. The significance of flows between places is not sufficient to determine the existence of spatial integration. At the same time, in many cases, such flows can be asymmetric and associated with social or economic heterogeneity between territories (Engin Duran H., Pelin Özkan S., 2015). Flows help to determine a material dimension of spatial integration (Var E.B., Yazgi B., et al., 2014), but they do not directly provide information about its institutional and mental dimension that is the most important in the long term (Kurushina, 2019).

To assess the level of cooperation relations between entities of Russian European North, Rosstat data on the volume of commodities' import and export were used; to assess migration processes, data of Rosstat and its territorial bodies were used. Moreover, we substantiated and tested the methodological tools for assessing integration processes in the region's economic space from the perspective of the development of migration relations between the territories. They include the calculation of the following coefficients:

a) coefficient of efficiency of migration relations (CEMR) is a quotient of a number of departures from region *i* to region *j* by a number of arrivals in the opposite direction, measured in per mil. Region *i* actively gains population if the CEMR is less than 800; region actively loses population if the CEMR exceeds 1250;

б) coefficient of intensity of migration relations (CIMR) is the ratio of the paired volume of departures in the total volume of departures of the *i*-region to the migration capacity of this region in the entire active environment of the array;

в) migration index of spatial structure of turnover (MISS) shows how high the connection tightness between two regions is in comparison with the arithmetic weighted average for the entire array of interregional migration links.

The economic space integration and provision of its connectivity largely depend on the development level of transport and other infrastructure. To assess the level of transport development in Russian European North, we used data of the Federal Road Agency (Rosavtodor) for the RF entities.

4. Results

According to the results of the conducted analysis, liberalization of foreign trade in the early 1990s significantly affected the economy of Russian European North. Thus, according to Rosstat data on the volume of commodities' import-export, currently, nearly 65–70% of products of the Republic of Karelia, 55% of products of the Murmansk Oblast, 40% of products of the Komi Republic are delivered to foreign markets. Moreover, a significant share of exports includes products of the region's specialized industries – mostly of low technological conversion: fuel and energy complex (Komi Republic, Arkhangelsk Oblast), chemical industry (Vologda Oblast), ferrous and non-ferrous metallurgy (Vologda and Murmansk oblasts), and timber industry (Karelia, Komi, Arkhangelsk Oblast). In some regions of the Russian Federation, food products are also significant (for example, fishing products in the Murmansk Oblast). In turn, the ENR entities import products of mechanical engineering (machinery, equipment, vehicles) and petrochemical complex – goods of higher levels of technological conversion (Tab.1).

Table 1. Commodity structure of exports and imports of entities of Russian European North (2018)

Territory	Food products and agricultural raw materials		Products of fuel and energy complex		Chemical industry products, rubber		Wood, pulp and paper products		Metals and products made of them		Machinery, equipment, and vehicles	
	E	I	E	I	E	I	E	I	E	I	E	I
NWFD	6.7	20.9	47.7	0.48	8.7	12.5	9.7	2.7	14.3	6.64	8.2	47.7
Republic of Karelia	5.9	10.9	0.1	0.3	1.2	17.2	47.5	11.6	1.1	15.1	1.8	39.3
Komi Republic	0.0	0.2	32.1	0.1	2.9	32.8	63.5	6.1	0.0	3.81	0.2	51.9
Arkhangelsk Oblast (with NAO)	3.5	6.6	39.8	0.1	0.2	9.6	34.9	0.6	1.5	4.53	8.5	76.4
Vologda Oblast	0.5	12.6	0.3	0.6	32.6	12.3	11.1	4.5	52.9	18.0	1.2	42.9
Murmansk Oblast	17.2	14.3	2.8	0.0	0.3	31.8	0.0	0.4	68.7	13.1	0.7	37.7
For reference: E – export, I – import.												
Source: own calculation based on data of the Federal State Statistics Service.												

In other words, within such model, the European North loses significant resources that could be used to ensure the accelerated growth of its economy and improve northerners' well-being.

For example, the most export-oriented entity of the ENR – the Republic of Karelia – has Finland as its key counterparty country: its share in the foreign trade turnover of the Republic is about ¼. The commodity structure of exports in 2020 was dominated by pulp and paper products (38.5%), fuel wood, unprocessed and processed timber (37.4%); food products and raw materials for its production (18.8%). In import – machinery products (boilers, machinery, industrial equipment, electrical machinery, and equipment).

To enhance cross-border cooperation between territories of the Republic of Karelia and Finland, the “Karelia” Euroregion was established in 2000. In general, its activities, to a certain extent, contributed to the development of interregional cooperation between countries in the commodity markets. However, as the authors rightly note (Druzhinin, Kukhareva, 2012), such cooperation between the territories was not a parity-based and “in fact, the western part of Karelia became a part of the Finnish forest cluster, supplying raw materials for Finnish timber processing enterprises”.

In other words, the nature of such relations did not lead to more “mature” stages of integration processes, i.e., a qualitative convergence of economic systems of Russian and Finnish regions in terms of the main socio-economic indicators and their development as a single cross-border region due to the continuing extremely high disparities in the development of its parts. In particular, in 2018, household income per capita in Finnish territories of the “Karelia” Euroregion was 18.5 thousand euros; in the Republic of Karelia – about 5900 euros (i.e. 3.1 times less). Also, there are huge technological economic differences in these territories. Thus, in the Kainuu economic structure (Finland), economic activities related to “blue” bioeconomy, mining, innovations in metallurgy, forestry, as well as information and communication technologies (ICT), and electronics are significant; in North Karelia (Finland) – forest bio-economics, distributed by bioprocessing, renewable energy sources, technologies and materials (photonics, ICT, development of materials for chemical industry), wooden housing construction; in North Ostrobothnia (Finland) – clean technologies, including the energy sector; ICT and software development. In turn, in the Republic of Karelia, the key economic sectors are types of economic activities of low technological conversion (forestry and mining, electricity production, food and chemical industries).

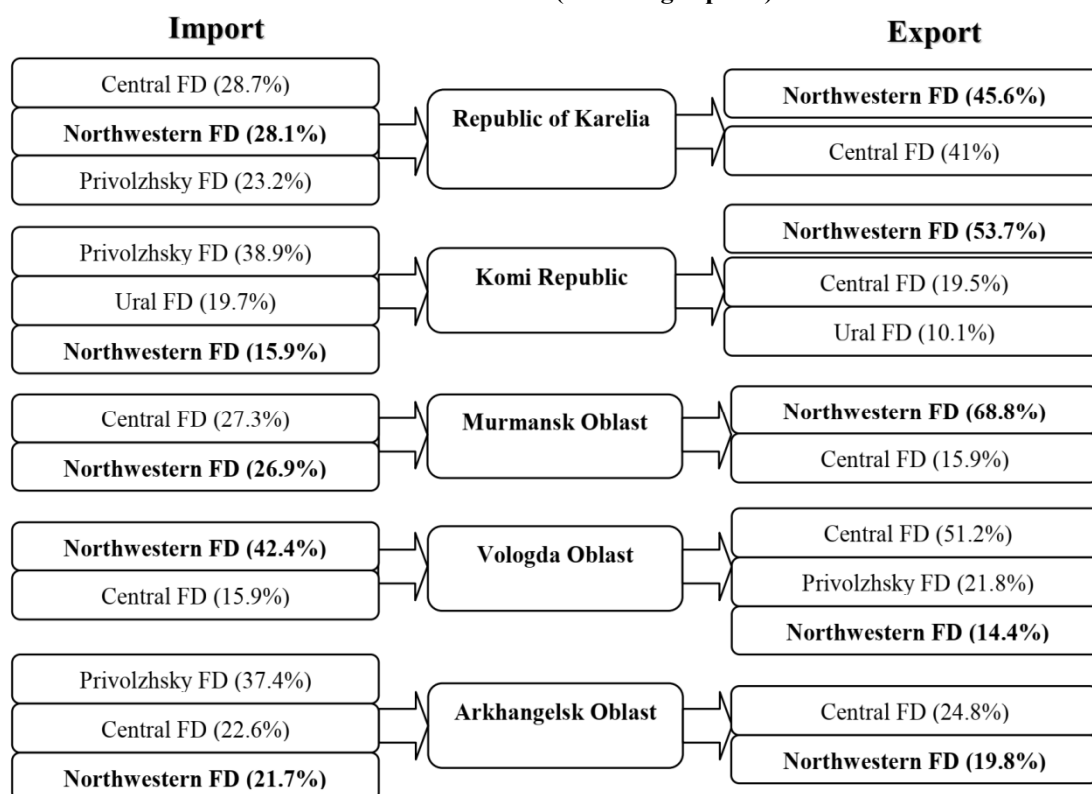
For the Russian party, the situation with modernization is aggravated by extremely low spending on science and research (in Karelia, on average, it is 18-80 times lower than in Finland), which preserves the outdated structure of the Karelian economy. At the same time,

the territories of Finland develop within the innovative “knowledge economy”, producing products with high added value.

The existence of certain cooperative processes in the region’s economic space can be assessed by directions of commodity flows. Entities of Russian European North have rather close ties with each other in terms of commodity exchange, and it is especially evident in the Northwestern Federal District. In the structure of commodities, imported to the Republic of Karelia from other entities of the Russian Federation, the NWFD accounts for 28% of the total volume of commodity flow; in turn, 45.6% of goods exported from the Republic to other entities of the Russian Federation are also in the NWFD. Among the ENR entities, the closest ties have developed with the Vologda, Arkhangelsk oblasts and Komi. However, the main attraction centers for incoming and outgoing commodity flows within the district are

St. Petersburg and the Leningrad Oblast (Fig. 4).

Figure 4. Main flows of commodities’ import-export in the territory of Russian European North, % of a total volume (excluding exports)



Source: own calculation based on data of the Federal State Statistics Service.

It should be noted that the main categories of products that are exported outside the ENR to the NWFD territory and other regions are products of the mineral raw materials complex and processing of natural resources (non-metallic construction materials, wood, lumber, paper, coal, and products of its processing, rolled ferrous metals, steel pipes, fertilizers), food industry (milk, meat, sausage, and confectionery products, compound feed). In turn, southern entities of the NWFD (St. Petersburg, Leningrad Oblast) supply the following products to the European North territory and other RF regions: food (sweets, beer, sausage, etc.) and commodities of higher technological conversion – products of ferrous metallurgy and mechanical engineering (steel pipes, passenger and cargo cars, cargo wagons, air and gas drive compressors, bulldozers and cranes, medical equipment), petrochemicals (paint and varnish materials, automobile tires, synthetic detergents), TIC (household furniture).

Thus, Russia’s European North retains a historically established status of the “currency workshop of the country” and “resource storehouse”. Production and primary processing of natural resources remain major specialization areas of the region. Preserved relations with the NWFD entities and integration in the commodity markets are objective prerequisites for the development of more mature forms of integration processes in the economic space.

However, the research shows that integration processes in the ENR markets of production factors have not received a high level of development. For example, in the labor market, this is primarily related to high centripetal vectors of population migration. Population of the European North mostly migrates to the Central FD and the Leningrad Oblast. Thus, the population of the Murmansk Oblast mainly leaves for the CFD (7827 people out of 39866 residents who left the region for other country's subjects, or nearly 20%; mostly – to the Moscow Oblast (1485 people, 4%) and Moscow (1072 people, 2.7%)), other entities of the NWFD (24846 people, primarily – St. Petersburg (5871 people, 14.7%) and the Leningrad Oblast (2649 people, 6.6%)), the Republic of Karelia (1206 people, 3%).

In 2018, the population of the Komi Republic left for St. Petersburg (2576 people out of 22642 people who left the Republic for other regions, or nearly 11.4%), Moscow and the Moscow Region (2614 people, 11.5%), the Kirov Oblast (1791 people), and Krasnodar Krai (1632 people).

From the Republic of Karelia, people also leave primarily for the Leningrad Oblast (616 people out of 9530 people), St. Petersburg (521 people), the CFD – 254 people (mostly, the Moscow Oblast).

Before 2011, the Vologda Oblast had a positive migration balance, and later it became negative. The population from the Vologda Oblast mostly relocates to other subjects of the NWFD (first of all, St. Petersburg).

Thus, in the post-Soviet period, the subjects of Russia's European North lost their population due to migration. The main attraction centers are Moscow and the Moscow Oblast, St. Petersburg, and the Leningrad Oblast. At the same time, we agree with S. Farahmand and N. Ghasemian (2019) that regions, which are actively losing their population, may soon face a reduction and, perhaps, even destruction of not only human, but also material capital. It will eventually lead to stagnation of the territory's production and economy.

Using the well-founded tools for assessing integration processes from the perspective of the "flow" approach and calculating the corresponding coefficients, we have identified that relatively balanced migration flows only exist between the subjects of Karelo-Kola (Murmansk Oblast and the Republic of Karelia) and Dvino-Pechora (Komi Republic, Nenets AO, Arkhangelsk and Vologda oblasts) sub-regions of the European North. At the same time, in the post-Soviet period, such connectivity was significantly disrupted due to the increasing centripetal vector of migration to the NFFD and CFD (Manaeva I., Rastvortseva S., 2016). These processes cause the polarization and disintegration of the region's space (Tab. 2).

At the same time, despite the reduction of an extremely high level of heterogeneity of space in terms of labor market tension in 1992–2019, its current value (48.7%, threshold value of the coefficient – 33.3%) still indicates a low level of its integration, which cannot yet be provided by migration flows within the region.

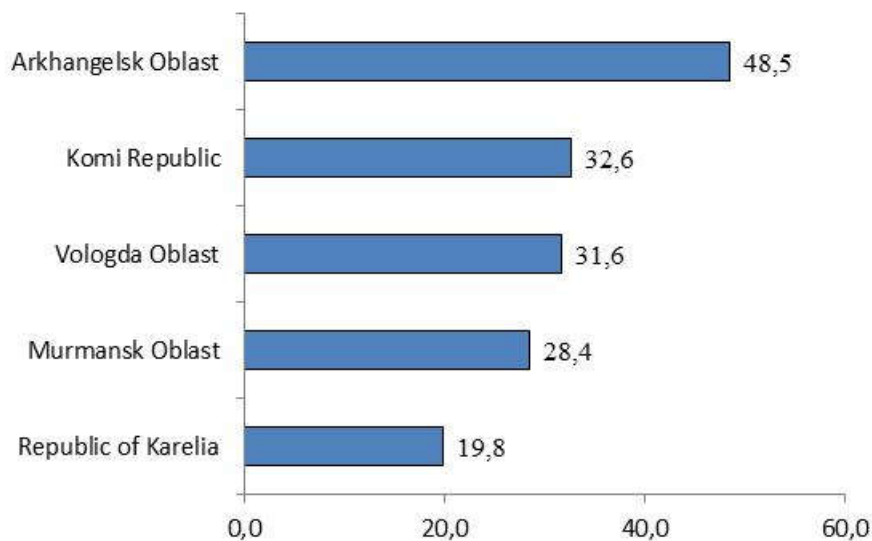
One of the barriers to spatial integration of the country's economy is its weak infrastructure (Manaeva I., Kanishteva A., 2017). At the same time, according to the annual study of the InfraOne investment company, the main specialization of which is direct investment in infrastructure, these problems are truly relevant for the entities of Russia's European North. At the same time, such issues are particularly relevant for the region's transport infrastructure: in the Arkhangelsk Oblast, its development level is 2.52 points, in Karelia – 2.73, in the Vologda Oblast – 2.86, in the Komi Republic – 2.99 points out of 10 (the leader is Moscow – 8.54 points).

Table 2. Indicators of interregional connectivity for population migration of the ENR entities

Region j	CEMR paired, %	CIMR (departures), un.	MISS of turnover, times
Vologda Oblast (region i)			
Arkhangelsk Oblast	1001.84	1.51	1.41
Murmansk Oblast	1051.53	1.21	0.82
Republic of Karelia	1419.19	0.48	0.48
Komi Republic	826.64	0.50	0.93
Arkhangelsk Oblast (region i)			
Vologda Oblast	998.16	1.14	1.31
Murmansk Oblast	1487.78	1.60	0.89
Republic of Karelia	937.20	0.26	0.30
Komi Republic	966.32	0.82	1.37
Murmansk Oblast (region i)			
Arkhangelsk Oblast	672.14	1.02	0.93
Vologda Oblast	950.99	0.83	0.79
Republic of Karelia	1075.83	2.32	2.09
Komi Republic	584.84	0.23	0.42
Republic of Karelia (region i)			
Arkhangelsk Oblast	1067.01	0.44	0.37
Vologda Oblast	704.63	0.41	0.55
Murmansk Oblast	929.52	3.63	2.45
Komi Republic	2222.22	0.23	0.27
Komi Republic (region i)			
Arkhangelsk Oblast	1034.86	1.68	1.69
Vologda Oblast	1209.72	0.90	1.07
Murmansk Oblast	1709.88	0.83	0.50
Republic of Karelia	450.00	0.13	0.27

Source: own calculation based on data of the Federal State Statistics Service.

According to our calculations based on Rosavtodor data, poor transport connectivity is natural, first, for rural areas of the eastern ENR entities. Nearly 48.5% of rural localities in the Arkhangelsk Oblast do not have auto transport connection for paved roads with a network of public roads (the nearest railway station, port (pier), airport); in the Komi Republic – 32.6%, in the Vologda Oblast – 31.6% (Fig. 5).

Figure 5. Share of rural localities that do not have auto transport connection for paved roads with a network of public roads (the nearest railway station, port (pier), airport), % of their total number

Source: own calculation based on Rosavtodor data.

To solve this problem, a local road network has been developed: in the Murmansk Oblast, about ¼ of rural settlements, in the Komi Republic – 11%, in the Arkhangelsk Oblast – 4.5% of their total number are connected through it to the nearest railway station, sea or river port (pier), airport. At the same time, such transport system is a factor that limits connectivity of the economic space, free movement of commodities and people, and leads to additional time and other logistics costs. A poor development of the transport infrastructure and its limited capacity lead to an increase in the economic distance and “viscosity” of the country’s Northern regions space in certain areas.

Several barriers to ensuring spatial integration of the Northern regions’ economy are associated with the current system of public administration. Thus, based on the analysis of 2025–2030 strategic documents of the federal level and entities of Russia’s European North, it was revealed that:

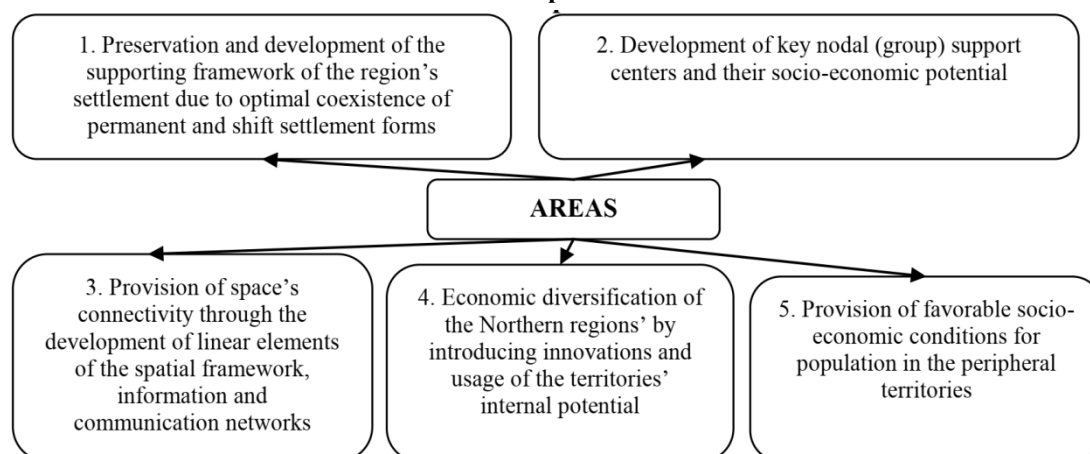
- they poorly reflect a current and prospective place of the Northern territories in the national division of labor;
- task of ensuring spatial integration with other RF entities was not directly recorded;
- in the instrumental provision, the main emphasis is still placed on the development of nodal forms of space organization and “development corridors”; at the same time, a place and tools for supporting non-urban territories are poorly substantiated;
- a significant emphasis in the transport framework development of the region is placed on strengthening mostly external relations, which limits the development of interregional integration within the national economic space and preserves the raw material model of the economy of these territories.
- functionality of interregional institutions’ activities (for example, the ANPO “North-West” Strategic Partnership”) to ensure integration processes is extremely limited.

These circumstances actualize the task of improving the public administration of the spatial development of the country’s Northern territories, which will be focused on the efficient usage of integration potential of their economies.

5. Conclusion

Considering opinions of leading regionalists, domestic and foreign practices, we can propose the following conceptual areas for improving strategic administration of the development of the Northern territories, focused on ensuring the spatial integration of their economies at intra- and interregional levels (Fig. 6).

Figure 6. Conceptual areas of strategic administration of the Northern region’s spatial development



Source: own compilation.

Let us overview these areas in more detail and identify the specifics of implementing these priorities, considering the best experience of the Nordic countries.

5.1. Preservation and development of the region's supporting framework due to optimal coexistence of permanent and shift settlement forms.

Due to pronounced depopulation in the Northern regions of the country, the question of general expediency of maintaining the existing settlement system arises. There is currently no global consensus on how exactly Northern and Arctic territories should be settled. Supporters of the intensive approach suggest a point development by creating large agglomerations and group settlement systems, which can significantly reduce costs of supporting the territory's infrastructure.

At the same time, from a geopolitical point of view, it is necessary to form a settlement system that covers space as much as possible. Obviously, consolidation of sovereignty in the North and the Arctic requires a permanent resident population. As

V. V. Fauser (2018) rightly points out, the emphasis should be placed on the development of small and medium-sized towns, since cities and agglomerations only attract population to themselves, thereby "exposing" adjacent territories.

In the foreign North, territorial organization was usually based on the predominance of highly specialized small settlements, and, since the 1970s, the shift-expedition development method has been widely used. Today, it is becoming obvious to the world community that the former model, based on the resource-industrial development, should be replaced by a comprehensive sustainable development of these areas. At the same time, in our opinion, it is important to preserve the existing towns, since they, as the author notes (Fazylov, 2012), are existing and potential points of the economic growth, "connecting transport hubs, important information, scientific, and cultural centers for adjacent territories".

5.2. Development of key nodal (group) support centers and their socio-economic potential.

Destructive socio-economic processes in the North lead to a concentration of population and economic activity in large nodal centers (administrative and industrial), as well as an increase in the economic periphery area, which includes not only rural areas, but also several small and medium-sized towns that are in a systemic crisis.

In this regard, a relevant objective is to identify nodal forms, as well as group settlement forms, which can act as reference points for holding space in the North and its "in breadth" development, as growth poles in the transition to the resource-innovative economy of the North. According to foreign experience, an option for the formation of a stable settlement system and development of the Northern territories' economic space can be the construction of an interaction scheme "base city – intraregional watch". To do this, it is necessary to analyze and identify several the most promising nodal and group settlement sites that have a relatively stable economic base, growth potential, and stable existing or potential connections with other localities within the region and with other RF entities. These cities and group settlement systems, in our opinion, will be reference points in maintaining space and its deeper development in modern conditions.

5.3. Provision of space's connectivity through the development of linear elements of the spatial framework, information and communication networks.

The Northern territories are characterized by a low population density and a focal (enclave) nature of locating production facilities and infrastructure. Development of transport systems, information and communication networks is crucial for ensuring territories' connectivity in this context. In this regard, it is interesting to study the experience of the United States and Canada, since the Northern regions of these countries have great similarities with Russia in terms of territory size, natural and climatic conditions.

For example, the feature of Alaska is that its most remote and sparsely populated towns and villages are not connected to the rest of the state by a road network. Air transportation is the only transport for passengers and cargo. To provide local population with food and

household items, the federal Alaska Bypass Mail program and subsidy programs arrange regular air transportation by mail planes.

Under the current scheme, the federal government funds the US Postal Service from the federal budget, and the Postal Service sends 70% of the funds to local air carriers. Local airlines, participating in the program, are required to maintain a minimum number of flights to each served locality. Cargo of the Bypass Mail system is delivered from the airports of the Anchorage and Fairbanks agglomerations. Transportation is carried out to 16 regional centers and up to 120–130 remote settlements. Even though the program is unprofitable for the US budget, rural population is provided with regular passenger transportation and cargo delivery at affordable prices due to its implementation ¹.

Canada pays a lot of attention to the development of connectivity between focal settlements and other localities. For example, the country has the Airports Capital Assistance Program (ACAP), which provides funding for remote airports. This status is assigned if air service is the only year-round communication method with a locality it serves. Allocated funds are used to solve the tasks of improving security of regional airports, protecting infrastructure facilities (equipment, runway), and reducing transportation costs. The National Airports Policy (NAP) is being implemented simultaneously. With it, the federal government plans to continue funding remote airports. In addition, one of the promising areas may be the creation of logistics systems for delivering goods using unmanned aerial vehicles.

5.4. Economic diversification of the Northern regions' by introducing innovations and usage of the territories' internal potential.

An important component of spatial development strategic management in the context of transition from the raw-material model of territories industrial development to innovative development is diversification of the economy. Let us explore successful experience of the Nordic countries in solving this problem.

For example, even though Alaska is a region with a raw-material focus, in addition to mining, other industries (prospecting, fishing, and hunting tourism) are also highly developed there. Intensive development of prospecting tourism is primarily caused by the implementation of several administrative tools (issuance of licenses for free ore minerals extraction, etc.). Small family enterprises offer tourists independent gold mining services; federal services and regional departments support the development of this area, including release of special reference books for novice prospectors. Efficiency of the implementation of measures for developing hunting and fishing tourism is proven by the fact that, in 2017, the Alaska Department of Fish and Game was second in the state, after the Alaska Railroad, in terms of revenue generated from outside tourists – 25.5 million dollars (20% of state government revenue). In general, government revenue from tourism activities in Alaska increased by 38% in 2011–2017.

Canada is actively implementing a set of measures to support development of entrepreneurship in the Northern regions of the country. For example, the Nunavut Development Corporation (NDC) is engaged in developing priority sectors of the region's economy and small businesses. The organization invests in fishing, tourism, and culture areas, therefore creating new jobs in the region. In 2018, the NDC invested 1.6 million dollars in small businesses through venture financing.

The implementation of regional innovation policy instruments contributes to balanced spatial development in Finland. In cities, innovative strategies are being developed to strengthen the prerequisites for the economic growth and deepen specialization within national and international division of labor. A regional policy implementation tool is the Program of Expertise Centers, coordinated by the Ministry of Economic Affairs and Employment. These expertise centers offer universities and private companies services that provide competitive advantages in implementing an innovative project: planning, access to innovation networks, establishment of partnerships with contractors, etc.

¹ *Sbornik luchshih praktik razvitiya regionov rossijskoj i zarubezhnoj Arktiki: Chast' I* [Collection of best practices for the development of Russian and foreign Arctic regions: Part I]. Institute of Regional Consulting: Izdatel'skie resheniya, 2018. 54 p.

The key elements of Finland's innovation infrastructure are science and technology parks. The homeland of Finnish technology parks is Oulu, situated in the North, which has transformed from a depressing industrial city into one of the key European centers of high technology over the past 30 years. Technopolis was created here: it is an association of 18 science and technology parks, 2 of which are located outside the country. There are more than 1300 companies that have up to 20 thousand employees.

Thus, the policy of the Nordic countries in terms of territorial modernization of areas in systemic crisis is the economic diversification. At the same time, modernization of old raw-material centers using a new technological basis and development of new (innovative) economy sectors occur there due to capitalization of existing factors of the "first" and "second" nature.

5.5. Provision of favorable socio-economic conditions for population in the peripheral territories.

In addition to towns, which should become base points for the economic space development in the Northern territories, peripheral settlements also require special attention. Thus, in the United States, due to implemented socially oriented policy, population of Alaska continues to grow steadily. In Finland, regional policy also considers the development of all the country's territories: towns, rural areas, settlements of the archipelago islands. Special attention is paid to the development of rural areas in the country. Back in the 1990s, a special government commission, an extensive network of regional research institutes and rural development organizations were established. Finnish rural policy has achieved significant results mainly through participation in the European LEADER program, which was developed by the EU. The country has also developed its counterpart – own national program. The emphasis in the rural development management was placed on maximum usage of internal resources of local communities, consideration of regional specifics, introduction of innovations, and application of the network approach by building clear trajectories of interaction of stakeholders not only at local, regional, and state levels, but also at the transnational level (Nikulin, 2015).

The archipelago policy remains an important component of Finland's regional policy. Back in 1948, the government created a committee for the affairs of this territory, but a special law on the archipelago was adopted only in 1981. It obliges the state and communes to ensure economic development, transport links, services, culture, and environmental protection there. The main tools are the programs developed by the Archipelago Affairs Committee in cooperation with ministries, municipalities, companies, and public organizations. The goal of the current program is to develop the archipelago as a natural and recreational complex for the whole country and to improve living conditions of local population.

Even though Norway does not have a specific rural development policy, sustainable rural development is a priority of regional policy. It is explained by the fact that Norway, compared to other Nordic countries, is more focused on maintaining existing settlement system to fully use the country's resources and ensure freedom of residence for its citizens. To solve this problem, Norway is taking measures to create conditions for employment and creative usage of local resources in the peripheral territories, as well as to ensure universal living conditions in cities and villages. An important tool for implementing local development is the national program aimed at small local communities. Over the past four years, it has funded nearly 50 various projects: in particular, ones to provide services to population, to use local natural and cultural resources, to attract migrants and refugees to sparsely populated areas.

In Canada, the Northern regions (Yukon, Nunavut, Northwest territories) have the Aboriginal Entrepreneurship Program (adopted in 2014) aimed at assistance with business planning and support for existing firms. To implement this program, 42 million dollars are allocated annually from Canada's federal budget. As a result, in 2012–2016, an annual increase in a number of companies created by the aboriginal population was 2%. Besides, back in 2009, the Canadian Northern Economic Development Agency (CanNor) was established to develop a diversified and sustainable economy in these Canadian provinces. It develops programs for the economic development of indigenous peoples and cooperates with governments and aboriginal organizations.

In the Russian North, despite certain restrictions, it is possible to form local innovation systems based on available opportunities in urban and regional peripheries. As noted by Pilyasov A.N. and Zamyatina N.Yu. (2013), priorities for cities are innovative modernization of city-forming industrial resource enterprises, introduction of technologies and competencies of heat and energy efficiency in a local community, development of entrepreneurship in the industry and business services sector, creation of new communication platforms for active interaction of carriers of different knowledge of a local community. For a district type, local innovations in environmental management, introduction of new technologies for heat and energy conservation, and modernization of local educational institutions, mostly secondary vocational education, are of particular importance.

The implementation of a comprehensive approach to the development of the North will increase the efficiency of using the potential of this region by integrating it into national value-added chains and the national economic space.

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DIGITALIZATION OF TERRITORIAL AND ECONOMIC SYSTEMS AT THE REGIONAL LEVEL

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Abstract

The article considers the features, trends and patterns of the development of digitalization of territorial and economic systems. IT technologies have been implemented in an integrated model for assessing the sectors of digitalization of territorial and economic systems, which are determined on the basis of the concept of “Industry 4.0” and aimed at increasing production and servicing public needs, increasing the competitiveness of the state. It is substantiated that the process of digitalization of the territorial economic system is formed on the basis of Internet economy (environment for introducing e-business) and “digital economy” – a modern type of management, characterized by methods of resource management in production, distribution, exchange and consumption. The hierarchical structure and model of digitalization of territorial and economic systems are presented. Methodical approaches to the assessment of digitalization of territorial and economic systems are determined. Scenarios for ensuring the development of digitalization of sectors of territorial economic systems on an innovative basis are grouped. The analysis of the development of the Internet trade market in Ukraine is carried out. The volume of production (services) by types of economic activity in the field of digital territorial and economic systems is determined. The dynamics of the trend of financial results of enterprises in the field of telecommunications, computer programming, consulting and information services in Ukraine is presented. Forecast indicators of the development of digitalization of territorial and economic systems, including in the production of information and communication technologies, services and use of computer equipment have been calculated.

Keywords: digitalization, Internet trade, business entities, business processes, IT technologies

JEL classification: L24, L81, L86, M15

1. Introduction

The development of relationships in the social environment depends on the level of digitalization of the economy (global, national, regional, territorial) and is a certain technology with its own characteristics, trends and patterns. The use of digital technologies to increase the efficiency of the economic system is considered in the broad context of socio-economic, cultural and historical relations that are in the process of evolutionary change, taking into account historically stable institutional mechanisms that ensure its functioning. The set of qualitative features of the economic system is determined by its parts (their nature, properties), which are dual in nature. In this case, any part has “independent” features of an independent unit that requires support, functioning as “full” and “dependent” properties that show its belonging to the system (part of the whole). Accordingly, the system does not fully determine the properties of all elements that are part of it, but only partially. In turn, the main qualities of the system are accompanied by recommendations of elements that form specific features of the territorial economic system, as the territorial unit is an independent structural part that takes into account the complex of national interests, ensuring the welfare of the population. At the same time, the information revolution, characterized by the massive spread of information technology among the population and business, its constant improvement and adaptation, has a significant impact on the development of national and regional economy, which together with economic relations forms the basis of the information field. Due to this, there is an interaction of different elements of space in the process of their economic life. It forms the specifics of the process of interaction between different levels that make up the economic space of the region.

Features of the development of modern economic systems, in particular and of digital economy are a basis of research of the following scientists O. Demydiuk (2014, 120-126), Sh. Ibatullin and O. Stepenko (2013, 6-10), D. Kolomyichuk (2018, 14-21), R. Matviienko (2013, 152-155), N. Metelenko (2008, 70-79), T. Moshchytska (2015, 100-102), L. Novakovskyi and I. Novakovska (2018, 11-16), V. Shchepak (2010, 144-148), D. Ziuz (2016, 1-12). The issue of capitalization of information-intellectual potential and the development of network-information economy was discussed in the works of H. Karcheva, D. Ohorodnia and V. Openko (2017, 13-21), M. Voinarenko and L. Skorobohata (2015, 18-24), V. Zaharii, T. Kovalchuk and V. Synilnyk (2019, 64-68); the research of transformation processes of economy in the conditions of decentralization was considered in the works of O. Amosha and L. Solomatina (2017), T. Muzhanova (2017, 116-122), P. Putsenteilo and O. Humeniuk (2018, 131-143).

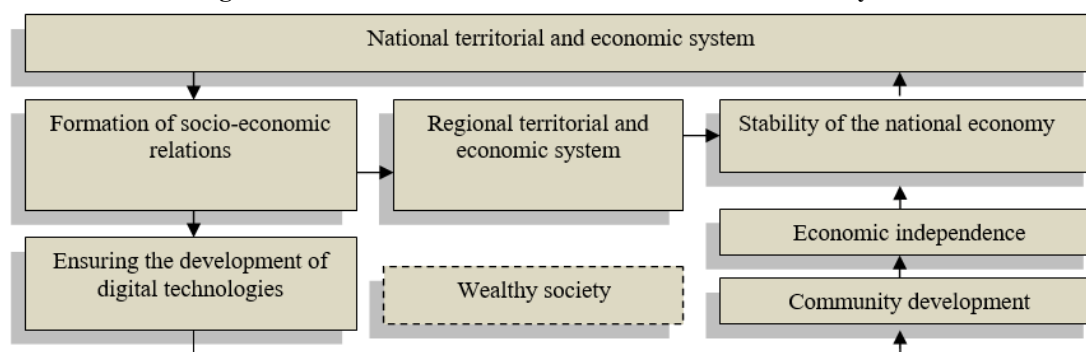
The priority of our study is the implementation of IT technologies in the integrated model of evaluation of the sectors of digitalization of territorial economic systems, which are determined based on the concept of “Industry 4.0” and aimed at increasing production and service needs and the competitiveness of the state.

2. Methods and Materials

The foundation of the development of the economic system is the state, which is the regulator and subject of economic relations, builds the structure of economic growth by creating appropriate conditions for self-realization and welfare of the population. It should be noted that the national characteristics of each country’s development are determined by the economic and social policy of the government, which depends on a certain political orientation and the corresponding theoretical model of economic development, where the quality of state intervention in the economy remains an important factor. It is guaranteed by the high competence of the political elite in these matters, as well as their honesty towards all citizens. Accordingly, socio-economic relations in the structure of the territorial-economic system should be based on the spiritual and moral imperative, strengthening the regulatory function of the state (Moshchytska 2015, 100-102; Ovcharenko et al. 2021, 201-216; Gubanova and Voroshilov 2019, 55-68). The interconnected components of the hierarchical structure of the territorial economic system at the national and regional levels are presented in Image: 1. We should note that the hierarchical structure of the territorial and economic system at the national level forms the socio-economic relations, ensuring the development of digitalization of the territory and communities to ensure economic independence, stability of

the economy as a whole. The development of regional territorial subsystems is subject to the general laws of the development of the national economic system.

Image 1: Hierarchical structure of the territorial economic system



Source: developed by the authors according to data (Matviienko 2013, 152-155; Moshchytska 2015, 100-102)

Development of digital technologies in the e-management system of the regional level, integrates models of information presentation into a single space, formed as a result of analysis and modeling (Biletskyi and Khominich, 2014). Quantitative economic effect from the use of digital technology, allows (Andryeyev et al., 2012):

- reduction of labor costs and time for obtaining and processing information about territorial processes, decision-making, in particular in crisis situations; reduction of labor costs in the electronic document management system;
- reduction of travel (and time) costs by centralizing management and approval through video conferencing;
- increase of receipts to the regional budget of taxes from the use of resources (lands of agricultural, forest, industrial function, under construction, in particular in nature protection and reserved zones); receiving additional funds to the budget for clear and objective accounting of environmental damage in the course of economic activity (fines, payments to the relevant funds);
- assessment of effective nature management, in particular publicly available minerals (sand, gravel, rubble), which are extracted in riverbeds, protected areas, in the territory of recreation; obtaining long-term indirect qualitative effect;
- improving the efficiency, effectiveness and quality of public administration; increasing information asymmetry regarding the transparency of public authorities;
- creating preconditions for the integration of information resources at the regional level; increasing the investment attractiveness and competitiveness of the region via the Internet for advertising promising investment sites; increasing the efficiency of interaction of departmental information systems.

The process of digitalization of the territorial economic system is formed on the basis of the Internet economy (environment for introducing e-business) and “digital economy” – a modern type of management, characterized by methods of resource management in production, distribution, exchange and consumption. Acceleration of digitalization of the economy, which is stimulated by the state, has a positive impact on the economic development of the territory, but this requires not only legislative initiatives, but also scientific grounding (Trusova et al. 2021, 1-15).

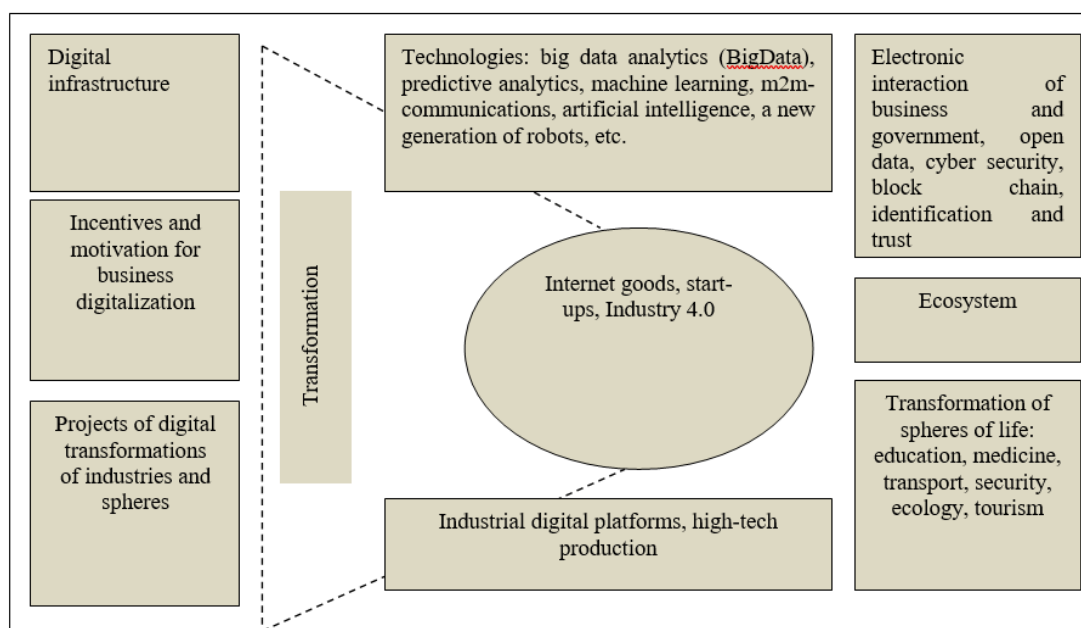
Global trends in the world economy are developed on the basis of the concept of “Industry 4.0”, which allows to implement tools for digital infrastructure development, acquire digital competencies in society, identify pressing issues and digitization projects, stimulate the domestic market, apply and use digital technologies. A corresponding increase in gross regional product is possible only when digitization initiatives and programs are integrated from national into sectoral development strategies and programs (Order of the Cabinet..., 2018).

Levels of Industry 4.0 (functional merging, operational interaction, interoperability, virtualization, decentralization, real-time interaction, service orientation, modularity, learning and continuity of vocational education, synergies and emergencies) embody the production,

exchange and distribution and consumption of “electronic goods”, calculations are made using electronic money (Voinarenko and Skorobohata 2015, 18-24). Therefore, the formation and bridging of the “digital divide” in territorial and economic systems requires the separation of functioning components: the development of a developed digital infrastructure through the provision of new quality and Internet coverage of broadband areas (remote villages, business and social network) which are in digital divide; formation of an effective system of identification, protection of personal data, trust services that are part of the “soft” infrastructure; development of highly qualified human capital which can work with new technologies, meets specific skills and competencies for full integration into the digital space; use of applications and services “Smart-city” and “digitalization of education”, which are components of “Industry 4.0”, implemented in the field of medicine, industry, ecology, public safety, transport; introduction of “digital” legislation, which enshrines the digital rights of citizens, defines the principles and measures to eliminate institutional, tax barriers and stimulate the digitalization of economic sectors; protection of intellectual property as a factor influencing motivation and building of creative ideas, the possibility of obtaining a commercial profit and a guarantee of protection of intellectual work (Puhachevska 2018, 39-45; Trusova et al. 2021, 1-15).

The OECD identifies three key components of digitization of territorial economic systems: infrastructure (hardware and software, telecommunications, networks, etc.); e-commerce (distribution of goods via the Internet), e-business (doing business and any other business processes via computer networks) (Apalkova, 2015). For the development of digitalization of territorial and economic systems, the authors proposed and built a model of its transformation, which is based on the updated concept of the Internet goods, “smart factory” and identified with the fourth industrial revolution and the emergence of cyber system Industry 4.0 (Image: 2).

Image 2: Model of digitization of territorial and economic systems



Source: built by the author

The built model transforms the digital economy of the country and includes incentives and motivation for digitalization of business, development of digital infrastructure, renewal of projects of competitiveness of digital industry and spheres of the national economy.

The main tools that will ensure the transformation of digitalization are technologies (big data analytics (Big Data), predictive analytics, m2m-communications, machine learning, artificial intelligence, a new generation of robots, etc.) and industrial digital platforms (the process of creating a digital economy product), high-tech production. The result of digitalization of territorial and economic systems is the development of electronic interaction between business and government, open data, cybersecurity, blockchain, identification and trust, created ecosystem, transformation of spheres of life (education, medicine, transport,

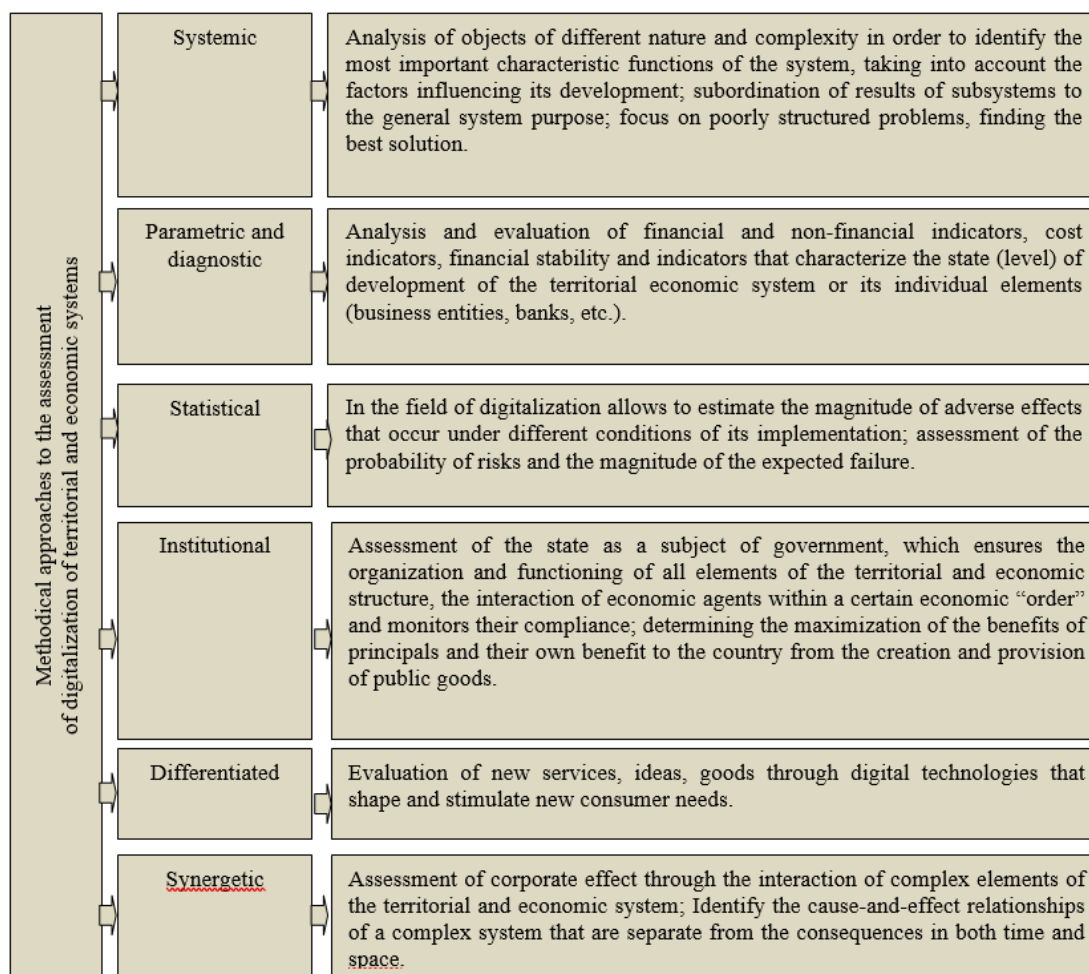
security, ecology, and tourism). The presented model expands the interests of society, considers in a broader socio-economic aspect the demographic, environmental, educational and other changes caused by it. Separately in the model of transformation of the digital economy, an important place is occupied by a system of indicators that determines the level of the development of information and communication technologies in the country. Accordingly, the main areas of measurement of indicators of digitalization of territorial economic systems are: the development of high-tech sector of the economy, its share in manufacturing and services; investment in research and development, education costs and additional retraining; release of information and communication equipment; job creation in science and high technology; indicators of cooperation between corporations, venture firms, universities and research organizations; international flows of knowledge, international cooperation in the field of science and innovation; dynamics of Internet spread; the share of high-tech products in international trade (Puhachevska 2018, 39-45; Dionysopoulou et al. 2021, 153-168; Batabyal and Yoo 2018, 119-125).

At the same time, the degree of impact of digital technologies on territorial and economic systems, taking into account their individual sectors are represented by quantitative digital indices, each of which is based on the organization's chosen priorities: Global Competitiveness Index (GCI), which includes the following indicators (Kovtoniuk 2017, 29-33):

- Company competitiveness, business compliance with modern company requirements and innovation potential and the Networked Readiness Index (NRI);
- Digital Opportunity Index (DOI), estimated on the basis of 3 sub-indices, such as capabilities, infrastructure and usage; digital development index (ICT Development Index (ICT DI)) takes into account 11 indicators that assess the access and use of digital technologies, as well as ICT skills); the Digital Access Index (DAI), developed by the International Telecommunication Union (including within the framework of the World Summit on the Information Society);
- The Global Connectivity Index (GCI) contains four sub-indices: supply, demand, experience and potential.

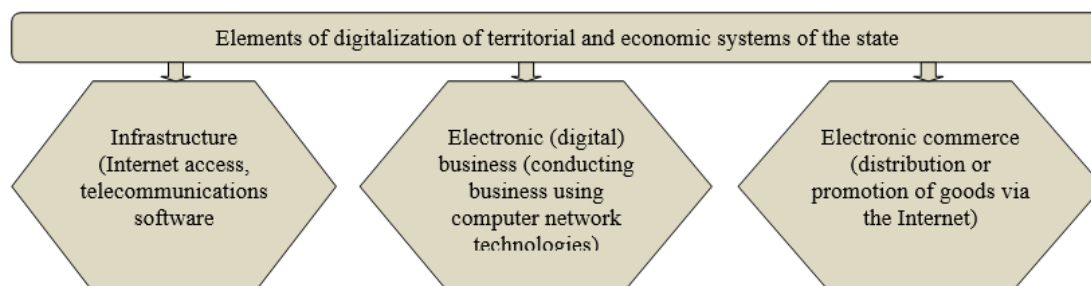
Since territorial and economic systems are an open, complex, nonlinear, unbalanced structure, we have proposed methodological approaches that can be used in the development of digitalization (Image: 3). The presented methodological approaches determine the advantages of digitalization of territorial and economic systems for the development and provision of public welfare of the society and the state as a whole in order to increase competition and quality of products and services; reduction of production costs and product prices; expanding the range of goods and services; increasing the availability of goods and services for ordinary citizens through the use of the Internet; development of technologies in the medical field that will promote the treatment of deadly diseases; emergence of new professions; increasing the mobility and flexibility of the education system; use of scientific development to improve the environmental situation in the country; increasing life expectancy; improving the quality of life of the population.

Digitalization involves the formation of the relationship between government, business and community using the latest information technology, covering innovative activities on the platform of the Internet, mobile and touch networks. The introduction of digital technologies in the territorial and economic systems of the country makes it possible to increase labor productivity, business competitiveness through expanded access to the Internet (Image: 4), as the most important element of economic development.

Image 3: Methodical approaches to the assessment of digitalization of territorial and economic systems

Source: grouped by authors according to data (Metelenko 2008, 70-79; Biletskyi and Khominich, 2014; Demydiuk 2014, 120-126; Voinarenko and Skorobohata 2015, 18-24)

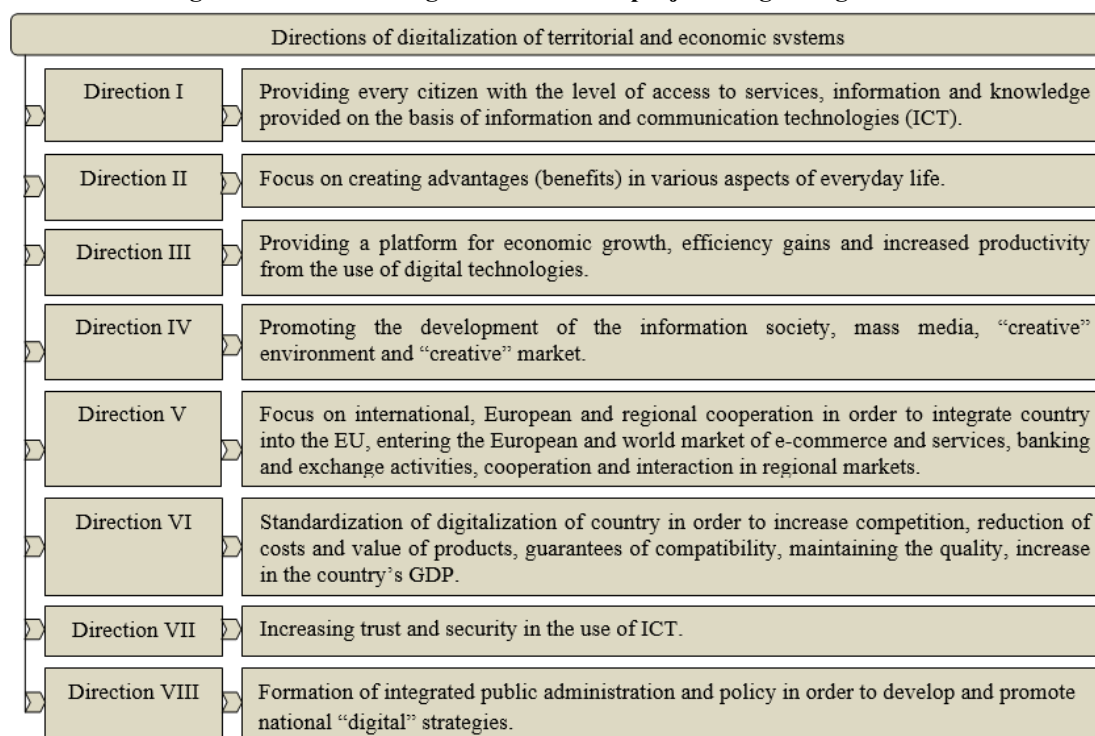
A targeted policy towards the digitalization of territorial and economic systems that already operate in the EU and have their own "digital strategies", allows us to propose the stages of the development of the project "Digital Agenda 2020".

Image 4: Components of digitalization of territorial and economic systems

Source: built by the author

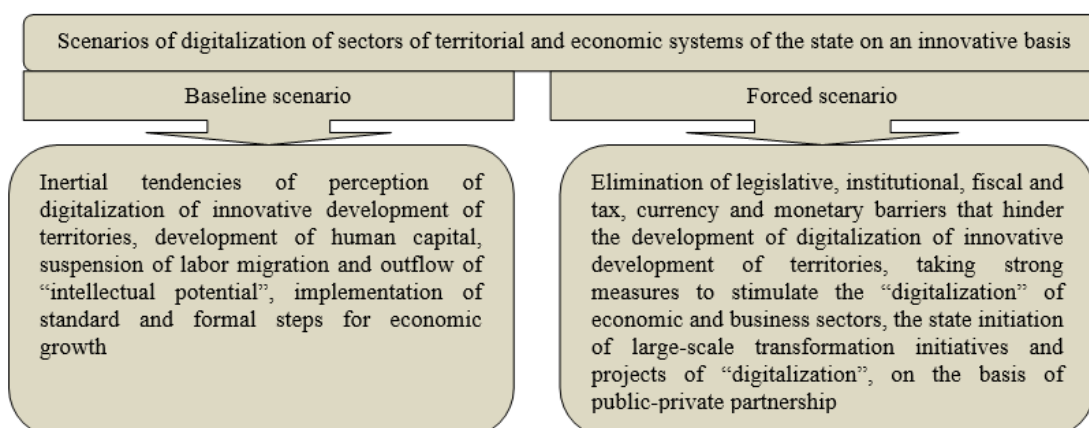
This is a huge industry market, a platform for efficiency and competitiveness of all spheres of the country's economy, as access to the Internet as an open, secure and free space for the dissemination of ideas, information and knowledge allows communication and social interaction on the basis of human rights. Digital development should be aimed at improving the livelihoods of local communities, raising the living standard of citizens, which meets the goals of digital development. The project "Digital Agenda 2020" identifies eight main areas of digitization (Image: 5). Probable scenarios for digitization of innovative development of economic sectors of the state are presented in Image: 6.

Image 5: Directions of digitalization of the project “Digital Agenda 2020”



Source: grouped by authors according to data (Apalkova, 2015; Order of the Cabinet..., 2018; Digital Agenda of Ukraine, 2020)

Image 6: Scenarios for ensuring the development of digitalization of sectors of territorial and economic systems of country on the innovative basis



Source: generated by the authors according to data (Apalkova, 2015; Order of the Cabinet..., 2018; Digital Agenda of Ukraine, 2020)

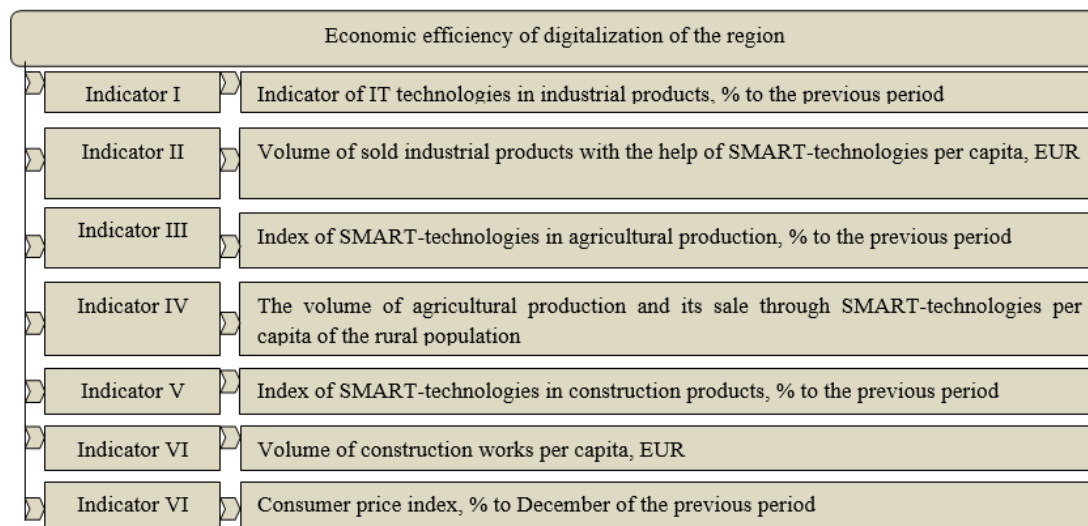
At the stage of transformation of territorial and economic systems, the process of digitalization monitoring through the concept of “Industry 4.0” embodies a set of indicators for assessing the implementation of IT technologies in the field of state regional policy (“economic efficiency of digitalization”, “financial self-sufficiency”, “labor market efficiency”, “investment development and foreign economic cooperation”, “infrastructure development”, “renewable energy and energy efficiency”) to accelerate the innovative development of the territory of the state (Bukht and Heeks, 2017; Puhachevska 2018, 39-45; Batabyal and Beladi 2016, 11-18). The ordinal number of the region in the rating of digitalization of innovative development by IT technologies is determined on the basis of deviations from the largest and smallest values according to formula (1), (Bukht and Heeks, 2017; Irtysheva et al. 2018, 586-593):

$$R_j = \sum \frac{x_{\max_i} - x_{ij}}{x_{\max_i} - x_{\min_i}} + \sum \frac{x_{ij} - x_{\min_i}}{x_{\max_i} - x_{\min_i}} \quad (1)$$

where, – the total value of estimates of individual sectors of digitalization of territorial and economic systems on the indicators of IT technologies; – the i -th indicator of the j -th sector of digitalization of territorial and economic systems.

Estimation of economic efficiency of digitalization covers seven indicators (Image: 7).

Image 7: The structure of the assessment of economic efficiency of the region



Source: developed by the authors according to data (Bukht and Heeks, 2017; Irtyshcheva et al. 2018, 586-593)

3. Results and Discussion

Thus, the implementation SMART-technologies in the basic concept of “Industry 4.0” on the basis of smart management is an important element of territorial and economic systems for the development of efficiency criteria, development goals and norms that serve as a basic guideline for innovative development of regions. In addition, the model takes into account the possibilities for using the main tools to stimulate the development of local communities, in particular (Bukht and Heeks, 2017; Irtyshcheva et al. 2018, 586-593; Kalybekova et al. 2021, 31-48):

- development of existing and a new local business: education, consultations, trainings, support, information on soft and targeted loans, simplified conditions for obtaining permits, access to start-up leases, incentives, transparent access to business-oriented information, clusters;

- creation and improvement of local development institutions: activities of economic development agencies or local and regional development agencies, business incubators, urban development centers, business centers, public organizations, business associations, investment agencies, permitting centers, administrative service centers, information and consulting centers, chambers of commerce and industry, business support funds, etc.;

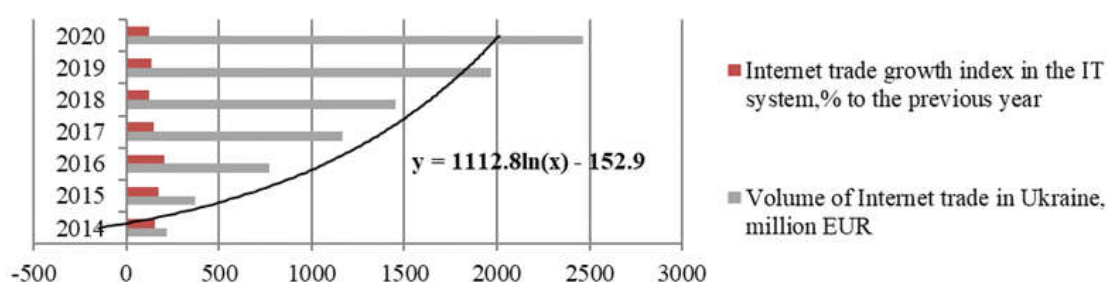
- attraction of business and investments in the territory: creation of investment products and investor’s road map, algorithm of procedure of opening a new enterprise, design of territory, preparation of industrial sites, creation of industrial parks, marketing of attraction of investments in the territory, development of investment passports, promotion of territory, definition of competitive advantages, criteria for the investor, priorities of the development of the territory, etc.

The current stage of the development of territorial economic systems in Ukraine is characterized by rapid structural changes under the influence of the rapid spread of innovative and digital technologies, which have a multiplier effect, require the formation of qualitatively new, adaptive approaches and models of economic management at all levels. Digitization of territorial and economic systems of Ukraine models: changes in the economic structure, changes in traditional markets, social relations, public administration, which is associated with the penetration of IT-technologies; changes in the main source of added value and the structure of the economy through the formation of more efficient economic processes provided by digital infrastructure; the mechanism of economic development of institutions

based on digital models and processes at all levels (markets, industries, areas of activity); technological level, which presents advanced technologies and platforms; the level of a single environment, represented by regulations, information infrastructure, staffing and information security. The single environment is designed to optimize the conditions for the development of economic and technological levels, as well as increase the efficiency of their interaction (Trusova et al. 2021a, 1-19; Ziaril and Mohammadi 2016, 47-63; Xanthos et al. 2013, 173-179; Mustra 2017, 135-144).

We should note that in the EU group, the cost dimension of digitalization of territories is 3.2 trillion euro, which corresponds to about 8% of GDP (Nykolaev, 2018; Batabyal 2016, 31-35; Cutrini and Valentini 2017, 107-117). Every year, the digital economy expands 9 large companies (Apple, Google, Facebook, Amazon, Microsoft and four Chinese: Baidu, Alibaba, JD.com, Tencent) produce 90% of their income and profits at the expense of the digital economy (Gada, 2016). In Ukraine, the mass dissemination of information technology among the population and business, its constant improvement and adaptation has a significant impact on the development of the national economy and individual regions. One of the areas of information economy is e-business (Internet commerce), which is developing in the direction of diversification, increase, integration and reduction of online services, while repeating the global trends of the virtual market. This is evidenced by the main trends in the growth of the e-commerce market, the volume of which for the period 2014-2020 has increased almost 12 times. At the same time, the peak of growth of consumers of e-commerce services (in 207% times) compared to the previous year was observed in 2016. During 2017-2020, there is also an increase, but at a slightly slower pace.

Image 8: Development of the Internet trade market in Ukraine for 2014-2020



Source: calculated by the authors according to data (Scientific and innovative activity..., 2018; Monitoring of socio-economic..., 2020; State Statistics Service..., 2020)

The growth of e-commerce in Ukraine is due to the preferences of consumers to use the Internet service and turn it into a natural environment, within which most needs are met, due to such factors as: saving consumer time and choosing products according to the selected filter; the ability to consider a wider range of product items; the ability to choose goods outside the country.

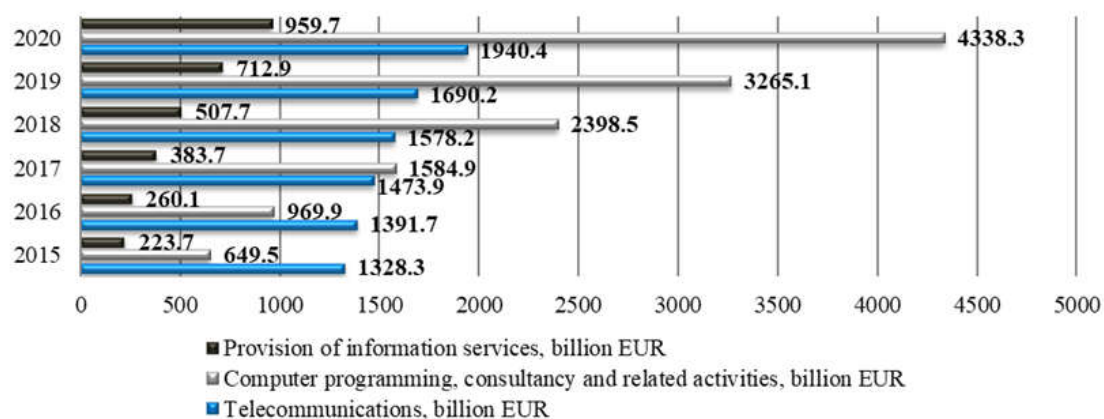
E-commerce also has a number of advantages (including contactless delivery and no need to go out in crowded places) in emergencies, which can be quarantined due to the rapid spread of the corona-virus epidemic. In particular, according to a study of the Chinese market, in just one-month quarantine, e-commerce platforms received more than 200% increase in demand for food and more than 75% increase in demand for non-food products. A structured business network that works in contact with consumers has increased sales through Internet platforms created and improved for this purpose (European innovation scoreboard, 2020; Napolskikh and Yalyalieva 2019, 73-81). The most successful e-business in China, the volume of online trade which has increased during the quarantine period includes: car sales on electronic platforms, delivery of ready meals and beverages, remote work services (Microsoft Teams, WeChat Work, and DingTalk and others), services for online learning, platforms for online travel (Chishti and Barberis, 2016; Vgenopoulou et al. 2016, 85-98; Engin Duran and Pelin Özkan 2015, 35-46).

The COVID-19 outbreak has led to the advancement of artificial intelligence technology, which has improved data capabilities by combining online and offline customer data. In addition, it has accelerated the use of 5G technology, which optimizes the process of online shopping and affects the accelerated construction of "smart cities". The entertainment

industry has grown to retain customers. For example, bars launched live broadcasts of DJ sets in the Chinese version of TikTok – the Douyin application. Revenues from some broadcasts were equivalent to (more than 229 thousand EUR) (Trend 3. Platform Economy..., 2016; Alexiadis and Felsenstein 2012, 39-44).

The quality system of information security and development of the IT sphere in Ukraine under the influence of globalization processes, as a reaction to the new requirements of the market environment, is developing quite rapidly. The rapid growth of sales of services and value added by business entities in the field of IT technologies allows to stimulate the relationship with the industries and services, ensuring the efficiency of digitalization of territorial and economic systems in Ukraine, namely: telecommunication, which is the main component of the digital infrastructure of the state; computer programming, consulting and related activities of business entities that create a basic product for the transition of the regional economy to a new level of business processes and management, economic and social relations; provision of information services and servicing of regional market segments, taking into account individual and specific requests and needs.

Image 9: Volume of production (services) by types of economic activity in the field of digital territorial and economic systems of Ukraine for 2015-2020, billion EUR

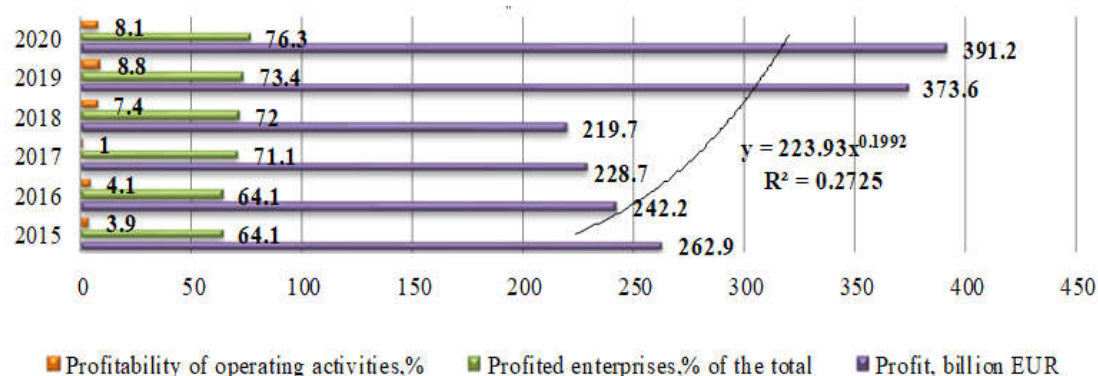


Source: calculated by the authors according to data (Chishti, and Barberis, 2016; Scientific and innovative activity..., 2018; Monitoring of socio-economic..., 2019; State Statistics Service..., 2020)

Thus, in 2015-2018 there was a rapid increase in sales of products and services of enterprises operating in the field of information and communication (Image: 9). IT products grew the fastest (more than 5 times), including software development and implementation, IT consulting and related activities. The share of this type of activity in GDP has increased by 3.5%, which indicates a significant innovation shift in the development of the economy of the territories. Almost 180 thousand of specialists work in the field of IT and their number is constantly growing, which allows to develop this business in the field of small business, which is not subject to income tax. During this period, the volume of information services (in the field of web portal development, cloud computing, creation and management of online platforms) increased, the rate of which increased by 3.0 times, times, their share in GDP increased by 0.4%. However, the volume of production of products and services in the field of telecommunications grew at a slower pace (+46%), which is explained by the faster pace of the development of the industry in 2009-2015, which has led to some stabilization of domestic demand. In particular, the volumes of gross value added of telecommunications enterprises increased by 15.5 times, information services and IT – by 5.2%.

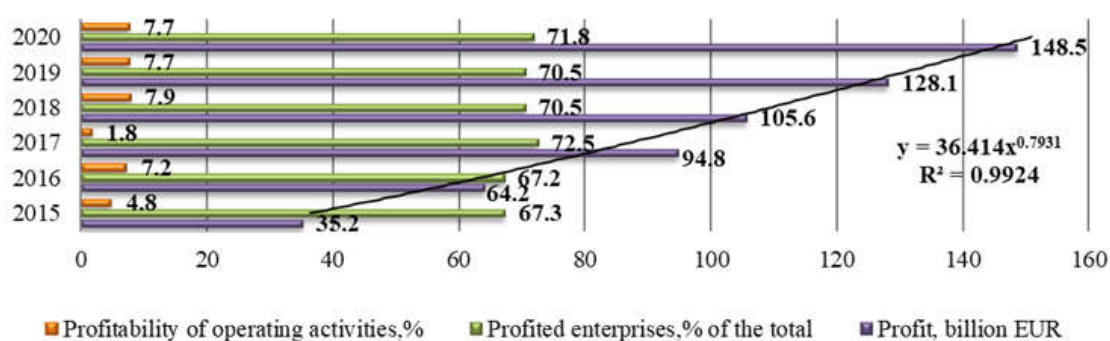
A significant advantage of information and communications in addition to the fast-growing market and relatively high wages is a high level of profitability compared to certain economic activities in Ukraine. Image: 10-12 shows the dynamics of financial results of digital enterprises in Ukraine.

Image 10: Financial results of enterprises in the field of telecommunications in Ukraine for 2015-2020



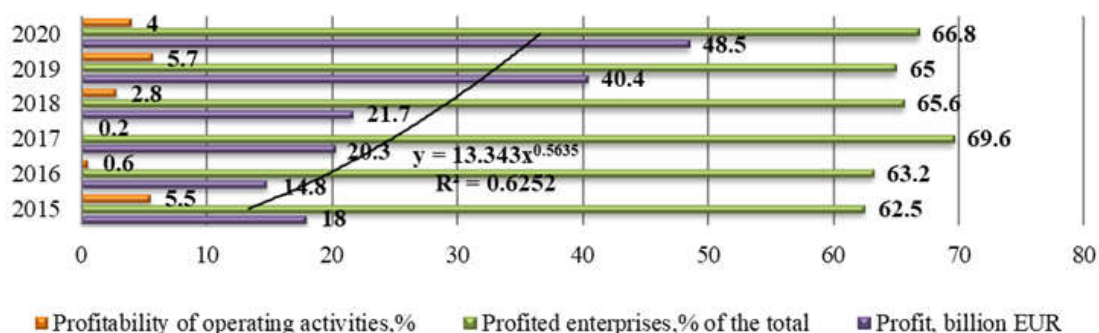
Source: calculated by the authors according to data (Chishti, and Barberis, 2016; Scientific and innovative activity..., 2018; Monitoring of socio-economic..., 2019; State Statistics Service..., 2020)

Image 11: Financial results of enterprises in the field of computer programming, consulting and related activities in Ukraine for 2015-2020



Source: calculated by the authors according to data (Chishti, and Barberis, 2016; Scientific and innovative activity..., 2018; Monitoring of socio-economic..., 2019; State Statistics Service..., 2020)

Image 12: Financial results of enterprises in the field of information services in Ukraine for 2015-2020



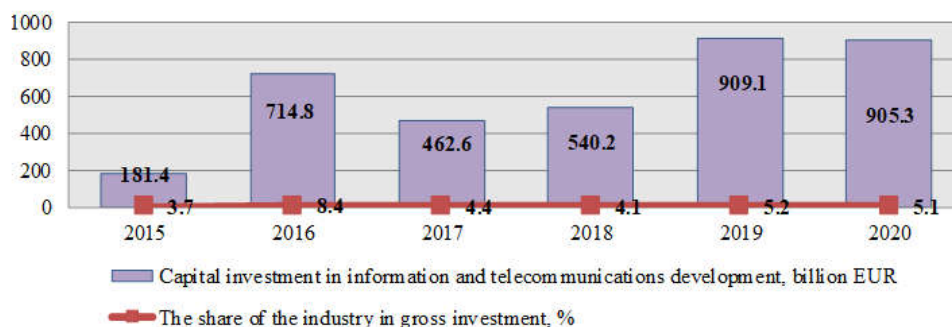
Source: calculated by the authors according to data (Chishti, and Barberis, 2016; Scientific and innovative activity..., 2018; Monitoring of socio-economic..., 2019; State Statistics Service..., 2020)

In 2015-2018, the growth rate of gross profit of IT enterprises (computer programming, consulting and related activities) increased by 4.2 times, in the field of information services – by 2.7 times, and in the field of telecommunications – by 1.5 times. The share of profitable enterprises on average in the industry is about 72%, which is higher than the industry average. At the same time, there is a tendency to increase the level of profitability of operating activities on average by 4%. This indicates the presence of significant domestic economic potential for enterprise development in Ukraine, which, while creating a favorable environment, can create the conditions for a strong economic leap of the national economy both by increasing exports of digital technologies and services and by multiplier influence on innovation development of other areas of economic activity of the country. Information

technology is the most promising area of investment. An increase in broadband investment at 10% leads to an increase in average annual GDP at 0.6-0.7%.

During the period 2015-2018, the volume of capital investment in the development of the information and telecommunications industry increased by 5.0 times (or by 723.9 thousand EUR). However, the share of gross capital investment in the country's economy during this period increased only by 0.4%, except in 2016, when the share was over 8.4%. In 2020, the volume of capital investment in the field of information and telecommunications decreased by 0.4% compared to 2019, the share in gross investment also decreased by 0.1% (Image: 13).

Image 13: Capital investments in the field of information and communications of Ukraine for 2015-2020



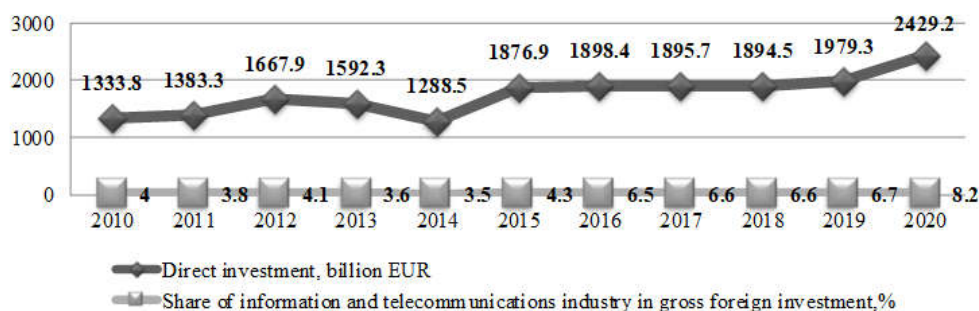
Source: calculated by the authors according to data (Chishti, and Barberis, 2016; Scientific and innovative activity..., 2018; Monitoring of socio-economic..., 2019; State Statistics Service..., 2020)

In terms of the main components of the industry 11.8% investments in 2019 are directed to the field of telecommunications (radio), 0.8% – to the field of computer modeling and 1.2% – to the development of information services. This distribution is primarily related to the level of capital intensity of production of services in these areas.

At the same time, the volume of foreign investments in the field of information and telecommunications in Ukraine is growing. In particular, in 2020 their value amounted to billion EUR, which was 8.2% of all foreign investment in Ukraine (Image: 14). The largest share of foreign investment is directed to the IT sector, which is explained by the orientation of most IT companies in Ukraine and the execution of foreign orders on the terms of outsourcing and export of services.

Since 2010, the volume of export of telecommunications, computer and information services has been growing on average by 7-11% every year (Image: 14). At the same time, the export of IT services is growing the fastest, which has increased 1.8 times during the studied period. The main customers of Ukrainian IT services are US companies (over 60%), as well as European companies, whose share in the import of information services produced in Ukraine has reached 11%.

Image 14: Capital investments in the field of information and communications of Ukraine for 2015-2020



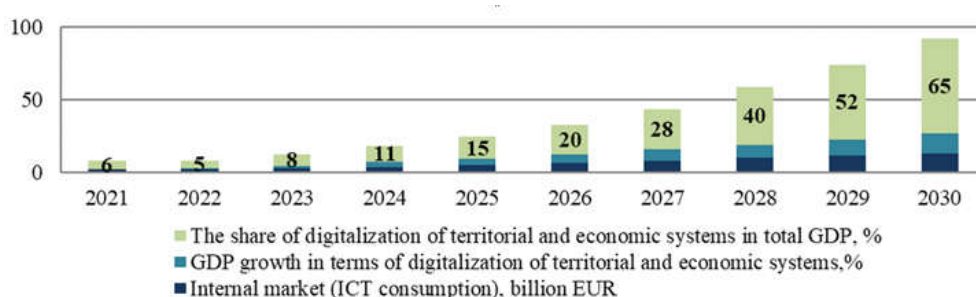
Source: calculated by the authors according to data (Chishti, and Barberis, 2016; Monitoring of socio-economic..., 2019; Scientific and innovative activity..., 2018; State Statistics Service..., 2020)

The volume of export of digital services from Ukraine in 2021-2022, under favorable conditions, can increase by 3.0 times and improve the country's export potential. Thus, the export of IT services from Ukraine has significant potential for development and growth. At the same time, the predominant export orientation of telecommunication products leads to

insufficient consumption of IT products in Ukraine. In particular, in 2020 the total volume of ICT services amounted to approximately 1.31 billion EUR, which is 6.0 times less than consumed by the Polish economy during the same period.

The current stage of digitalization of territorial and economic systems in Ukraine is the removal of legislative, institutional, fiscal and tax barriers that hinder the development of the digital economy. Another important task is to create motivation for digitalization of society, which is to ensure the affordability of digital technologies for consumers, creating conditions in various spheres of life to form the needs of citizens and businesses to use new digital tools instead of the usual, traditional (Trend 3. Platform Economy..., 2016). Taking into account the impact of digitalization processes on the innovative development of Ukraine's economy and its share in the country's GDP, and the growth trends of IT in the country, in the context of the project "Digital Agenda of Ukraine" the forecast indicators of the development of territorial and economic systems are developed that is resulted in Image: 15.

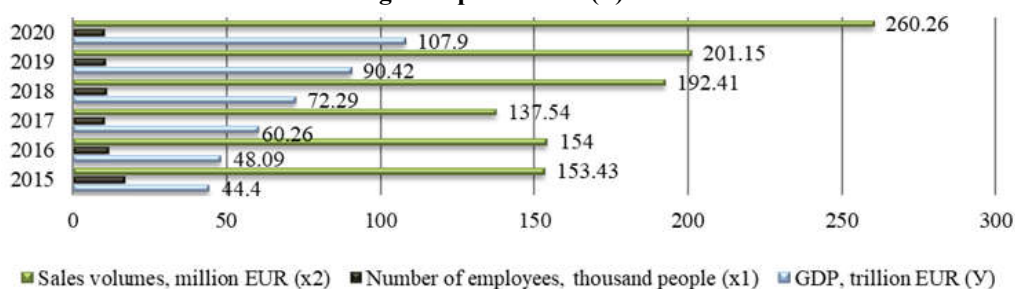
Image 15: Forecast indicators of digitalization of territorial and economic systems in Ukraine for 2021-2030



Source: calculated by the authors according to data (Trend 3. Platform Economy..., 2016; Digital Agenda of Ukraine, 2020; European innovation scoreboard, 2020)

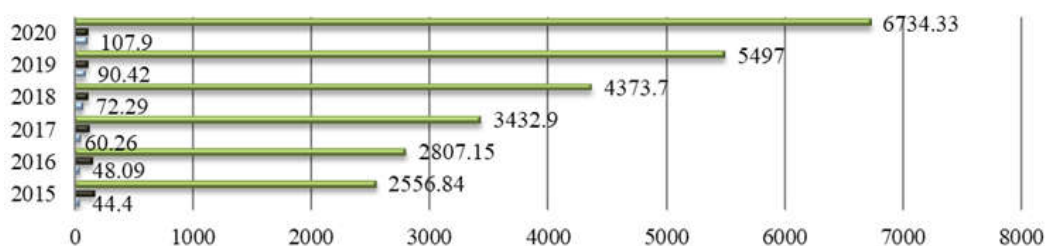
These forecasts are relative and the conditions for the formation of a purposeful state policy in the field of digitalization, as well as the development of effective mechanisms for its implementation in all areas of management and economic activity can be implemented. In Image: 16-18 the dynamics of the indicators of production (services) and the number of employees involved in the field of digital technologies in terms of key sectors are given.

Image 16: Indicators of the development of enterprises of the sector of information and communication technologies in production (P) of Ukraine for 2015-2020

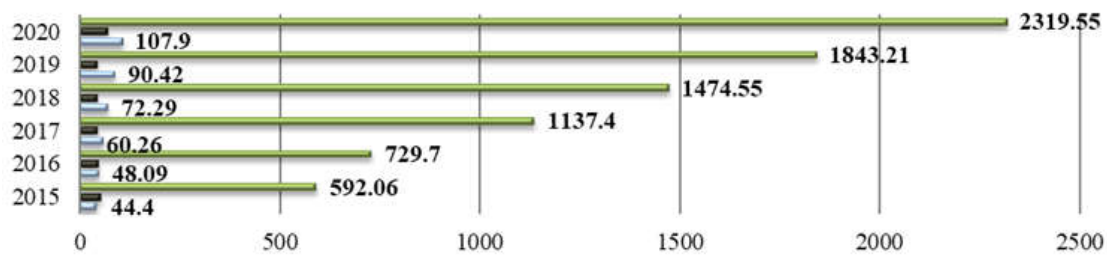


Source: calculated by the authors according to data (Trend 3. Platform Economy..., 2016; Digital Agenda of Ukraine, 2020; European innovation scoreboard, 2020)

Image 17: Indicators of the development of enterprises in the sector of information and communication technologies in services (S) of Ukraine for 2015-2020



Source: calculated by the authors according to data (Trend 3. Platform Economy..., 2016; Digital Agenda of Ukraine, 2020; European innovation scoreboard, 2020)

Image 18: Indicators of the development of enterprises in the sector of services for the use of computer equipment (I) of Ukraine for 2015-2020

Source: calculated by the authors according to data (Trend 3. Platform Economy..., 2016; Digital Agenda of Ukraine, 2020; European innovation scoreboard, 2020)

Thus, the dynamics of the main areas of digitalization of territorial and economic systems of Ukraine in 2015-2020 and the dynamics of GDP has negative trends (-56 due to the reduction in the number of employees employed in knowledge-intensive industries for technology and equipment used in economic and social processes. However, there is a relatively small increase in the output of the information and communication technology sector (+63%) compared to other areas of IT. This means that in the context of growing trends in the digital economy of the regions, Ukraine is becoming increasingly dependent on import of relevant equipment and technologies. The largest increase during 2015-2020 is observed in the information sector, i.e., the sector of services for the use of computer equipment – the number of employees in this sector increased by 31%, the volume of services provided – by 4.0 times.

A correlation-regression analysis of the impact of the development of certain sectors of the information and communication sphere on GDP is given, the results of which will adjust the tactical plans for the strategy of digitization of territorial economic systems in the regions by stimulating the development of certain economic activities. Regression models of the impact of individual sectors of the digital technology sector on Ukraine's GDP have been verified (Table 1).

Table 1. Correlation-regression analysis of the impact of indicators of the development of sectors of digitalization of territorial and economic systems on the GDP of Ukraine

Indicators	Volumes of production (works, services), million EUR		
	Information and communication technologies in production (x1)	Information and communication technologies in services (x2)	Computer equipment services (x3)
Regression equation	$y = 21.44 + 0.20x_1$	$y = 6.93 + 0.016x_2$	$y = 0.14 x_3 - 20.84$
Coefficient of determination (R2)	0.18	0.99	0.69
Checking the significance of the equation $F_{calc.} > F_{table.}$ ($\alpha=0.05$)	$F_{calc.}$ 1.54	89.07	6.99
	$F_{table.}$ 0.82	0.82	0.82
Coefficient of elasticity, %	-	0.093	0.0013

Note. F_{calc.} – Fisher's criterion (calculated); F_{table.} – Fisher's criterion (tabular).

Source: calculated by the authors

Forecast GDP growth under the influence of forecast growth of individual sectors of digitalization of territorial and economic systems is carried out according to formula (2) (Byrkovych et al. 2019, 9; Kunanets et al. 2016, 257-274):

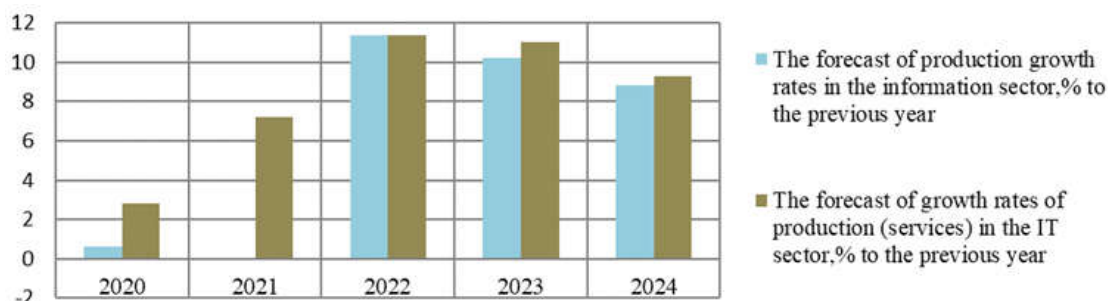
$$GDP_{forecast}^t = GDP_t^t + (K_e \times T_{forecast}^t \times GDP_t^t) \quad (2)$$

where, – is the forecast value of GDP in year t under the influence of the development of the sector; – extrapolation forecast value of GDP in period t; – the coefficient of elasticity of

GDP from the development of a particular IT sector; – the forecast growth rate of the sector in the year t , %.

Extrapolation growth of production (services) of the information sector for the period up to 2023 is shown in Image: 19.

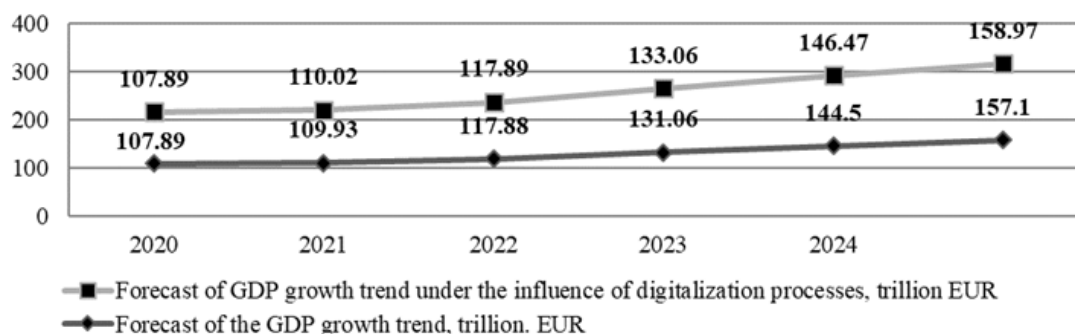
Image 19: Forecast extrapolation trend of growth of production (services) in the information and IT sectors of Ukraine for 2020-2024, %



Source: calculated by the authors

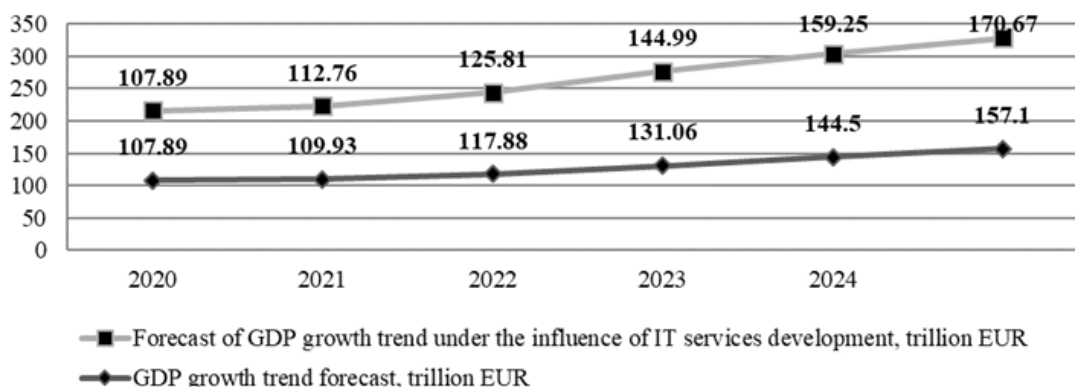
According to the algorithm of formula (2), the forecast value of GDP is calculated under the influence of trends in the development of the sectors of information services and IT technologies of territorial and economic systems. It is established that the increase in the volume of information services on the use of computer technology in the forecast period (2020-2024) will be 25%, which will increase the significant impact on GDP growth to 47.3% with 45.6% of forecast growth, without taking into account the impact of this sector (Image: 20). This is primarily due to the intensification of informatization processes in all areas of production, management, marketing and social activities, a significant part of which is the development of e-marketing and commerce.

Image 20: Forecast of GDP growth of Ukraine taking into account the processes of digitalization of territorial and economic systems in accordance with certain trends



Source: calculated by the authors

Image 21: Forecast of GDP growth in Ukraine under the influence of the development of the IT sector in accordance with certain trends



Source: calculated by the authors

The analysis showed that the level of the development of industrial production of information and communication technologies and equipment in Ukraine has significant

prospects for intensification of digitalization processes in all areas of territorial and economic systems, job creation and GDP growth.

4. Conclusions

Thus, the current stage of the development of territorial economic systems in Ukraine is caused by the implementation of structural, administrative and economic processes using the mechanism of digitalization, which is one of the important integration tools to optimize the management of economic sectors and increase the manageability of changes.

The main vectors of digitalization of territorial and economic systems, adapted to the global network of IT technologies and models of innovation-oriented development are:

- development of digital infrastructure in the regions and elimination of inter-territorial gaps in the provision of Internet services;
- improvement of electronic systems of public management of territories, increase of transparency of management of economic activity of communities and expansion of opportunities of citizens in the processes of discussion and formation of key decisions concerning development of territorial communities;
- introduction of geolocation systems of all types of business in the region and electronic inventories of natural resources;
- development and implementation of digital services (standard mandatory minimum of public services) for citizens covering key areas of life, i.e., social security, education, medicine, security, environment;
- formation of programs to attract investment in the processes of digitalization of the public sphere and business, in particular in terms of priority industries;
- development of regional programs of digital competencies, skills and culture of using digital services for citizens.

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SUSTAINABILITY ANALYSIS OF GREECE'S PROMOTION AS A TOURISM DESTINATION

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Abstract

Sustainable tourist destination management is nowadays one of the competitive components of the tourism industry. Sustainable marketing advocates new mainstream marketing methods that replace conventional publicizing practices, which lead to sustainable development. It also creates an appeal to the businesses to take into consideration social and ecological limitations of conventional corporate marketing philosophy. Promoting sustainability has been considered as a core theme of destination tourism management for attaining competitive edge. Aim must be the sustainable tourism promotion of the tourism destinations. The purpose of this article is to reveal the degree to which the promotion of Greece as a tourist destination is based on sustainable principles. This is done through the analysis of sustainable promotion of 13 regions of Greece, in 2020. The main objective for the analysis of sustainable promotion is the approaching of sustainability concept through the special characteristics of sustainable promotion. The sustainability analysis will be approached quantitatively. Three (3) representative variables has been used: a) the approved funds for tourism promotion, b) the tourist over-night staying and c) the tourism saturation of the area, as determined by the TALC model growth coefficients calculation. The results, which have stem from the analysis, could be a useful tool for sustainable tourism management and marketing in frame of the regional policy. They also could be the basis for the proposed strategies. This will help in the future the planners to make tourism development and promotion more sustainable.

Keywords: Tourism Marketing, Tourism Promotion, Sustainability, Sustainability Analysis

JEL classification: M31, Z330, Q56

1. Introduction

Promotion refers to all the tools of communication mix used together towards a common objective of persuasion. The objective of promotion is to create behavioral modifications along with informing, persuading, and reminding stakeholders' methods of conducting a particular task in a specified manner (Kotler and Keller, 2012). Promotion is a form of an external motivator that is defined on the basis of environmental and social aspects and allows attracting an individual towards following a specific behavior (Caca et al., 2015; Kim and Trail, 2016). Further Schultz (2011), is suggestive that human activities are drivers of several diverse phenomena causing unsustainability these include climate change, loss of habitat for different species', and even ocean acidification among others. These conditions can be traced back to consequence of the lifestyle choices of humans and hence, conservation methods also must change behavior through "promotion" of sustainable development.

Promotion of sustainable development includes measures of encouraging practices of environmental ethics in society. Consequently, it leads to propagation of environmental literacy among people. Also, promotion of sustainable development is boosting persistent and inclusive economic growth of the sector to full and productive employment of resources at hand. This leads to building resilient infrastructure at the same time promote viable and inclusive industrialization in each segment and foster innovation (Karagiannis et al., 2010; Alexiadis et al., 2011, 2015; Crespo et al., 2017; Kokkinou et al., 2018).

The paradigm of sustainable tourism has developed over the past half-century and is still evolving. Inclusion of the terms sustainability and sustainable development in tourism has enabled tourist destinations to respond to developmental demand better (Tsiotas et al., 2021a). That is, by clearly integrating unavoidable demands of tourism such as better facilities stay and tourism-related infrastructure with sustainable use of available resources (Weaver, 2006; Tsiotas, 2017; Polyzos and Tsiotas, 2020a,b). The mission of sustainable development is to meet the needs of the present, without jeopardizing the ability of future generations to meet their own needs (WCED, 1987; Alexiadis et al., 2011; Kalantzi et al., 2016). Environmental health, economic viability and social justice are essential, in order to achieve it. Tourism management has adopted the concept of sustainability. The traditional consumer marketing perspective on the contrary, in which profit maximization is the main objective, did not adopted it yet fully. Tourists' needs are not restricted to one factor and the principal theory of promotion argues that each tourist destination has its own groups or segments of clients. Each destination needs to build a typology of tourists and their need to promote tourism better (Stayrakis et al., 2011; Vijayanand, 2013; Tsiotas et al., 2020).

To be sustainable, marketing, must incorporate social, consumer and environmental perspectives. For this reason, Jamrozy (2007) proposes a sustainable tourism-marketing model (STMM), which will challenge the traditional tourism-marketing model. "This new sustainable marketing paradigm requires the integration of alternative approaches and radically moving towards more sustainable tourism marketing principles and practices". This model reflects the principles of sustainable development based on the Brundtland report (WCED, 1987) and "represents the three dimensions of sustainability, economic viability, social equity and environmental protection". Otherwise, tourism marketing is an oxymoron.

Meler and Magas (2014), in a study define sustainable marketing as a "holistic approach with the aim of satisfying the wants and needs of customers while putting an equal emphasis on environmental and social issues, thus generating profit in a responsible way". Sustainable marketing thus advocates new mainstream marketing methods that replace conventional publicizing practices to include environmental concerns and lead to sustainable development. It also creates an appeal to the business to take into consideration social and ecological limitations of conventional corporate marketing philosophies (Belz and Peattie, 2012).

From the above, it becomes clear that the pursuit of sustainable tourism development of a tourist destination is nowadays a key goal. Likewise, aim must also be the sustainable tourism promotion of the tourism destinations.

2. Methodology and Data

The purpose of this article is to reveal the degree to which the promotion of Greece as a tourist destination is based on sustainable principles. This will help in the future the planners to make tourism development and promotion more sustainable. This is done through the analysis of sustainable promotion of 13 regions of Greece, in 2020. The main objective for the analysis of sustainable promotion is the approaching of sustainability concept through the special characteristics of sustainable promotion. The overall analysis can be a useful tool for tourism management – marketing and regional policy. The results, which would stem from the analysis, will be the basis for the proposed strategies. The sustainability analysis will be approached quantitatively. Three (3) representative variables will be used: a) the approved funds for tourism promotion, b) the tourist over-night staying and c) the tourism saturation of the area, as determined by the TALC model growth coefficients calculation. These variables will be properly correlated and the results will determine both the effectiveness of the funds sharing and if the saturated areas need further promotion or not. At the end, there will be a brief report and connection with the qualitative aspect of a sustainability approach analysis of the regions of Greece,

The areas, for which the sustainability analysis is conducted, are those of the Greek administrative spatial segregation as applied by Act 3852/2010, known as ‘Kallikratis Program’ (Alexiadis et al., 2011; Xanthos et al., 2012; Polyzos and Tsiotas, 2020a,b). This Act’s objective was a reformation of the existing regional administration system in terms of jurisdictions, spatial separations, fund distribution and local authorities’ elections. Basic points of this Act were the following: a) reduction of the number of municipalities. b) transition of secondary administrative jurisdiction from the former fifty-seven (51) prefectures (NUTS III Level) to the thirteen (13) regions (NUTS II Level) (Alexiadis et al., 2010; Ladas et al., 2011; EU, 2018), c) separation of some insular prefectures in more territorial parts, for purposes of administration, thus resulting in a total of seventy-six (76) prefectures, d) formation of decentralized authorities, e) change in the way of funding the organizations of local subsidiarity, f) redistribution of administrative responsibilities among local authorities organisms and g) extension of administration service from 4 to 5 years.

In this paper is used the NUTS II Level (Alexiadis et al., 2011; Ladas et al., 2011; EU, 2018), the segregation of thirteen (13) regions. Figure 1 and Table 1 depict the name, labelling and position of all Greek regions (NUTS II Level). Moreover, Table 2 depicts the composition of regions with their respective prefectures. For purposes of easily locating, each area (NUTS II Level) in this paper will be referred along with its respective labeling number.

Figure 1. The Greek NUTS II regions (Source: European Union, 2018)

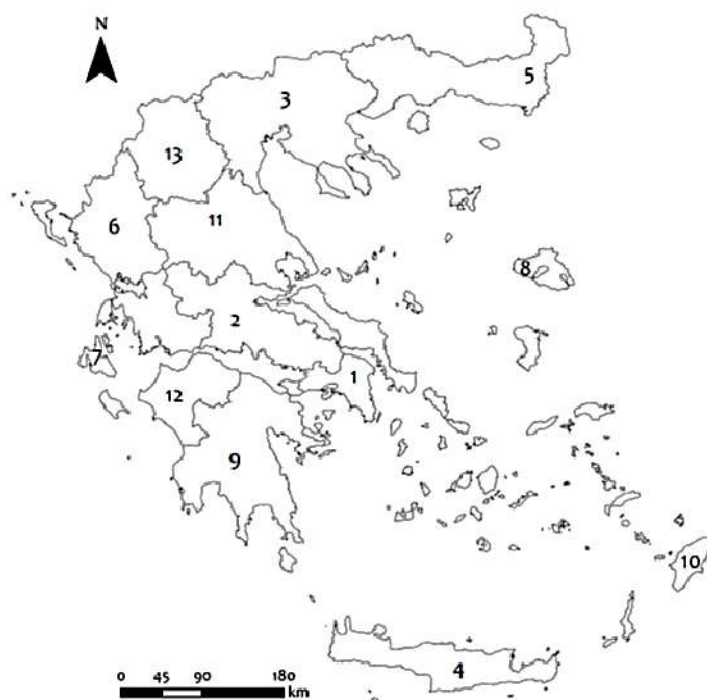


Table 1

The Greek NUTS II regions

Label	REGION	Label	REGION
1	ATTICA	8	NORTHERN AEGEAN
2	CENTRAL GREECE	9	PELOPONNESOS
3	CENTRAL MACEDONIA	10	SOUTHERN AEGEAN
4	CRETE	11	THESSALIA
5	EASTERN MACEDONIA AND THRACE	12	WESTERN GREECE
6	EPIRUS	13	WESTERN MACEDONIA
7	IONIAN ISLANDS		

Source: European Union, 2018

Table 2
Composition of Greek regions (NUTS II Level)

Label	REGION	Label	PREFECTURE
1	ATTICA	6	ATTIKHS
2	CENTRAL GREECE	12	EUVOIAS
		14	EVRYTANIAS
		16	FOKEEDOS
		17	FTHEOTIDOS
		49	VEOTIAS
3	CENTRAL MACEDONIA	7	CHALKEDIKHS
		20	HMATHIAS
		28	KILKIS
		39	PELLAS
		40	PIERIAS
		45	SERRON
		47	THESSALONIKHS
4	CRETE	8	CHANEON
		21	HERAKLEEIOU
		34	LASITHIOU
		42	RETHYMNOY
5	EASTERN MACEDONIA AND THRACE	11	DRAMAS
		13	EVROY
		25	KAVALAS
		43	RODOPHS
		50	XANTHIS
6	EPIRUS	5	ARTAS
		22	IOANNINON
		41	PREVEZAS
		46	THESPROTIAS
7	IONIAN ISLANDS	26	KEFALLONIAS
		27	KERKYRAS
		36	LEFKADOS
		51	ZAKEENTHOU
8	NORTHERN AEGEAN	9	CHIOU
		35	LESVOU
		44	SAMOU
9	PELOPONNESOS	3	ARGOLEEDOS
		4	ARKADIAS
		29	KORENTHIAS
		32	LAKONIAS
		38	MESSEENIAS
10	SOUTHERN AEGEAN	10	DODEKANEESOU
		31	KEEKLADON
11	THESSALIA	23	KARDITSAS
		33	LARISSIS
		37	MAGNESSIAS
		48	TRIKALON
12	WESTERN GREECE	1	ACHAIAS
		2	AITOLOAKARNANIAS
		19	HELEIAS
13	WESTERN MACEDONIA	15	FLORINAS
		18	GREVENON
		24	KASTORIAS
		30	KOZANHS

Source: European Union, 2018.

3. Sustainable promotion of tourism

Among other responsibilities, every region is responsible for the promotion and development of its touristic product in order to make it known to a wider audience. This is mainly achieved via marketing practices including the participation in tourism-related conferences or actions, the advertising of tourism capabilities in media (TV, internet, radio etc.), distribution of informational leaflets, the establishment of 'routes' including the area's attractions and the use of technology in general, to name a few. The actions taken to serve this goal are complied with the sustainable tourism concept, hence considering the current and

future economic, social and environmental impacts while simultaneously addressing the needs of visitors, the industry, the environment and host communities (Middleton and Hawkins, 1998; Karagiannis et al., 2010).

The interest and notability that each region shows towards its tourism promotion and development is mainly depicted on the establishment and fulfillment of tourism promotion plan and the economic resources spent for the fulfillment of these actions. These resources are mainly deriving from European Union's subsidies in a general context of financial enhancements towards member countries in order to achieve growth and development (Alexiadis et al., 2013; Kalantzi et al., 2016; Kokkinou et al., 2018).

Regarding the evaluation of the tourism promotion via the spectrum of sustainability concept, a quantitative analysis is performed, as a necessary procedure for extracting accurate results and suggesting effective strategy. Moreover, it is worth mentioning that the tourism marketing plans are devised for every region (NUTS II Level), so the analysis and evaluation of them will be performed in such spatial level.

3.1. Variable configuration

To transfuse a quantified dimension on the marketing plan analysis and evaluation through a qualitative aspect, it is considered necessary to use appropriate variables. As the terms of 'promotion' and 'marketing' are subjectively linked with the economic factor, the basic and essential variable used is the approved funds each region (NUTS II Level) received from central government for the year 2020 (F2020), in order to design and fulfill its marketing plan. Furthermore, the dimension of sustainability is approached via the dynamics of incoming tourism in correlation with the saturation of an area. These two parameters are appropriately represented by the available data for tourist overnight stayings per prefecture Ns2017 (year 2017) (ELSTAT, 2020; Tsiotas et al., 2020, 2021) and the TALC growth coefficient $r(t)$ respectively.

The growth coefficient $r(t)$, as defined in TALC Theory (Polyzos et al., 2013; Polyzos, 2019), represents in a way the velocity of saturation in an area as it shows how quickly the number of incoming tourism increases throughout a period of time. Consequently, behind this parameter many other factors are hidden which include the starting conditions of each area (existing infrastructures, socioeconomic situation, cultural heritage etc.), special features of it along with environmental characteristics to name a few. Therefore, the calculation of this coefficient is vital to deepen into the study of tourism saturation in an area.

As the tourism marketing plan is referred to regions (NUTS II Level), the TALC growth coefficient should be adjusted to such spatial level. Consequently, the TALC growth coefficient $rw(t)$ for each region is the weighted average of the separate TALC growth coefficient $r(t)$ of prefectures that consist each region.

3.2. Correlations

The quantitative aspect of sustainable promotion analysis will be performed by utilizing a proper correlation (Walpole et al., 2012; Tsiotas et al., 2021b) among the variables that will be used. This correlation is meant to depict simultaneously the distribution (Walpole et al., 2012; Tsiotas et al., 2021c) of funds according to the touristic profile of each region in conjunction with the saturation of it. The objective of this composite correlation is in a way the evaluation of effectiveness of funds sharing for tourism promotion.

Firstly, the effectiveness of the funds sharing can be partly revealed by the amount of used resources per capita, which in our case is considered to be appropriately depicted by the approved funds' weighted distribution. For this reason, an auxiliary ratio f_{st} , as shown in relation (1), is calculated at first place; which will depict the weighted approved funds of each region regarding the tourist's overnight stayings NS2017.

$$f_{st} = \frac{F_{2020}}{N_{S2017}} \quad (1).$$

The next step of the quantitative analysis is the calculation of the correlation between the regions' f_{st} ratios and TALC growth coefficients $rw(t)$. The results of this correlation suggest if there is any patterned policy regarding the distribution of the funds from the central

government, while it is expected to reveal each area's need for promotion in terms of its saturation degree

4. Sustainable promotion in the greek regions

4.1. Variable configuration

The values of the three variables are depicted in Table 3. It is worth noticing that the regions considered the pillars of incoming summer tourism, hence the insular ones of Crete (NUTS II: 4), Ionian Islands (NUTS II: 7) and Southern Aegean (NUTS II: 10) are endorsed with at least one million euros each. A first reading of this fact reveals both an interest to expand the incoming tourism and a need to maintain the so far established touristic profile of the area. On the other hand, the rather augmented funds for the regions of East Macedonia and Thrace (NUTS II: 5) and Peloponnissos (NUTS II: 9) are indicating an attempt for a dynamic presence in the tourism sector. Regarding the rest regions, low budget of certain areas such as Central Greece (NUTS II:2), Epirus (NUTS II:6), Western Greece (NUTS II:12) and Western Macedonia (NUTS II:13), could probably be indicative of their dynamics in touristic activity, while the medium size one at Central Macedonia (NUTS II:3), Northern Aegean (NUTS II:8) and Thessaly (NUTS II:11) probably show a more moderate approach towards tourism promotion.

Table 3

Approved funds for tourism marketing plan (F2020), overnight stayings (NS2017) and weighted growth coefficient $r_w(t)$ for each Region of Greece

Label	Region	F_{2020} (million euros)	NS_{2017}	$r_w(t)$
1	Attica	0.68	8833584	4.670
2	Central Greece	0.35	1717667	6.050
3	Central Macedonia	0.60	9086001	7.418
4	Crete	1.00	24473913	9.574
5	Eastern Macedonia and Thrace	1.80	1973242	5.155
6	Epirus	0.38	1099202	4.114
7	Ionian Islands	1.73	9885033	9.912
8	Northern Aegean	0.50	1750671	8.216
9	Peloponnissos	1.20	3091937	4.988
10	Southern Aegean	1.00	21310044	10.083
11	Thessaly	0.80	2209719	4.629
12	Western Greece	0.30	1902912	3.975
13	Western Macedonia	0.35	294448	3.276

Source: Compiled by authors

4.2. Correlations

After reviewing the absolute values of approved funds for each region, they were further evaluated in terms of visitors' density by using an appropriate indicator, as described in section 3.2. The f_{st} ratio's values, for each region, are depicted on Table 4, in ascending order.

Table 4

The f_{st} ratio for each Region

Label	Region	f_{st} ratio
13	Western Macedonia	1.189
5	Eastern Macedonia and Thrace	0.912
9	Peloponnissos	0.388
11	Thessaly	0.362
6	Epirus	0.341
8	Northern Aegean	0.286
2	Central Greece	0.204
7	Ionian Islands	0.175
12	Western Greece	0.158
1	Attica	0.077
3	Central Macedonia	0.066
10	Southern Aegean	0.047
4	Crete	0.041

The results of the fst ratio almost override the review made on the absolute values of the approved funds. It is obvious that the ratio is higher to the less popular tourist destinations (despite a few exemptions), thus indicating that there is awareness from region and State's side of the need for further promotion and tourism development in these areas. Secondly, the regions with recognizable touristic value such as Central Macedonia (NUTS II: 3), Crete (NUTS II: 4), Ionian Islands (NUTS II: 7) and Southern Aegean (NUTS II: 10) are willing to spent even 7-30 times less funds per overnight staying, as they are already established to the national and international tourist destination map, thus having secured the growth of incoming tourism.

Moreover, this intuitive ascertainment is statistically amplified by using the Pearson correlation coefficient r (Norusis, 2004; Walpole et al., 2012), along with a t-test for fst ratio and $rw(t)$ growth coefficient. Indeed, the r Pearson correlation coefficient turned to be $r = -0.54$, while the t-test resulted in $Pone\text{-}tail = 7.0681 \text{ E-}07$ and $Ptwo\text{-}tail = 1.4136 \text{ E-}06$. These results indicate a moderate and statistically significant correlation between the fst ratio and the regions' growth coefficient $rw(t)$, which supports the initial impression about the funds distribution.

The following figure 3 depicts a concentrated view of the fst ratio, the $rw(t)$ growth efficient and the approved funds F2020 in order to visualize the distribution of them among the regions. Moreover, figure 4 depicts the pair-wise correlation between the fst ratio and $rw(t)$ growth efficient which is characterized by a linear distribution.

Figure 3. Approved funds F2020, fst ratio and $rw(t)$ growth coefficient

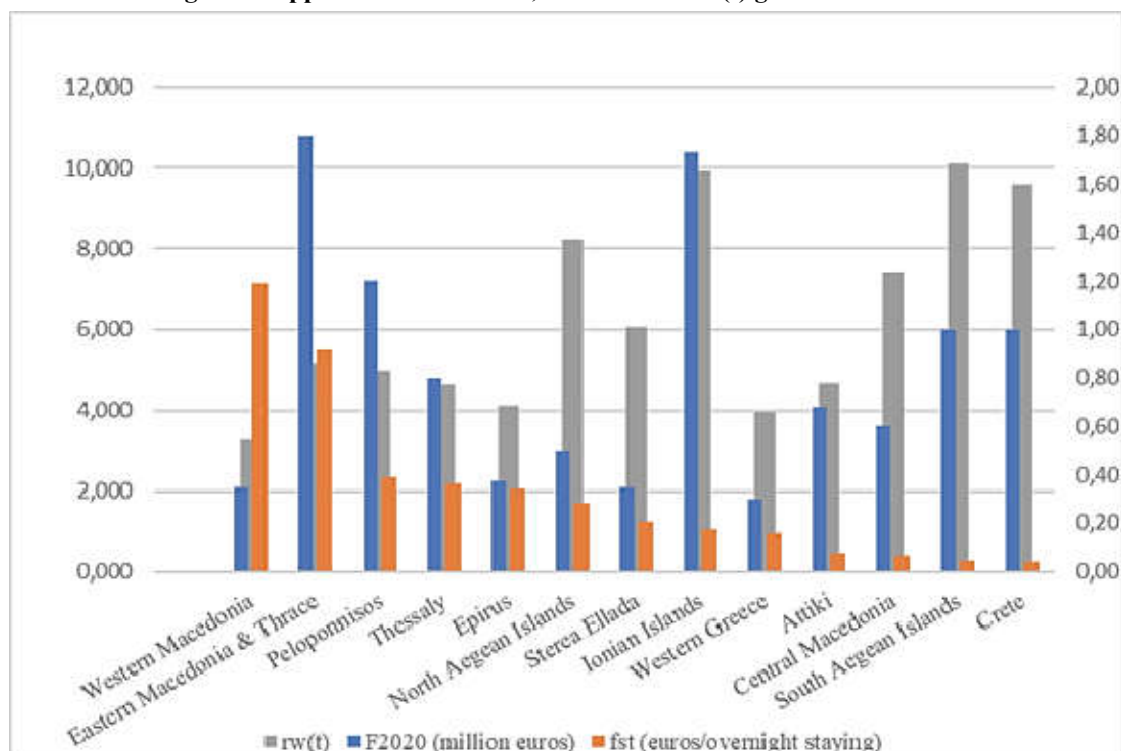
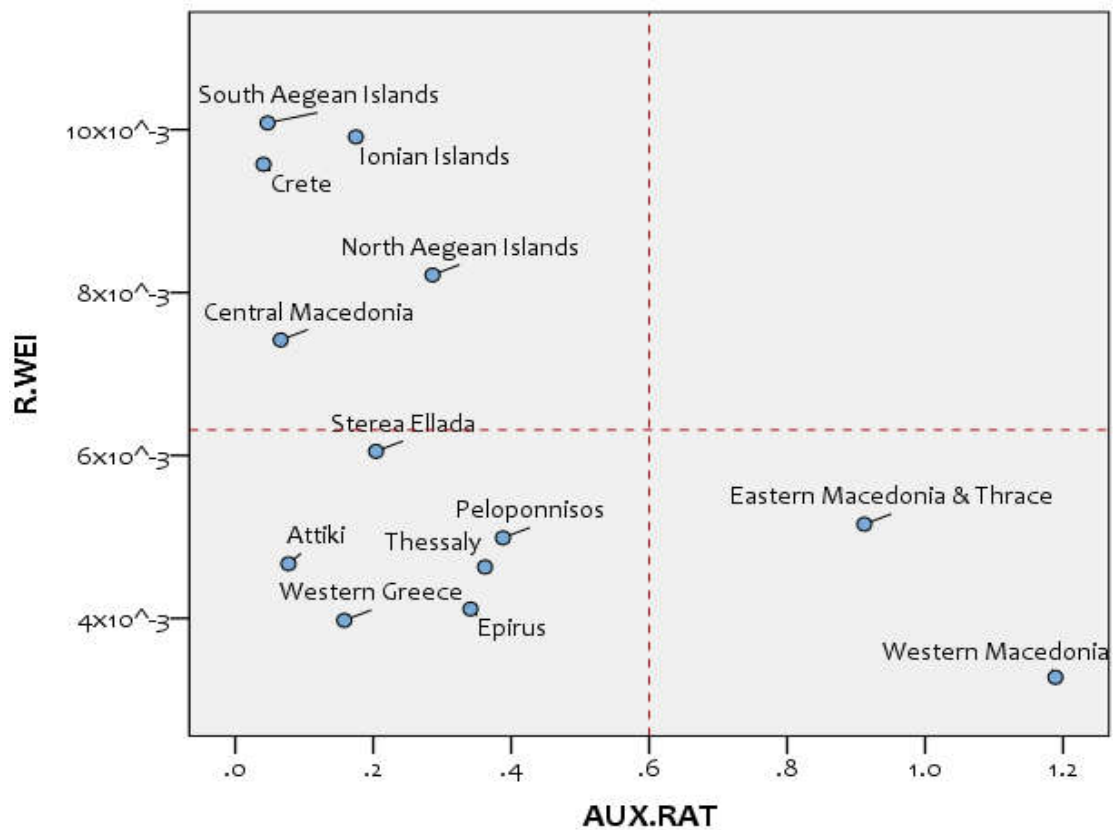


Figure 4. Pair-wise correlation between fst ratio and rw(t) growth coefficient

5. The qualitative dimension of the sustainable promotion

The qualitative aspect of analysis is thought to be the key for a successful promotion policy. It is performed by evaluating and correlating the specific actions each region has set up for the forthcoming year through its tourism marketing plan with the proposed strategy configuration of this thesis. The expected result of such evaluation will be the rating of each region's tourism marketing plan regarding its supportability to this thesis' sustainable development proposals. Inferentially, after the evaluation of each region's tourism marketing plan, it is safe to claim that they are supporting this thesis' proposals in a quite satisfactory degree (Amoiradis, 2021). Apart from the regions of Ionian Islands, Attica and Crete, whose marketing plan seems to lack of focused actions which could support specific objectives, the rest of the regions seem to have acknowledged their special needs related to tourism by devising proper tourism marketing plans to serve them. For purposes of categorization, the regions' tourism marketing plans will be rated by one of the following three (3) qualitative values, depending on their supportability to this thesis' strategic development proposals and are depicted in Table 5:

- *Disconnected*: Low supportability to this thesis' strategic development proposals
- *Connected*: Adequate supportability to this thesis' strategic development proposals
- *Supportive*: Excellent supportability and integration of this thesis' strategic development proposals

Table 5
Regions' tourism marketing plans rating

Label	Region	Tourism Marketing plan rating
1	Attica	Disconnected
2	Central Greece	Supportive
3	Central Macedonia	Supportive
4	Crete	Disconnected
5	Eastern Macedonia and Thrace	Connected
6	Epirus	Supportive
7	Ionian Islands	Disconnected
8	NORTH AEGEAN	Supportive
9	Peloponnisos	Supportive
10	SOUTH AEGEAN	Supportive
11	Thessalia	Supportive
12	Western Greece	Supportive
13	Western Macedonia	Connected

6. Conclusions

The purpose of this article is to reveal the degree to which the promotion of Greece as a tourist destination is based on sustainable principles. This is done through the analysis of sustainable promotion of 13 regions of Greece, in 2020. The main objective for the analysis of sustainable promotion was the approaching of sustainability concept through the special characteristics of sustainable promotion. The sustainability analysis has been approached mainly quantitatively.

At the end, there was a brief report and connection with the qualitative aspect of a sustainability approach analysis of the regions of Greece. The marketing plan of each region was evaluated after its correlation with the proposed development strategy, as a result of which it was evaluated as supporting the sustainable development strategy or not (Amoiradis, 2021).

From the previous quantitative analysis, we can observe the following:

At first glance, three regions, which are characterized as the pillars of inbound tourism, have increased funds for their tourism promotion. This shows a strong interest in maintaining the tourist profile of the area but also expanding inbound tourism. Two other areas have relatively high funding. There we see an effort to create a profile with a stronger presence in the tourism sector. Medium-sized funds are observed in three regions, which probably show a more modest approach to tourism promotion. Finally, in four areas we have a low budget, which probably indicates their dynamics in tourism.

The results after using of the fst ratio almost replace the view taken on the absolute prices of authorized funds. It is obvious that the ratio is higher to the less popular tourist destinations (with some exceptions), thus indicating that there is awareness on the part of the region and the state about the need for further promotion and tourism development in these areas. Furthermore, areas of recognizable tourist value such as Central Macedonia (NUTS II: 3), Crete (NUTS II: 4), the Ionian Islands (NUTS II: 7) and the South Aegean (NUTS II: 10) are willing to spend even 7-30 times less funds per night. They are already installed on the map

of national and international tourist destination, thus ensuring the development of inbound tourism, having secured the growth of incoming tourism.

After determining the supportiveness' degree of the regions' tourism marketing plans, it is worth retracing the figure 4, where the pair-wise correlation between fst ratio and rw(t) growth coefficient is depicted. The regions located to lower-right quartile are those of the greatest need for tourism reinforcement and their promotion plans are at an encouraging level towards this direction. On the other hand, the prefectures at the upper-left quartile, 60% of them (3 out of 5) are consistent and supportive to development strategy proposals, probably due to their 'secured' attractiveness and established ranking among tourism destinations. Finally, the regions of the lower-left quartile are quite more willing to support the development strategy as 83,3% of them (5 out of 6), thus probably indicating that they are not complacent regarding the tourism promotion and are trying to find possible ways to attract more tourists in a sustainable context.

Finally, the regions' tourism marketing plans rating (Table 5) shows the supportiveness' degree of the each regions. Here we can observe that the results of the quantitative analysis largely confirm the findings of the reported qualitative analysis.

The overall analysis could be a useful tool for sustainable tourism management and marketing in frame of the regional policy. The results, which have stem from the analysis, could be the basis for the proposed strategies. This will help in the future the planners to make tourism development and promotion more sustainable.

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SPATIAL LINKAGE BETWEEN QUALITY OF INSTITUTION, NATURAL RESOURCES MANAGEMENT WITH GDP PER CAPITA IN D8 COUNTRIES (DURBIN MODEL IN PANEL DATA)

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Abstract

Suitable economic growth has always been one of the priorities of any economic system. Meanwhile, economists have tried to achieve this goal by determining the factors affecting economic growth. At first, the main emphasis was on the physical capital and labor force, and the natural resources management. However, institutional factors, including natural resource management, emerged as a determinant of economic growth. In this regard, in this paper, the effect of institutions and management of natural economic resources on GDP per capita as a proxy for economic growth have been investigated by applying spatial regression models and Durbin model in the D8 countries during the period of 1996-2019. The empirical results of model estimation showed a positive and significant effect of natural resource management on economic growth of these countries. Moreover, the effect of physical capital, human capital, foreign investment accumulation and natural resources on economic growth is positive and significant. In addition, the effect of neighborhood and spillover impact of institutional quality on the economic growth has been confirmed in D8 countries.

Keywords: GDP Per Capita, Institutions Quality, Natural Resource Management, D8 Countries.

JEL classification: C23, O47, I25

1. Introduction

A crucial subject for theoretical and empirical studies is the extent to which determinants of economic growth play in different countries, meanwhile the economic growth is essential to maintain and improve the international competitiveness of a country. Although economic growth has been widely studied, the traditional economic theories lack a framework explaining the differences in economic systems between countries beyond human capital, physical capital, labor, technology, and natural resources. Recent studies in institutional economics have arisen as an attempt to provide a framework investigating those residual differences. High institutional quality has been debated as an economic growth momentum by incentivizing economic activities such as consumption and investment improving efficiency allocating resources more efficiently protecting property rights and supporting freedom of choice. Achieving higher economic growth rates and per capita incomes is one of the primary targets of all economic systems and the desirable point of all the efforts that are made to regulate the economic affairs of societies. Given the changes in economic growth rate and its importance in economic systems, economists have been trying to formulate different theories of economic growth, so as to provide a comprehensive insight into the differences between economic growth and per capita income among countries around the world and to provide a comprehensive explanation of these differences over the years and long-term between

countries of the world. Therefore, several factors are proposed as determinants of economic growth. For example, a study by Mankiw et al. (1986) showed that the long-term economic growth rate is not highly correlated with the country's initial income level and low physical capital accumulation is not the only factor of low economic growth in countries, but also some other factors such as the stability of macroeconomic space and institutional factors accelerate economic growth (Lucas, 1988). Investment security is an institutionalized framework of social, political and legal conditions that gains the confidence of investors to develop investment and start a new business.

A secure economic environment is closely related to a stable macroeconomic environment, stability in policies and laws, efficiency and effectiveness of government and the governance of law and regulations (Parkhideh and Tajik, 2011). The basis of economic security is the belief in the effect of economic uncertainty on people's livelihoods. This belief has a logical consequence: because the economic threat of individuals in a society leads to unexpected economic damage due to the inefficiency of their economic activities. Due to the effect of this issue on all aspects of society, economic security in recent years has been the subject of research in various fields of humanities such as economics, political science, social psychology and sociology. In an insecure economic environment, due to the increase in investment costs, the amount of investment in projects that require long-term investment decreases, and in such circumstances, the context of growth of investment in brokerage as well as smuggled imports is provided. In addition, the appropriate level of economic growth and development to enjoy its benefits, including higher income, less poverty and inequality, and consequently greater welfare, is the goal of more economic and social programs of different societies.

Development experts suggest different definitions of development. Sen (1983) expresses development as an increase in the merits and abilities of individuals. Myrdal (1975) sees development as the movement of a social system forward. Todaro also sees development as a process in which the three axes of livelihood, self-esteem, and freedom are improved (Todaro & Smith, 2012). In the studies, several factors are introduced as factors affecting development.¹ One of these factors that has received special attention among development researchers and policy makers in recent years is the discussion of institutions and development. North (1990) defines institutions as rules of the game or constraints imposed by mankind to regulate human interactions. According to this definition, institutions cause the structuring of incentives in political, economic and social exchanges, and their most important function is to reduce uncertainty and exchange costs in various activities of societies. As Acemoglu et al. (2014) state, institutions affect development by influencing the total productivity of the factors of production, improving human capital and physical capital. These effects are such that Engerman & Sokoloff (1997 and 2011) attribute the different development paths of the American countries over the past hundred years to the initial conditions of these countries to benefit from institutional variables. But is the causality only from institutions to development, or can development also affect institutions? In most researches on the relationship between institutions and development, only the causality of institutions to development is examined and the effect of institutions on development through channels such as increasing the total productivity of factors of production, improving human capital and physical capital, reducing uncertainty and transaction costs and improving social capital are investigated.

After explaining the importance of favorable economic growth and the need to pay attention to the institutional index and improving natural resource management, the question arises as what could be the effect of the institutional index of governance and improving natural resource management on economic growth in the D8 countries² during 1996-2019. For this purpose, in the second part, a review of literature and in the third part, the research methodology and statistical databases have been presented. The fourth section presents the empirical results and finally the fifth section presents the conclusions and policy implications.

¹ For further reading about the factors affecting the development refer to Todaro & Smith (2012) and Hunt (1989).

² . Turkey, Iran, Egypt, Nigeria, Pakistan, Bangladesh, Indonesia & Malaysia

2. Review of literature

In this section, a theoretical framework and empirical review of the relationship between institutional quality and natural resource management with economic growth and the most important empirical studies have been reviewed in following sections.

2.1. Theoretical framework

New economic growth theories emphasize the effect of political and economic institutions as well as governance on production and economic growth. Acemoglu & Robinson (2012) "The Origins of Power, Prosperity and Poverty", introduce numerous examples from different periods of history along with numerous evidences and documents, in all of which, inappropriate decision by leaders is seen as a common point. It is clear that it should be found that what has brought these leaders and the decision-making system to this point. According to Acemoglu & Robinson (2012), the performance of these institutions and the correctness or inaccuracy of their performance ultimately leads to the emergence of a class of elites and political, social, economic, military and other decision makers whose sum and estimation of their decisions will lead the society in a certain direction and improve economic growth and per capita income. Now, if this is the right and appropriate direction for society and the world at that time, society will succeed in its economic goals, including economic growth and improved per capita income. If not, we can assume that it will lead to decline and downfall. Acemoglu & Robinson emphasize that improperly functioning societies will turn into unsuccessful governments, but something can be done about it. There can be governments with infrastructure and law and order where people can work and earn with confidence and rely on public services, but there is no political will to do so. There is no need for the military to implement such plans; what is needed is an efficient and capable administrative system to lay the institutional foundations of the markets. In sum, it can be said that in traditional growth models, countries and even technologies were assumed to be the same. These models attributed the root of the difference between the investment rate and economic growth in different countries to the savings rate and the growth rate of factors of production. In the second stage, economists tried to minimize the unexplained waste growth by controlling the model over other factors, such as human capital, the degree of development of the financial sector, the importance and quality of macroeconomic policies in different countries (Sharif Azadeh & Hosseinzadeh Bahreini, 2003). In this way, even the difference in technology performance in different countries and regions was considered; yet the unexplained waste was significant. In the third stage, researchers focused on non-economic factors affecting investment and economic growth. Considering non-economic factors, including institutions, as another source of countries' heterogeneity, raised the question of what the relationship is between institutions in general and political and social institutions in particular with economic growth and per capita income. In this regard, Ranani (1997, p. 16) states that contrary to popular belief that the realization of economic growth either requires the governmentalization of the economy or requires the marketization of the economy, the new institutionalized economy believes that the economy should be the optimal combination of the market and non-market institutions; Or in classical terms, a combination of market, program, and tradition; Or, in the words of institutionalists, a combination of market, government, and enterprise (in the sense of an orderly, purposeful, and hierarchical institutional set). But these institution sets, must be combined in such a way as to minimize not only exchange costs (in private contracts between economic agents) and free riding (in collective decisions) (which is necessary for market allocation efficiency), but also improve other function indicators, such as security, distributive justice, compassion, freedom, etc. (superior efficiency). Acemoglu et al. (2002) also believe that deep differences between countries in transition, crises and growth practices have institutional reasons, and poor macroeconomic performance and deviations in macroeconomic policies are signs of this institutional disease.

Researchers describe six characteristics and components for governance and institutional indicators, which has been reported in the following section:

1- Transparency and accountability: This component includes awareness, understanding and the ability of the citizens of the country to participate in government elections, freedom of expression, freedom of parties and associations, as well as freedom of the media. In any

society where its members have a greater role in decision-making, due to the accountability of elected officials to the people and the active presence of the people in social and economic activities, we can expect that society from a higher level of development. Besides, developed countries, are countries where people participate freely in social and economic activities and have a higher level of social capital³(Putnam, 1993; Frey, 2003; Przeworski et al. (2008); Tridico (2013)).

2. Political stability and non-violence: Awareness of the possibility that the government may become unstable or overthrown against the constitution or by using violent means, including politically motivated violence (like war or coup d'etat) and terrorism. Inclusive economic development in the long run requires a stable and secure environment in order to form a proportionate and optimal formation of economic activities; in other words, it can be said that political stability is one of the requirements for improving macroeconomic indicators and removing economic barriers (Gisselquist, 2012). In environments that do not have the necessary political stability and in which military conflicts take place, due to the loss of resources and rising investment risks and costs, return on investment is reduced and the motivation of economic actors to implement economic activity in these environments will be reduced and this will reduce investment and slow down the development process (Campos & Nugent, 2000; Campos & Karanasos, 2007; Gurgul & Lach, 2012; and Aisen & Veiga, 2013).

3- The effectiveness of the government: Awareness of the quality of public services, the quality of civil services and the degree of freedom and independence of these services from political pressures, the quality of regulation, formulation and implementation of policies, as well as the validity of government commitment to such policies is placed in this component. In the 1980s and 1990s, when the Washington Consensus was one of the dominant theories in economic circles, there was more emphasis on market functioning and less role was considered for the government in the development process, but with market failure in some cases, especially poverty reduction, and inequality, development theories tended to support the role of government in development, in particular, the emphasis on the role of government in supporting the creation of human capital, public health, technology transfer and support for policies based on sustainable development. Gennaioli et al. (2011) and Aderemi (2014) emphasize the positive effect of human capital on development. Bloom et al. (2004), Bloom & Canning (2005) and Ashraf et al. (2008) emphasize the positive effect of health on development.

4. Regulatory quality of regulations: This indicator includes awareness of the government's ability to formulate and implement transparent policies, as well as regulations that promote licensing and private sector development. Having clear rules and incentives for economic activity will reduce costs by making the future more predictable for economic actors, and this will attract more investment and move the development process forward. On the other hand, institutions and laws that reduce the motivation of economic activities by slowing down costs and delaying economic activities, lead to a slowdown in the development process (Borrman et al., 2006 and Lee, 2008). Clear and efficient rules can also facilitate the development process by increasing trade and, consequently, trade and technology transfer (Freund and Bolaky, 2008; and Silberberger, 2015).

5. Judicial security: This indicator of understanding and awareness shows the extent to which economic factors affect the laws of society, especially the quality of the implementation of contracts, property rights, police and courts, as well as the likelihood of crime and violence, confidence, perseverance and loyalty. Economic agents can safely make new investments or expand existing investments when they are confident of legal protection of their property rights and benefits.⁴ When each individual is concerned about the seizure of his or her rights by others, his or her motivation to engage in economic activity will diminish,

³ It should be noted that it's not only countries with democracy that are of a higher level of development; and countries such as China, Taiwan and South Korea are also of a good level of development while they do not have a democratic government. For further reading in this field see Reuschmeyer et al (1992), Acemoglu et al. (2006), Acemoglu & Robinson (2008).

⁴ It should be noted that legal supports of the property rights and specifically, intellectual property rights, should not be in a way that creates monopoly for some people. For further reading in this regard, see the Chang (2001, 2011) paper.

and this will lead to delay in the development process (Acemoglu et al., 2001; Zak, 2002; and La Porta et al., 2008).

6. Corruption control: It includes understanding whether public power has been exercised in the provision of private interests, as well as the seizure of power by political elites and the private interests of politicians. The existence of corruption can have a negative effect on development by reducing the motivation of economic actors to engage in productive works, diverting resources to low-yield activities, and reducing the incentive to increase capital types (D'Agostino et al., 2012; Srithongkul & Pastpipatkul, 2013; Boicos, 2013; and Baxamusa & Jalal, 2014).

Greif (2006) defines institutions as a system of laws, beliefs, norms, and organizations that form an order of social behaviors. The institutions of each society are different from the other. The main issue in the field of economic growth of countries is not the quality of one or more specific institutions but the method of creating order in society. How to create order affects institutional quality and, consequently, economic growth (Fatehi Dabanloo et al., 2017). In addition, the relationship between the abundance of natural resources and economic growth and development can be explained through the effect of the abundance of natural resources on economic policies. The richer countries are in natural resources, the weaker macro-policies last longer and the less pressure there is to achieve industrial maturity.

2.2. Empirical studies

In this section, the most similar empirical studies on the effect of institutional factors and natural resources on economic growth and macroeconomic variables have been reviewed.

Singh and Pardhan (2020) empirically examines the impact of institutional quality on economic performance in South Asia for the period 2002 to 2016. The empirical results revealed that institutional quality has a positive impact on economic performance in the long-run whereas, governance indicators such as control of corruption, government effectiveness and political stability are vital for better economic performance in South Asian countries.

Alexiou et al (2020) by using of panel co-integrating method like FMOLS have been tested the long-run relationship between institutional quality and economic growth in 27 post socialist economies over the period from 1996 to 2016. They founded that in the long-run, economic growth is positively associated with the rule of law and voice and accountability. In the short run, regulatory quality retains a positive effect, but voice and accountability demonstrate a puzzling negative effect on economic growth that merits further analysis

Myakshin & Petrov (2019) employed the balanced score card method for evaluating the investment attractiveness of a region. In performing this study, we were governed by the current theories of institutional economics, region's economy, and the theory of investment, the latter viewing the investment attractiveness through the prism of investment efforts. The results and conclusions of this study may serve as the basis for elaborating the region-level investment promotion strategies.

Hisamoglu (2018) examined the effect of institutions and economic growth in Turkey during the period -1987-2016. This period is chosen as a stimulus for improving institutional quality due to Turkey's move towards EU membership. The results of this study, while emphasizing the important role of institutions on Turkey's economic growth, show that the effect of the quality of laws and bureaucracy, as well as the management of social conflicts and political tensions has had a greater effect on Turkey's economic growth than other institutional indicators.

Melnikova et al (2017) investigated issue of the development of electronic government and electronic democracy in Russia in terms of fostering the public need for the everyday use of electronic services. The authors draw the conclusion about effective manipulation being possible only if the process of cultivating specific mindsets to shape and drive human behavior has an all-encompassing nature.

Gallyamova & Miftakhov (2017) stated that institutional regulation of the regional banking system is proceeding along the path of putting together regional financial-industrial clusters, participants in which are eligible for the long-term use of the resources available. What is open to question is the degree to which the regulator's standards and requirements are

differentiated depending on the specificity of the region's economy and the bank's sectoral specialization.

Flachaire et al. (2016) evaluated the effect of economic and political institutions on the economic growth process in 79 selected developing and developed countries during the period 1975-2012. This study shows that political institutions do not have a direct effect on economic growth rate and the improvement of political institutions by stimulating other factors affecting economic growth such as business environment, increased investment in human capital and physical capital are drivers of economic growth.

Duran (2015) by using of nonparametric convergence regressions has investigated the nonlinear regional income divergence in 67 provinces of Turkey during the 1975-2000. He find that the relationship between initial income and growth takes a inverted-U shape which means that the very low-income and high-income group of provinces experience a slow growth pattern compared to middle-income group.

Siddiqui and Ahmed (2013) examined the effect of institutions on economic growth in 29 selected countries of the world during 2002-2006. In this study, the index of Institutionalized social Technologies, policy and institutional law, Institutional and Policy Rents, Political rents, Risk Reduction Index and World Governance Indicator is used to introduce the effect of institutions. In this study, by pointing out that the undeniable importance of institutions on economic growth has been accepted, it examines the intensity of the effect of various institutions on economic growth. In this study, which uses the dynamic panel method and generalized moments, the results show that institutions have a positive and significant effect on economic growth. The results of this study also indicate that the effect of policy-making index on long-term economic growth is more than other institutional indicators, while the effect of risk-reducing institutions has been meaningless even in some cases.

Law et al. (2013) examine the effect of institutions on economic growth and development using the panel data approach and Granger causality analysis method for 60 selected developing and developed countries during 1996-2008. In this study, the governance index and the International Country Risk Guide (ICRG) was used to show the status of institutions in each country. The results of this study show that there is a two-way causal relationship between institutions and economic growth. The results also show that the patterns of causality between institutions and economic performance are different at different income levels. In countries with higher average per capita incomes, better quality institutions boost economic growth, and in countries with lower average per capita incomes, economic growth leads to improved institution quality.

Putterman (2013) examined the effect of social institutions and capacities on economic growth in different parts of the world and at different times after the Industrial Revolution so far. The results of this study show that one of the reasons why some countries experienced rapid economic growth is the development and increase of social capacities of countries by improving the quality of institutions.

Hossain & Miyata (2012) by applying OLS regression evaluated the relationship between environmental sustainability, energy use and economic growth in the Toyohashi city of Japan. The results of their findings show that manufacturing and trading sector of the economy are causing expansionary pressure on use of combustion energy. The study also finds that contribution of technology to reduce use of energy in production side of the economy yet a dormant factor.

Dias & Tebaldi (2012) investigated the nexus between human capital and institutions with economic growth using the data panel approach and the generalized torque method for more than 50 selected countries during 1965-2005. The results of the model estimate show that improving the quality of institutions improves the accumulation of human capital, reduces income inequality and accelerates the movement in the historical direction of development. The results of this study also emphasize that strong infrastructure and structural institutions that are necessary for economic growth affect the long-term economic performance of countries, while in the short term, they have little effect on economic growth. Also, the effect of political institutions on productivity and long-term economic growth is meaningless. On the other hand, the intensity of the effect of institutions on economic growth in developing countries is greater than in developed countries.

Arezki and Van der Pleog (2010) examine the role of natural resources on per capita income in two groups of countries with good and bad economic policies and the effective role of law in the economy. The results show that dependence on natural resources has a negative and significant effect on per capita income, especially in countries where the role of law in the economy is weak or where poor economic policies are applied.

Huynh and Jacho- Chávez (2009) nonparametric examine the effect of good governance on the economic growth of 125 countries (classified into 5 groups: Western Europe, Eastern Europe, Latin America and the Caribbean, Asia and Africa) during 1996-2006. The results show that only the three indicators of the right to comment and accountability, political stability and the ruling of law of the six indicators of governance effect on economic growth and the three other indicators of corruption control, government effectiveness and regulatory power have no effect on economic growth. Empirical evidence also shows that the right to comment and accountability, political stability and the ruling of law have a non-linear effect on economic growth and this is due to the heterogeneity of these indicators among countries, regions and times. The results of this study indicate that changes to improve the governance index can be more effective on economic growth than other economic reforms.

Aidt et al. (2008) examined the effect of political accountability index as an indicator of corruption and also considering a tool variable to determine the level of governance on economic growth (growth rate per unit of GDP) in 84 countries, including the Islamic Republic of Iran from 2000 to 1970. The results show that the effect of corruption variable on economic growth depends on the existing ruling regime. When the quality of institutions or governance is high, corruption slows economic growth. But in a regime with low institutional quality or governance, the effect of corruption on economic growth is meaningless. On the other hand, the effect of corruption on economic growth is stronger in the short run than in the long run.

Gilbert's study (2003) examines the importance of good governance and the quality of institutions in achieving economic growth and development in different countries. In this study, using panel data from 1970-2000 for 102 developing countries; he concludes that there is a direct and significant relationship between quality indicators of regulation and government efficiency as a substitute for a good governance index and economic performance measured by per capita income growth rate. Studies by Baldassi et al. (2003), Hall et al. (1999), and Kangundu (2006) show a positive relationship between good governance and economic growth.

Despite extensive researches on the positive effect of good governance on economic growth, there are few studies that show an inverse relationship. For example, an important challenge to the positive effect of good governance on economic growth is related to the study of African countries by Sachs et al. (2004). In an empirical analysis, they show that differences in the economic performance and level of development of African countries cannot be explained by differences in the quality of governance. This issue can be interpreted in two ways: the most important reason for the negative relationship between governance and economic growth is the lack of attention to improving the governance components in African countries and the low average governance index in these countries. In other words, improving governance is not a priority in the economic policy of developing African countries. Another method is the existence of historical analyses on the African continent; because in the last fifty years, given the macroeconomic goals of these countries, to get rid of poverty and hunger and move towards relative prosperity, improving the governance components to achieve this has not been successful. Therefore, other African countries should refrain from upgrading the governance index.

In a book entitled "Democracy, Governance, and Economic Growth", Kenak (2002) attempts to evaluate the effect of democracy on economic growth by establishing a relationship between democracy and governance. Therefore, it used statistics and information between selected developing countries during 1960-1990. The results of regression show a positive and significant effect between the status of institutions and the quality of governance. Thus, stronger democratic institutions influence governance and realize higher economic growth by reducing corruption and facilitating technological change.

Gradstein (2002) in a theoretical study expressed the relationship between economic growth and governance. By arguing this issue which is a vital aspect of this model that law

enforcement is costly when leading to better protection of property rights (and thus promoting growth) and requires resources that are only available in economies that are strong enough. Therefore, this analysis introduces two scenarios: one with minimal support for governance and low income and the other with full support for governance and high income. In both cases, improving the governance index promotes economic growth.

Komijani & Salatin (2008) examine the relationship between governance and economic growth between the two groups of member countries of the Organization for Economic Co-operation and Development (OECD) and the Organization of Petroleum Exporting Countries (OPEC) using the panel data method during (1996-2007). The results show that:

- There is a positive and significant relationship between the quality of governance index and economic growth in both groups.
- The rate of effectiveness of the governance quality index on economic growth in the OPEC countries is greater than in the OECD countries.
- The index of political stability in the group of OPEC member countries and the index of corruption control in the group of OECD member countries have the greatest effect on the rate of economic growth.

Jafari Samimi & Ekhtiari (2009) examined the relationship between economic growth and economic security, where Heritage Foundation was used to measure economic security in the countries which are a member of the Organization of Islamic Cooperation, relying on Iran during (1997-2005). The results show that economic security has a positive and significant effect on economic growth.

Komijani & Salatin (2010) have studied the effect of governance quality on economic growth using panel data in Iran and selected neighboring countries (Turkey and Pakistan) during 1996-2007. The results of the study show that the quality of governance in Iran is not favorable. The results of model estimation also show that the quality of governance index in all three countries has a positive and significant effect on economic growth rate. This index is more effective in Turkey than Iran and Pakistan.

Bashiri & Shaghaghi Shahri (2011) while explaining the mechanism of the relationship of good governance with reducing corruption and improving economic growth, in the form of a panel econometric model for the example of Southwest Asia countries during 1996-2007, examined the question of "Does implementing the good governance policy package leads to economic growth of countries?" In general, the results obtained from the estimation of the growth model emphasize the significant and direct relationship between the various components of the good governance index with the economic growth of the countries in the region.

Shahabadi & Pourjavan (2012) by stating the governance index as the main factor of economic development, dealt with the statistical analysis of governance indicators and some variables of social and economic development during 1996-2006 for 35 selected countries in Southeast Asia, West Asia, Latin America and Africa. Implicitly, the results of this study show that improvements in governance indicators (such as transparency and accountability, political stability, public service effectiveness, accurate regulatory regulation, judicial provision, and corruption control) in the countries under study, can have significant effects on improving development indicators such as per capita income, life expectancy, health and education, and unemployment rate, thus increasing social welfare.

Fatehi Dabanloo et al. (2017) examine the relationship between institutions and development in the Middle East during 1996-2014. Findings show that in oil-exporting and non-oil-exporting countries in the Middle East, there is a significant difference between the interaction of institutions and development.

According to the previous studies on the relationship between institutional quality indicators, governance indicators and economic growth in different developing and developed countries, researchers found that no direct research is conducted on the effect of institutional quality indicators and natural resource management on the economic growth of D8 countries using the effects of neighborhood of countries, hence, the difference between this paper in compared with previous studies is in presenting a new model and experimental modeling based on panel data using different models of spatial regression such as autoregressive, spatial Durbin and spatial error model during 1996-2020.

3. Methodology of research and model specification

In this research, the tools for collecting statistics and information are as follows:

- The data of average education of people aged 15 and over have been extracted from Barro and Lee database (2019).
- The data of natural resource governance and abundance as well as other variables used are extracted from the World Bank (2021) database.
- In order to extract the effects of space spillover and its spread in the countries of D₈ region, the proximity matrix in different states is used in Stata 16 software version 16 during 1996-2020.
- In order to estimate the model and extract the effects of spatial spillover in this study, different modes of spatial regression in the panel data model are used as follows and the appropriateness of each of these methods will be validated based on good fitting criteria such as Akaike information criterion and minimum square root of error. In other words, by estimating each of the following patterns, the effects of spatial spillover in error sentences, the intermittent value of the dependent variable or explanatory variables are tested, and in each case there will be effects of spatial spillover.

A. First-order spatial regression model

This model is the least used among space models; But it is most used in identifying spatial correlations among neighbors, because it uses only the product of the dependent variable in the standardized weight matrix⁵.

$$y_{it} = \rho \sum_{j=1}^n W_{it} y_{jt-1} + \varepsilon_{it} = \rho W y + \varepsilon_{it}, \quad \varepsilon_{it} \sim N(0, \sigma^2) \quad (1)$$

ρ , W_{it} and ε_{it} are the spatial lag coefficient, the standardized weight matrix and the error term, respectively.

B. Mixed regression-self-regression model

This model describes the y-changes as a linear combination of adjacent areas such as autoregressive (AR) model and considers what is happening in adjacent areas to be important. In this regard, the maximum likelihood method is used to estimate the parameters of this model. The model is as follows:

$$y_{it} = \rho \sum_{j=1}^n W_{it} y_{jt-1} + \sum_{k=1}^k \beta_k x_{ki} + \varepsilon_{it} = \rho W y + X \beta + \varepsilon_{it}, \quad \varepsilon_{it} \sim N(0, \sigma^2 I_n) \quad (2)$$

$y_{it} = \rho \sum_{j=1}^n W_{it} y_{jt} + \sum_{k=1}^k \beta_k x_{ki} + \varepsilon_{it} = \rho W y + X \beta + \varepsilon_{it}$, $\varepsilon_{it} \sim N(0, \sigma^2 I_n)$, ρ , W_{it} and ε_{it} , are the spatial lag coefficient, the standardized weight matrix, and the perturbation component, respectively.

C. Spatial error model

In this model, the dependent variable is affected by creating shock in adjacent and neighboring areas and is as follows:

$$y_{it} = \sum_{k=1}^k \beta_k x_{ki} + \varepsilon_{it} = X \beta + u_{it} \quad (3)$$

$$u_{it} = \lambda W u_{it-1} + \varepsilon_{it}, \quad \varepsilon_{it} \sim N(0, \sigma^2 I_n)$$

D. General space model

This model includes both mixed regression and self-regression models and spatial error models and is as follows:

$$y_{it} = \rho W y_{it-1} + X \beta + u_{it}, \quad u_{it} = \lambda W u_{it-1} + \varepsilon_{it}, \quad \varepsilon_{it} \sim N(0, \sigma^2 I_n) \quad (4)$$

To determine the spatial correlation, Moran and Wald tests with the null hypothesis of non-spatial correlation should be used. Also, the tests of Lagrange Multiplier Error (LMerror)

⁵ This matrix is obtained by Kronecker product.

and Lagrange Multiplier Lag (LMlag) are used to detect spatial correlation in error term and spatial independence in the observation of dependent variables, respectively. If the null hypothesis of spatial non-correlation in the error term is rejected, the spatial error model is used; But in case both hypotheses are rejected as null, the general spatial model is used. In addition, to choose one of the models with pool data, panel data with fixed or random effect, likelihood ratio and Hausman tests are used. Null likelihood test hypothesis (1) is a model with pool data versus a fixed effect model hypothesis and null likelihood ratio test hypothesis (2) is a model with pool data versus a random effect model hypothesis. In addition, the null hypothesis of Hausman test is a model with a random effect as opposed to the hypothesis of a model with a fixed effect (Shakibaei et al., 2015: 14-15).

Given that the presentation of the model for each country or group of countries, should be done according to their economic, social and political structure, the following explains each of the variables in the model:

One of the important variables that exists in almost all equations of production and growth is the variable of physical capital accumulation. Investment is a major factor in economic development and in the general sense is all the costs that contribute to maintaining or increasing production capacity, as well as generating revenue (Furman and Hayes, 2004). In general, sustainable development is based on knowledge and technology, and the development of knowledge and technology is based on creativity and innovation. On the other hand, achieving scientific development requires increasing and integrating more resources, facilities and material facilities to educational and research activities. From the point of view of classical theory, capital accumulation is the key to economic development (Almasi and Sepahban Gharababa, 2009). In the neoclassical growth equation, capital and labor are the most important factors affecting domestic production. Landon-Lane and Robertson (a, b, 2003) and Iwaisako and Futagami (2013) have used this variable in their work.

Another variable in the growth equation is the human capital variable. Kuznets (1971) believed that the concept of capital – which includes only physical and commodity capital – is an incomplete concept. Therefore, both human capital and physical capital must be taken into account. In this regard, he says: the human capital of a developed industrial country is not the industrial tools and equipment of that country, rather, it is the accumulation of knowledge obtained from experiments and the work of learning of the people of that country to apply this knowledge (Sobhani, 1992).

Also, Schultz, the father of human capital theory, believed that the role of improving the quality of labor obtained through investment in human capital, as one of the determinants of production in traditional analysis of factors affecting on the economic growth is forgotten (Schultz, 1961). For this reason, a group of economists used production functions to estimate the surplus production generated by higher levels of education. They argued that increasing levels of education increased material production because the results of formal and non-formal education is hidden in additional skills and potential abilities of those in the labor market and human capital in production. As a result, the presence of these trained people increases the production capacity of the entire economy and ultimately, contributes to economic growth (Sadeghi and Emadzadeh, 2003). Polasek et al. (2010), Golejewska (2010), Sunde and Vischer (2011), and Neagu (2012) have used this variable in their studies.

The abundance of natural resources is another variable included in the growth equation. In contrast to theories that emphasize the positive role of natural resource abundance in the process of capital formation and economic growth, the resource curse theory proposed by Auty in 1993 points to the inverse relationship between natural resource abundance and economic growth and development (Asadi et al., 2013). This theory is based on the basic recognition that poor economies in terms of resources have performed better than rich economies in terms of resources, and also emphasizes the institutional and political effects of the abundance of natural resources (Usui, 1997). The negative relationship between natural resource abundance and growth performance is also explained by the effect of natural resource abundance on policy choice: The richer countries are in natural resources, firstly, the weaker macro-policies last longer. Secondly, there will be less pressure to reach rapid industrial maturity. Thirdly, rent-seeking groups become entrenched and ultimately more likely to slow down and become more irregular in economic growth (Auty, 1994). Cavacanti

et al. (2011), Fan et al. (2012) and Hamdi and Sbia (2013) have used this variable in their work.

Another variable in the equation is the accumulation of foreign investment flow variable. Accumulation of domestic capital as one of the basic prerequisites of the production process can be provided from internal or external sources. External finance as a complement to domestic savings, in addition to bridging the savings-investment gap, it is also a solution to the foreign exchange gap. The flow of foreign direct and indirect investment is mostly done by the private sector in the form of multinational corporations and is referred to as the private flow of capital (Shahabadi and Mahmoudi, 2006). Economists' theories about the flow of foreign direct investment and the factors affecting it are in two forms: First, the study of foreign direct investment as part of investment, as well as the theories of classical economics, recognize investment as one of the factors of economic growth. But in addition to preserving the historical role of investment, new economic theories recognizes knowledge, technology, and management practices – some of which can be acquired through foreign direct investment – to be effective on economic growth. The flow of foreign direct investment in addition to eliminating the shortage of capital in the host country, with two new growth factors, is of great importance in recent theories. Some economists have also explored the flow of foreign direct investment as part of international trade. In this approach, direct investment is subject to international regulation, known as Dunning's theory of foreign international production. The flow of foreign direct investment is a function of spatial positions (Frawsen and Josefsson, 2004). Arshad Khan and Ali Khan (2011), Tiwari and Mutascu (2011) and Baltabaev (2013) have used this variable in their studies.

It should be noted that in order to investigate the effect of improving natural resource management on economic growth, this is included in the equation by the product of two variables (governance) and natural resources. Also, when considering the improvement of natural resource management in the equation, the direct effects of each variable are not considered in the equation. According to the above and explaining the relationship between institutions and economic growth in the literature section, the equation considered in this section is as follows:

$$GGDP_{it} = C + \beta_1 K_{it} + \beta_2 HC_{it} + \beta_3 FDI_{it} + \beta_4 RES_{it} + \beta_5 INS_{it} + \beta_5 (RES_{it} * INS_{it}) + \varepsilon_{it}$$

The variables used are as follows:

GGDP: per capita Income at the fixed prices of 2010

K: Fixed gross capital accumulation at the fixed prices of 2010

HC: Average years of study for people over 15 years old

FDI: Net accumulation of foreign investment inflows

RES: Total amounts from the sale of oil, gas, coal, minerals and forest as a percentage of domestic GDP

INS: Institutions. To represent this variable, the governance index provided by the World Bank is used. The sub-characteristics of governance are: 1- Transparency and accountability (this component measures the awareness, understanding and ability of the citizens of the country to participate in government elections, freedom of expression, freedom of parties and associations, as well as freedom of the media). 2. Political stability and non-violence (this component indicates awareness of the possibility that the government may be destabilized or overthrown in violation of the constitution or through violent means, including politically motivated violence (e.g., war or coup d'état) and terrorism. 3- The effectiveness of the government (this component shows the awareness of the quality of public services, the quality of civil services and the degree of freedom and independence of these services from political pressures, the quality of regulation, formulation and implementation of policies, as well as the validity of government commitment to such policies). 4. The regulatory quality of regulations (this component includes awareness of the government's ability to formulate and implement transparent policies, as well as regulations that promote licensing and private sector development). 5. Judicial security (this component shows the understanding and awareness of the extent to which economic factors have confidence, perseverance and loyalty in the laws of society, especially the quality of execution of contracts, property rights, police and courts, as well as the possibility of crime and violence). 6. Corruption control (This component

increases the understanding of whether public power is exercised in the provision of private interests and is comprised of minor and general forms of corruption as well as the occupation of the state by political elites and the private interests of politicians).

The overall index is averaged over six indices. In the following, for a more detailed study, the six governance indicators are classified into three groups as follows:

A. The process by which those in power are selected, monitored and replaced. This section is obtained from the arithmetic mean of the two indicators of transparency and accountability and political stability without the presence of violence (V&P) ⁶.

B. The capacity and ability of the government to efficiently manage resources and implement sound policies. This section is obtained from the arithmetic mean of the two indicators of government effectiveness and quality of regulatory regulation (E&R) ⁷.

C) Respect of citizens and the government for the institutions that manage social and economic interactions between them. This part is obtained from the arithmetic mean of the two indicators of judicial security and corruption control (R&C) ⁸.

ε indicates the error component, i represents the country and t represents time. It is worth mentioning that in this research, using a different model approach in spatial regression, the model is estimated.

4. Empirical findings

In this section, the results of model estimation and interpretation of research findings are presented. The first step in estimating the model using the panel data method is the test of using the panel data approach versus the least squares method. After ensuring the method of using the panel data approach, it is necessary to test the spatial dependence between the countries or sections under study. The results of F-Limer test statistics have been presented in Table (1).

Table 1). Results of F-Limer test for the significance use of panel data method

Test Statistics	F Statistics	Probability Value (PV)
F-Limer Test	18.45	0.000

Source: Research Findings

The results of the above table revealed that the null hypothesis that the cumulative regression method is appropriate at a significant level of 1, 5 and 10% is rejected and therefore the panel data approach can be used. In the next step, it is necessary to test the spatial correlation between the disorder sentences.

Auto-correlation is related to the relationship between the values of error terms along the regression line. Strong correlation occurs when opposites of a variable – that are geographically close to each other – are related to each other, in other words, their changes occur systematically. If the effects or the values of the variables related to them are randomly distributed in space and there should be no relationship between them. Failure to pay attention to the spatial dependence of the data may lead to inconsistent and inefficient bias estimates. On the other hand, in order to use complex spatial patterns, their necessity must be considered. Based on Table (2) and the results of Moran test at a significance level of 1%, the existence of spatial correlation between model variables is confirmed.

Table (2). Moran Spatial Correlation Test

Explanation	Moran statistic	Significance level 5%
Spatial autocorrelation test	-8.95	0.000

Source: Research Calculations

The results of Moran spatial correlation test show that the value of Moran statistic is equal to -8.95 and the null hypothesis that there is no spatial autocorrelation between the errors at a significance level of 5%, is rejected and therefore different spatial regression methods can be used in panel data to estimate the pattern and analyze the findings. In the following, the effect

⁶ Voice and political

⁷ Regulatory and Effectiveness

⁸ Rule and Corruption

of explanatory variables on the economic growth of the countries of the Middle East and North Africa in the form of space camera method will be studied. The reason for using the space camera method compared to other estimation methods such as spatial autocorrelation and spatial auto-regression is the significance of γ and θ coefficients. The results of the test of significance of these coefficients are presented in Table (3).

Table (3). The results of the test of significance of γ and θ coefficients in the space camera method

parameter	coefficient	probability value (PV)
0.007	0.056	Γ
0.05	0.084	Θ

Source: Author Calculations

The results of the above table show that the coefficients of both parameters γ and θ are significant at a significant level of 5% and therefore the space camera method can be used to estimate the model. The estimation results have been shown in Table (4):

Table (4). Results of model estimation by spatial camera method to examine the effect of institutions and natural resources variables on economic growth in D8 countries

Explanatory variables and Constant	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
C	1.64*	1.65*	1.77*	1.72*	1.6*	1.64*	1.65*	1.61*
K	0.16*	0.16*	0.14*	0.15*	0.15*	0.16*	0.16*	0.16*
HC	0.32*	0.30*	0.33*	0.30*	0.31*	0.30*	0.30*	0.30*
FDI	0.08*	0.059*	0.06*	0.05*	0.05*	0.05*	0.05*	0.06*
RES	0.05*		0.02*		0.02*		0.01**	
INS	0.12**							
RES*INS		0.02*						
V&P			0.12*					
RES*(V&P)				0.02*				
E&R					0.08***			
RES*(E&R)						0.02**		
R&C							-0.06	
RES*(R&C)								0.01***
\bar{R}^2	0.98	0.97	0.96	0.99	0.95	0.97	0.98	0.99

Source: Author Calculations

The results of the above table showed that in all estimated status, the effect of institutional variables (INS, V&P, E&R and R&C) on economic growth is positive and significant. This result is consistent with studies by Polterovich and Popov (2007), Huynh and Jacho-Chavez (2009), Ugur and Dasgupta (2011), and Kong (2011). Different aspects of governance through the following channels can have a positive effect on economic growth. 1- Improving the governance index gives investors the assurance that the laws will not change with the change of political leaders. This will stabilize investors' minds about not changing the conditions for investment planning, which will pave the way for increased economic growth; 2. In the absence of improving the governance index of activities such as the underground economy, bribery is a rent-seeking that leads to resources being diverted to unproductive activities. Therefore, improving the institutional governance index can increase economic growth through the optimal allocation of resources; 3. Improving the institutional governance index can pave the way for increased investment and consequently increase economic growth. This can be done by enacting laws that encourage economic actors to start or continue economic activities; 4- Improving the governance index can create confidence and peace of mind for all individuals, both domestic and foreign, by creating internal and external stability in the country because of the absence of internal and external conflicts. This can increase economic growth by increasing domestic investment and attracting foreign investment, as well as the absorption of advanced technologies in the production process; 5. The existence of an insecure economic environment can pave the way for the conversion of individuals' domestic assets to foreign assets and make the economy short of domestic resources, which results in reduced economic growth.

Also, the effect of abundance of natural resources (RES) on economic growth is positive and equal to 0.12. This result is consistent with the studies of Cavacanti et al. (2011), Fan et al. (2012) and Hamdi and Sbia (2013). This variable has two direct and indirect effects on economic growth. The direct effect is that the proceeds from the sale of natural resources are used as a source of funding for investment. The indirect effect is on the management of the sales of these resources. Examination of empirical studies on the effect of abundance of natural resources on economic growth shows a positive but small (as in this study) or even negative effect of this variable on economic growth. Researchers offer the following reasons:

- The posterior and anterior relations resulting from the export of primary goods to other economic sectors are weaker than those of the factory industry, so that the factory industries, unlike natural resources, leads to a more complete division of labor and improved standard of living. Thus, economic growth in countries with rich natural resources is slower.
- The abundance of natural resources has led to the prevalence of mismanagement of the economy by some governments, so that they do not use economic policies such as free trade, which improves the conditions for increasing per capita income. Therefore, some researchers consider the weakness of economic policy-making as the main reason for the poor performance of economies with natural resources (Gylfason (2001) and Sachs and Warner (2001)).
- Some economists have studied the effects of macroeconomics and changes in the structure of production as a result of a shock to the natural resources sector, known as the Dutch disease. However, this framework only explains the increase in the value of the domestic currency in the redeployment process without deriving from the long-term implications of economic growth. In the case of the Dutch disease, the increase in the value of the domestic currency due to the abundance of natural resources makes the export growth process vulnerable (Bravo-Ortega and Gregorio, 2002).

Therefore, natural resource exporting countries should improve the management of funds from the sale of point wealth, provide the ground for the expansion of the market of new factors of production and expansion of knowledge-based economy and conversion of non-renewable wealth into renewable wealth and endogenize economic growth.

As mentioned in the introduction of the model, in this study, the effect of improving natural resource management on per capita income is investigated. As shown in Table 4, this effect is positive and significant. This means that in countries with natural resources, if the institutional index of governance improves, the management of funds from the sale of natural resources will be well formed and the positive effects of these resources on economic growth will increase.

Another variable whose effect on economic growth is studied is the variable of physical capital accumulation. This variable is also the effect of physical capital accumulation (K) on per capita income and is positive and significant. This result is consistent with the research of Landon-Lane and Robertson (a, b 2003) and Iwaisako and Futagami (2013). This variable is one of the most important variables affecting economic growth and is always present in all models of economic growth from classical models to endogenous growth models. This variable can increase economic growth by providing the necessary facilities for new investments.

The human capital (HC) variable also has a positive and significant effect on the economic growth of the countries of the MENA region. This result is consistent with the studies of Polasek et al (2010), Golejewska (2010), Sunde and Vischer (2011) Neagu (2012). At first, economists only mentioned the accumulation of physical capital as a factor of production along with labor, but with the expansion of the concept of capital, human capital emerged as one of the most important types of capital and a factor of economic growth. This variable increases the productivity of human beings, improves the productivity of all factors of production and increases economic growth.

Another variable that has a positive and significant effect on economic growth is the accumulation of foreign capital inflow (FDI). This result is consistent with the works of Arshad Khan and Ali Khan (2011), Tiwari and Mutascu (2011) and Baltabaev (2013). Capital accumulation is always considered as one of the variables affecting production and economic growth that can be provided from domestic or foreign sources. At first, it was thought that foreign investment would be considered only for countries that have a low level of domestic

capital to provide investment projects, but with the passage of time and the use of foreign investment in industrialized and developed countries to provide financing of investment projects, this theory faded and later theories for the use of foreign investment were proposed. These theories include the introduction of technology and the transfer of knowledge and management to the countries hosting foreign investment. This is especially true in developing countries. Given that in these countries, production technology has a low level and is mainly imported, by attracting more foreign investment, in addition to financing projects, new production technology and modern management methods will also enter to these countries.

4.1. Investigating the effects of spatial spillover of institutions on economic growth

In order to test the significance of the effect of spatial spillover of institutions on the economic growth of the countries of the D8 region in the space camera method, the results are presented in Table (5):

Table (5). Investigating the effects of spatial spillover on the Economic Growth

Variable name	Coefficient	Probability value
W*INS	0.75	0.000

Source: Author Calculations

The results of the above table indicated that the effect of spatial spillover of institutions (W*INS) has had a positive and significant effect on economic growth in the D8 region. In other words, increasing and improving the institutional index leads to increased economic growth in the countries of this region.

5. Conclusion and policy implications

In this research, the effect of institutions and improving the management of natural resources on the economic growth of D8 region during 1996-2019 has been investigated using spatial regression models in panel data. In order to show the variables of institutions, the governance indicators provided by the World Bank were used. The results show that institutions have a positive and significant effect on the economic growth of the countries under study. Other variables, including accumulation of physical capital, human capital, net accumulation of foreign investment inflows and natural resources, have a positive and significant effect on economic growth. Improving natural resource management also has a positive and significant effect on per capita income. According to the results obtained in this study and in consistence with the competitiveness of the economy, moving towards a knowledge-based economy and having continuous and stable economic growth, the following suggestions are presented:

- Given the expected impact of institutional variables on the per capita income of the countries studied, it is suggested that the six indicators of institutions (transparency and accountability, political stability without violence, government effectiveness, regulatory quality of regulations, judicial provision and corruption control) be improved and promoted. This can be done by not changing economic policies in the event of a change of political leaders, adopting clear and efficient policies that pave the way for the economy to become more competitive.
- Given that many countries in D8 region have natural resources, it is suggested that the proceeds from the sale of these resources be used to improve the economic structure in order to convert non-renewable wealth into renewable wealth. This can be done by improving natural resource management and coordinating macroeconomic policies with education and research policies and innovation.
- Given the technological gap between the studied countries and developed countries, and that one of the ways to fill this gap is foreign investment, it is recommended to adopt appropriate policies to attract more capital in order to promote domestic technology and move towards a knowledge-based economy.
- Although, human capital improves the productivity of all factors of production and increases production. But if the demand for manpower does not grow in line with its supply, we will see little effect of this variable on macroeconomic variables. This is generally the case in countries with poor management of abundant natural resources. Because in these countries,

due to the income from the sale of oil wealth, less attention is paid to new factors of production that are based on knowledge (including human capital) and producers pay more attention to traditional factors of production (cheaper than new factors of production due to adopting inappropriate economic strategies). Therefore, it is necessary to pay serious attention to the expansion of the human capital market through the adoption of appropriate and coordinated policies towards macroeconomic supply and demand in order to achieve a knowledge-based economy in order to achieve continuous and stable economic growth.

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TERRITORIAL DISTRIBUTION OF LAND RESOURCE POTENTIAL OF AGRICULTURAL USE IN WORLD COUNTRIES

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Abstract

The article considers the territorial distribution of agricultural land and resource potential. From the standpoint of implementing the integrated value of the ecological and economic component of land resources, a methodological approach to the monetary valuation of agricultural land as one of the regulatory tools of territorial distribution of land in the world. The systematic approach to the formation of market turnover of agricultural lands and the formation of land resource potential of agricultural enterprises is substantiated. Indicators for assessing the land resource potential of agricultural use from the standpoint of the development of land relations in agriculture are presented. The method of normative monetary valuation of a separate agricultural land plot has been modified by changing its estimated value by an integrated indicator. The indicators for assessing the efficiency of land use are systematized. The territorial distribution of the main categories of lands in the world is analyzed. The share of arable land suitable for growing crop products in the world is determined. The dynamics of agricultural land areas by regions of the world and their reserve volume suitable for the development in the world are given. The ecological and agrochemical condition of the wholesale coverage of agricultural lands in Ukraine and in the natural and climatic zones of Polissya, Forest-Steppe and Steppe has been determined. The value of agricultural land in Europe and Ukraine is estimated.

Keywords: agricultural lands, agricultural production, monetary valuation of land plots, crop products, ecology.

JEL classification: Q12, Q13, Q16, Q17

1. Introduction

The transformation of economic mechanisms that have developed in a centralized economy, objectively led to not only the growth of instability of the external environment of agricultural enterprises, but also to the destruction of state-regulated, well-established and effective system of land formation and use of agricultural resources.

Centralized distribution of resources, in accordance with the plan of economic and financial activities, specialization, concentration and diversification of production, the formed sectoral and territorial division of labor, required economic entities to solve tactical tasks of distribution of allocated resources. The decision of strategic questions of the development of agricultural enterprises, including problems of formation, protection and reproduction of their land resource potential was considered as a prerogative of state management bodies. Left face to face with the elements of the market, in the context of shock therapy and accelerated reform of the economic mechanism, most agricultural formations have not been able to adapt to changes in the external environment. The state's refusal to participate in the process of forming the land resource potential of agricultural enterprises has led to not only a sharp decline in their resource security, but also to a rapid increase in resource imbalances. They deepen the difficult financial and economic situation of agricultural enterprises, especially small and medium, instability of their ecological development, disparities in land supply, capitalization, and specialization of production.

The use of land resources is a key factor in ensuring the effectiveness of socio-political and economic activities in the country, a determinant of human culture and social order in the state, production and rational development of its resource potential. Currently, this process requires in-depth study, clarification of its components, as the issue of economic valuation of land and, consequently, the functioning of market turnover of land is a cornerstone of agricultural growth, rural welfare, rural development and national economy. The process of forming the methodology of land valuation and market turnover of land, in particular agricultural, is, polar. However, on the other hand, according to the requirements of the time, monetary valuation of land is considered as the basis for land transfer, inheritance, pledge, lease, obtaining a bank loan, determining land tax rates, pricing, a condition for the development of rural areas.

The study of regulatory tools for efficient and rational use of agricultural land was carried out by A. Berle and G. Means (1932), J. Campbell (2004), G.C. Van Kooten (1993), V. Dankevych (2014, 117-123), H. Demsetz (1983, 385-387), F. Doving (1988, 490-491), S. Kay, J., Peuch, J. Franco (Kay et al., 2015) and the land management system was studied by P. Ciaian, d'A. Kancs, J. Swinnen, H. Van, L. Vranken (2012, 1-19), R. Ely, P. Whelpton, L. Dublin, H. Bodfish, R. Newcomb (1931, 125-133), M. Shchuryk (2016, 68-74), J Swinnen and L. Vranken (2009), I. Yasinetska (2016, 127-131), O. Yatsenko (2013, 31-38).

The priority of our study is to substantiate a comprehensive methodological approach to monetary valuation of land as one of the regulatory tools for territorial distribution of resource and land potential of agricultural land in the world, based on the optimization model of integrated indicator of land production and related ecological and economic component.

2. Methods and Materials

The objective need to assess the land resource potential of agricultural use arises from the moment of considering land as a means of production. The development of scientific heritage on land use allows assessing agricultural land from a statistical and economic point of view. In the methodological and methodical context, the assessing of the land resource potential of agricultural use have a valuable scientific heritage of results on the construction of scales for multidimensional analysis of agricultural land to obtain estimates; use of methods of valuation of lands with perennial plantations and lands with reclamation network (irrigated and drained) and natural forage lands, etc. (Dankevych 2014, 117-123; Tolidis and Dimopoulou 2012, 51-67). We should note that the monetary valuation of agricultural land is divided into expert and regulatory. Expert monetary valuation of land and rights to land is carried out in order to determine the value of the object of evaluation (Table 1), normative – to determine the amount of land tax, state duty on exchange, inheritance (Berle and Means, 1932).

Table 1. Methodical approaches to expert monetary valuation of agricultural land

Methodical approach	Features	Calculation algorithm	Legend
Direct capitalization	Based on the assumption of consistency of cash flow from land use	$Vdk = Do / Ck$	Vdk – the value of the land plot, determined by direct capitalization, USD; Do – net or rental income, USD; Ck – capitalization rate.
Indirect capitalization	It is based on the assumption of limited and substitutable cash flow from land use over a period of time.	$Vidk = \sum Doi / (1 + Ck)^i + P$	Vidk – the value of the land, determined as a result of indirect capitalization, USD; Doi – expected net operating or rental income for the <i>i</i> -th year, USD; P – current cost of reversion; Ck – capitalization rate.
Comparison of sales prices of similar land plots	The value of land is determined at the level of prices prevailing in the market by amending the selling prices of such land, taking into account differences in the terms of transactions.	$Vlp = Pa + \sum \Delta Paj$	Vlp – adjusted sale price of such land, USD; Pa – the actual sale price of such land, USD; m – the number of comparison factors; Paj – the difference in the sale price of such land in relation to the plot.
Taking into account the cost of land improvements	It is used to assess improved land plots or those that are expected to be improved, provided that they are used most effectively.	$Vli = Po - Coc$	Vli – the value of the land plot, determined by taking into account the cost of land improvements, USD; Po – expected income from the sale of improved land or capitalized net operating or rental income from its use, USD; Coc – costs of land improvements, USD.

Source: formed based on (Lobunko 2015, 17-21; Mesel-Veseliak and Fedorov 2016, 18-22).

The modern method of normative assessment of agricultural land involves the use of a classifier of land use by the factor that describes the functionality of lands ($K_f = 0.3$) (Harazha 2015, 21-24). In this case, the normative monetary value of one square meter of lands of settlements is determined by formula (1) (Dankevych 2017, 135-141):

$$R_n = \frac{C \times R_r}{R_n} \times K_f \times K_l, \quad (1)$$

where: – normative monetary valuation of a square meter of the land, USD; – costs for the development and arrangement of the territory per square meter, USD; – rate of return (6%); – capitalization rate (3%); – coefficient that characterizes the functional use of the land (for housing and public buildings, for industry, transport, etc.); – coefficient that characterizes the location of the land.

The coefficient that characterizes the location of the land () is calculated by formula (2) (Andriichuk and Sas 2017, 22-33):

$$K_l = K_{l_1} + K_{l_2} + K_{l_3}, \quad (2)$$

where: K_{l_1} – coefficient that characterizes the regional factors of the location of the land, in particular: a) population and administrative status of the settlement, its place in the settlement system; b) placement within the settlements located in suburban areas of large cities; c) placement within settlements that have the status of resorts; K_{l_2} – coefficient that characterizes the zonal factors of the location of the land within the settlements, in particular: a) distance to the city center of the settlement, concentrated places of work, mass recreation of the population; b) location in the core of the center of large and largest cities and other settlements of special historical importance, in the coastal strip of settlements; K_{l_3} – coefficient that characterizes the local factors of the location of the land by territorial-

planning, engineering-geological, historical-cultural, natural-landscape, sanitary-hygienic conditions and the level of the arrangement of the territory.

The average (base) cost of one square meter of the land of the settlement depending on regional factors of location (R_{al}) is determined by formula (3) (Andriichuk and Sas 2017, 22-33):

$$R_{al} = \frac{C \times R_r}{R_n}, \quad (3)$$

The value of the coefficient K_{t1} is the product of coefficients that take into account: population, geographical location, administrative status of settlements, their economic functions; locations of settlements in the suburban area of large cities; assignment of settlements to resorts; locations of settlements in the territory that was exposed to radioactive contamination as a result of the Chernobyl disaster. The normative monetary valuation of a separate agricultural land is determined by formula (4) (Hutsuliak 2013, 46-48):

$$M_{vd} = (\sum(P_{ag} \times Mn_{ag}) + P_{non-ag} \times Mn_{ag}), \quad (4)$$

where: M_{vd} – normative monetary valuation of agricultural land, USD; P_{ag} – area of agricultural production group of soils of agricultural land, hectares; Mn_{ag} – normative monetary assessment of the agricultural production group of soils of the respective agricultural land of the natural-agricultural district, hryvnias per hectare; P_{non-ag} – the area of non-agricultural lands (lands under economic roads and runs, field protective forest strips and other protective plantings, except for those referred to forestry lands, lands under farm buildings and yards, lands under the infrastructure of wholesale markets of agricultural products, temporary conservation lands, etc.), hectares; Mn_{ag} – standard of capitalized rental income of non-agricultural lands on agricultural lands, hryvnias per hectare.

At the same time, a retrospective analysis of the methodology for assessing the land resource potential of agricultural land proves the need to take into account the factor of lifting the moratorium on the sale of agricultural land, according to the experience of EU countries, namely (Dobriak et al. 2013, 12-15):

- from the standpoint of the national level, the process of buying and selling land should be carried out, taking into account the preservation of the optimal institutional structure of agricultural production;
- establishing a transitional period during which there are temporary restrictions or rules of operation of agricultural land, in order to agree on lease terms, pricing policy for sale and lease, determining the min / max size of land that may be available to one owner, the tax scale etc.;
- preservation of the ecological component of the activity of various business entities;
- formation of requirements to the potential buyer, namely, the presence of agricultural education, experience of business entities, able to physically, intellectually, materially conduct activities on a certain land plot;
- formation of legislative norms on the conditions of sale of land plots to the citizens of another country.

In European countries, the value of land is determined by calculating the productivity index or by establishing its real market value according to the purchase or sale prices of land. Land is revalued regularly, as its market value may change. The average net income per year provided by the land is determined for the last 15 years. Two years are not taken into account, which are characterized by the smallest and largest yield.

$$"Index \ C_{mopt}" = A \times B \times C \times X, \quad (5)$$

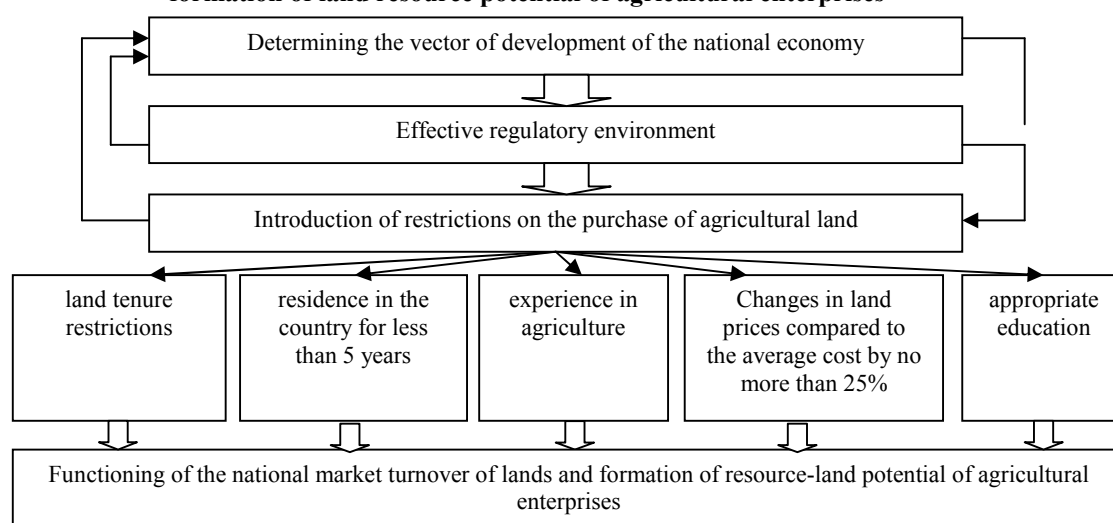
where: A – different characteristics of the soil profile; B – mechanical composition of the soil; Mn_{ag} – normative monetary valuation of the agricultural production group of soils of the respective agricultural land of the natural-agricultural area, USD per hectare; C – the slope of the surface; X – other characteristics (drainage, erosion, fertility level, micro relief).

It should be noted that in the United States when assessing the agricultural land potential, the following indicators are taken into account: the degree of intensity of agricultural activity, structure and type of soil. At the same time, the most suitable is the method of land valuation by Storey, namely: the state budget, which ensures the development of agricultural production, growth of the agricultural economy as a whole while preserving national interests. Arable land in the United States is divided into five grades: Grade 1 – the Storey index for this grade of land is 80–100%; 2nd grade – 60–79%; 3rd grade – 40–59%; 4th grade – 20–39%; 5th grade – less than 20%. According to this estimate, the value of US agricultural land can range from 300 to 1200 USD per a year (Barnard et al. 1997, 1642-1650).

In Spain, the assessment of land resource potential is determined by the level of profitability of crops, taking into account their degree of intensity. Yield (profitability) is capitalized at 3%, it allows to determine the value of land. The evaluation is carried out in several stages. The first stage – data are submitted to the territorial councils on real estate about those crops that are grown in a particular area, with information on the assessment of soil characteristics, the level of mineral fertilizers and technical support of farms. The second stage – each municipality is assigned a qualification number. At the third stage, the cadastral value of all rural land holdings is determined, taking into account the agronomic characteristics of the area, profitability and other factors that allow: to consistently place the level of profitability according to the degree of importance; to classify land plots depending on profitability; to assess the profitability of crops (Guyomard et al. 2004, 125-148).

Based on the above, the authors formed a systematic approach to national market turnover of land, which is based on the requirements of resource and land potential of agricultural use and land use by economic entities, taking into account the dynamics of socio-economic development of the agricultural economy (Image 1).

Image 1: System approach to the formation of market turnover of agricultural land and the formation of land resource potential of agricultural enterprises



Source: developed by the authors

Methodological innovations in the study of agricultural land potential are as follows:

- 1) application of indicators of land resource potential assessment, in the context of land relations development: registration of land ownership rights, transactions on change of ownership and use rights (sale, lease, inheritance, exchange, etc.), land taxation, change of ownership forms and resolving disputes over land plots;
- 2) use of SWOT and PESTEL-analysis, in order to determine the formation of organizational, legal and socio-economic priorities for the development of land relations and the use of land and resource potential of agricultural use;
- 3) application of the method of expert evaluation – a method of predicting future results based on the conclusions of experts (heads of agricultural enterprises, farmers, landowners, heads of district and regional departments of agro-industrial development, specialists of research institutes), to determine certain variables required to assess the research issue;

- 4) use of computer programs and forecasting models based on geographic information systems and substantiation of scenarios and directions of spatial transformation of the regional land use system.

The authors propose indicators for assessing the land resource potential of agricultural use in the context of the development of land relations at the subnational level, which will allow local authorities to adopt effective practices of cities and districts with similar conditions of agricultural land use (Table 2).

Table 2. Indicators for assessing the land resource potential of agricultural use from the standpoint of the development of land relations in agriculture

Indicator	Characteristic
Soil quality	comparative assessment of soil quality by their main natural properties, which have a sustainable nature and significantly affect the yield of crops grown in specific climatic conditions
Physical and chemical condition of the soil	characteristics that determine the selection of tillage technologies, allow to estimate energy costs for them, to choose the optimal timing of field work with their minimum deformation and the highest productivity of agricultural labor
Registration of land ownership rights	the share of land plots registered in the cadastre, calculated to the total number of lands of the relevant form of ownership, according to statistical reporting
Transactions for change of ownership and use	change of owner (purchase-sale, inheritance, change-donation) and user (rent); is calculated for 1 thousand landowners and land users on the basis of data on the number of transactions with land registered in the register of real estate rights
Land taxation	the number of taxpayers for land per 1 thousand owners of private land in terms of citizens and legal entities; allows to monitor the state of agricultural land use; stimulates the transition of plots to more efficient land users
Conflict resolution in the field of land relations	the number of lawsuits against land relations received by local courts per 10 thousand landowners in terms of civil and administrative proceedings
Change of ownership of agricultural land	number of citizens who exercised the right to free land privatization for agricultural land use

Source: developed by the authors

From the point of view of land relations, the proposed indicators are an innovative tool for assessing the agricultural land potential at the local level, which can be used by local authorities, investors and the public to identify problematic aspects of agricultural land use, ownership and disposal. The indicators cover almost all key areas of land relations. Indicators can serve as an indicator of investment attractiveness, and therefore will be of interest to investors. An important condition for the land resource potential of agricultural use in the economic turnover of enterprises is the long-term forecasting of efficient use of agricultural land.

To analyze the conditions of use of agricultural land, it is important to identify factors influencing the indicators of economic efficiency of agricultural activities of enterprises. The latter criterion depends on many factors, and in particular, environmental, which characterizes the environment and conditions for agricultural production and food. Therefore, monitoring of resource-land potential of agricultural use should be considered in the process of interaction of agricultural production entities and the environment, as well as between social, environmental and economic indicators that characterize their performance results (Ciaian and Swinnen 2006, 799-815).

In order to analyze the impact of environmental factors on the efficiency of land resource potential of agricultural use and agricultural economy in general, it is proposed to establish the relationship between economic and environmental indicators and modify the method of normative monetary valuation of individual land (formula (4)) by changing its estimated value on the integral indicator (formula (6)) (Hutsuliak 2013, 46-48):

$$M_{vd} = (\sum (P_{ag} \times Mn_{ag}) + P_{non-ag} \times Mn_{ag}) \times I_{int}, \quad (6)$$

where: I_{int} – is an integral indicator of the correction of the ecological assessment of agricultural lands.

Accordingly, the integrated indicator of ecological assessment of agricultural lands is determined by the integrated functionalities of the relationship between its components: of socio-ecological, innovative, investment and informational nature. Thus, the model of the

production function will have the form of the following dependence (formula (7)) (Hutsuliak 2013, 46-48; Marta-Costa et al. 2012, 111-124):

$$I_{ec}^{inov} = I_{ec}^{inov} + I_{ec}^{inov} \cdot I_{ec}^{inov}, \quad (7)$$

where: I_{ec} – is an integral indicator of the correction of the ecological assessment of agricultural lands.

Since the efficiency of land use in agriculture is influenced by positive and environmentally destabilizing factors to improve the methodology of its study, it is urgent to calculate economic indicators (Table 3). Leading positions among these indicators are: the share of privately owned agricultural land, the ratio of organic production to its total volume, the rental rate, yield, specific land productivity, value added per 1 ha of land, the share of perennial crops in the structure of agricultural land, the cost of additional products obtained through the transformation of sown areas (Ciaian and Kancs, 2009; Karjoo and Sameti 2015, 47-54). Thus, ecological and economic assessment of land is the basis for ensuring the rational use of resource and land potential in the conditions of transformation of property relations, economic regulation of entrepreneurial activity, improvement of social welfare of the rural population and environmental protection.

Table 3. Indicators for assessing the efficiency of land use

Indicators	Method of calculation
The share of privately owned agricultural land	the share of agricultural land cultivated in farms and private farms
The share of perennial plantations in the structure of agricultural land	opportunity for the costliest type of agricultural activity, which involves a larger list of lands in terms of qualitative and quantitative characteristics
The ratio of organic production to its total volume	the level of natural harmonization of production in agriculture
Rental rate	the share of regulatory valuation of land paid as rent to the landlord
Crop capacity	natural return of land resources
Specific productivity of land	comparative assessment of land use of different forms of management
Added value per 1 ha of agricultural land	the amount of value added per unit of land resources
The cost of additional products obtained through the placement of crops on environmentally friendly lands	absolute increase in production according to expert estimates of crop rotation optimality
Land return (taking into account the value of land)	rate of income according to the normative assessment (market value) of land
Land return (excluding the value of land)	specific profitability of the entire agricultural sector of the economy
The mass of profit per 1000 USD of value (regulatory assessment) of land	mass of profit per value unit (regulatory assessment) of land
Gross output growth rate	growth of gross output over a period of time
Growth rate of sown areas	increase in sown areas over a period of time
The growth rate of profit from sales of agricultural products and services	dynamics of accumulation of own capital and own enrichment of founders
The level of profitability of agricultural activity	the mass of profit accounted for the mass of costs
Yield growth rate	increase in yield over a period of time

Source: summarized by the authors based on (Dewbre et al. 2001, 1204-1214; Duvivier et al., 2005; Blancard et al. 2006, 351-364; Swinnen and Vranken, 2009; Breustedt and Habermann 2011, 225-243).

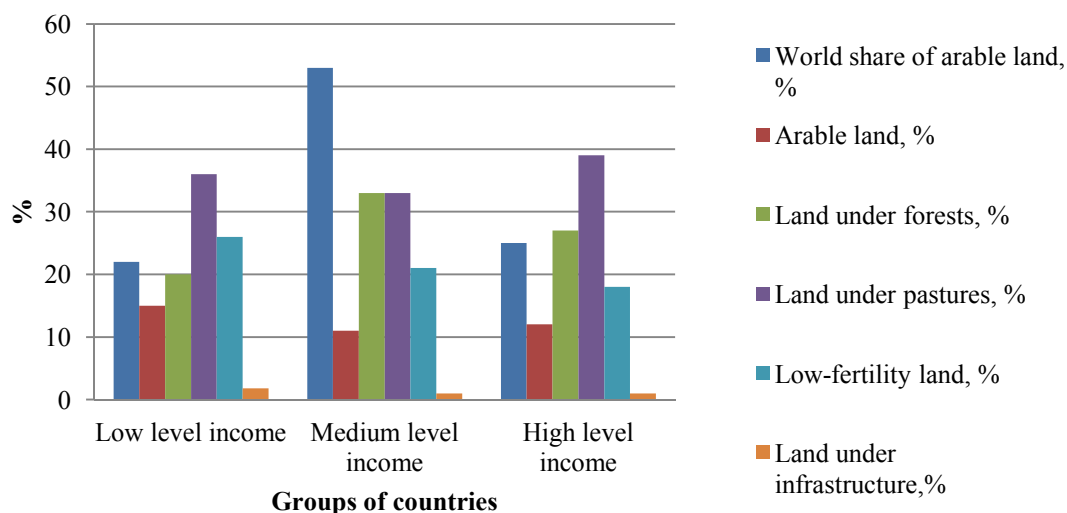
3. Results and Discussion

Land resource potential and methods of its use play an important role in solving the problems of food security in the world. The impact of global changes on soil resources and agricultural production, with the existing demographic problems, climate change and increasing competition for land resources in the absence of sufficient food cause an increase in insecurity of the population (Robison et al. 2002, 44-58; Dovgal et al. 2017, 231-242; Martinho 2018, 135-152). In order to improve the food security situation and succeed in the fight against malnutrition, it is necessary that the growth of agricultural production outpaces the growth of the population. This can be solved by intensifying land use, which minimizes existing food and social problems.

According to FAO forecasts, up to 3.2-3.5 billion hectares (20%) can be used in world agriculture, of which only 0.45 billion hectares after development can become highly productive agricultural lands. According to Doing Business, in the last 50 years the area of arable land in the world has increased by 12% due to the reduction of forest, wetlands and meadows (The State of the world's land..., 2016). At the same time, the area of irrigated areas has doubled the distribution of land resources and the state of their use is different, given the level of the development of countries.

According to the criteria of the state of economic development of the world, they are divided into groups according to the level of income (low, medium and high income). The World Bank's classification covers 209 countries: the first group ("low-income countries") includes countries in which per capita GDP is 725 USD or less; the second group ("middle-income countries") includes countries with average GDP per capita income in the range from 726 to 8995 USD; the third group ("high-income countries") includes countries in which GDP per capita is 8995 USD and above (Food and Agriculture Organization..., 2020; Trusova et al. 2021, 169-182). Each of the groups of countries has its own natural and climatic features, different areas of land suitable for agricultural production (Image 2).

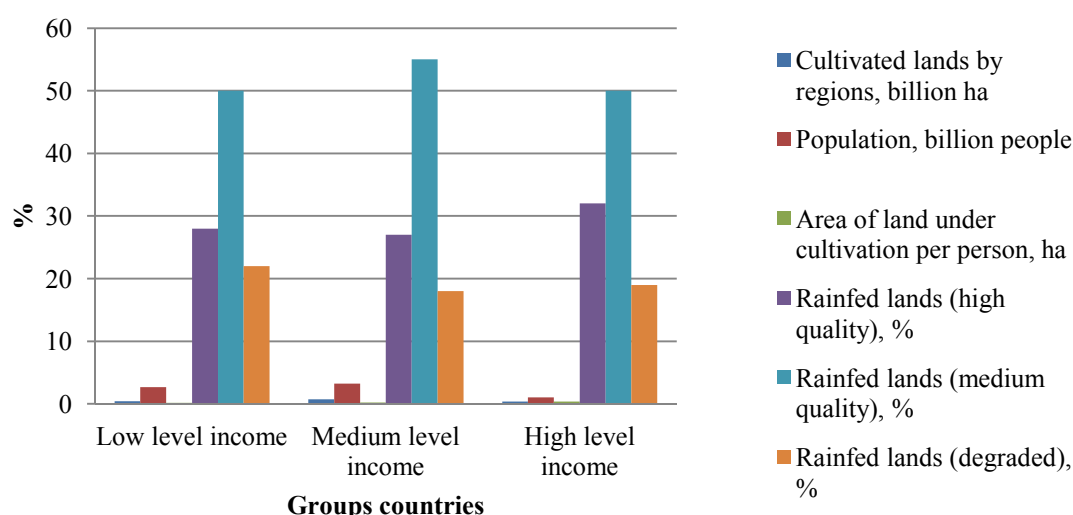
Image 2: Territorial distribution of major land categories in the world, 2020



Source: calculated by the authors according to data (Food and Agriculture Organization..., 2020).

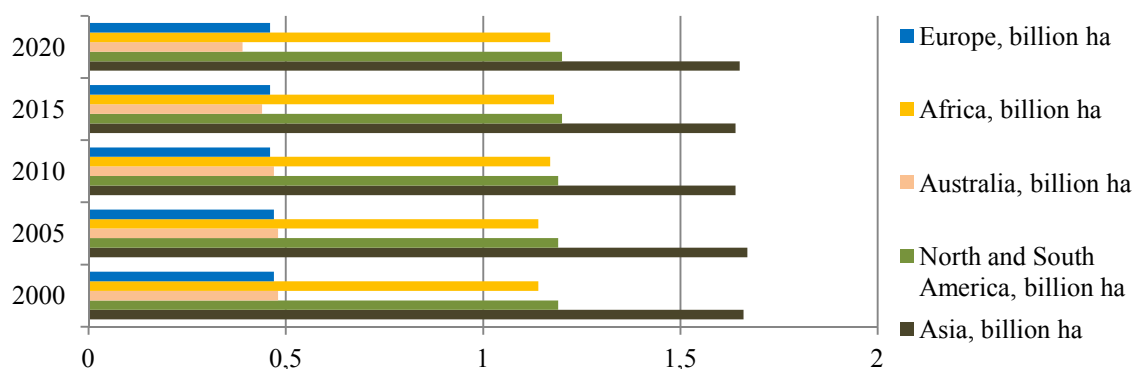
The territorial distribution of countries shows that favorable conditions for the expansion of arable land are in Africa and North America; potentially fertile lands of Asia are developed by 90%, Europe – by 97%. From the standpoint of the distribution of the main categories of land by groups of countries, there is a situation that shows that the highest regional share of arable land is concentrated in Central America and the Caribbean – 42%, Western and Central Europe – 38%, North America – 37% (The State of the world's land..., 2016; Balomenou and Maliari 2013, 127-143). On average, for high-income countries, the share of fertile land is 32% (Image 3). Soils in low-income countries are often less fertile and only 28% of all arable land is of high quality. It should be noted that the agricultural land potential is divided into five main regions of the world: Asia, Europe, North and South America, Africa and Australia (Image 4). Each of the studied regions has its own resource, economic, socio-political, environmental and climatic features. Thus, the prospects for the development of agriculture in Asia are inextricably linked with the development of new arable land, the introduction of irrigated agriculture. At the same time, mountains and deserts occupy most of the region, so there are limited land resources suitable for agriculture.

Image 3: The share of arable land suitable for growing crops in the world, 2020



Source: calculated by the authors according to data (The State of the world's land..., 2016).

Image 4: Dynamics of agricultural land areas by regions of the world, million hectares, 2000-2020



Source: calculated by the authors according to data (The State of the world's land..., 2016).

The regions of North and South America are sufficiently provided with land resources. The total land fund of the region is 3.889 billion hectares, agricultural lands occupy 1.194 billion hectares, of which arable land – 30%. A characteristic trend in 2005-2020 is the greening of land use; more than 9.2 million hectares of agricultural land are used for organic farming. The largest areas of them are in the USA (million hectares) and Brazil (1.8 million hectares), they are constantly expanding.

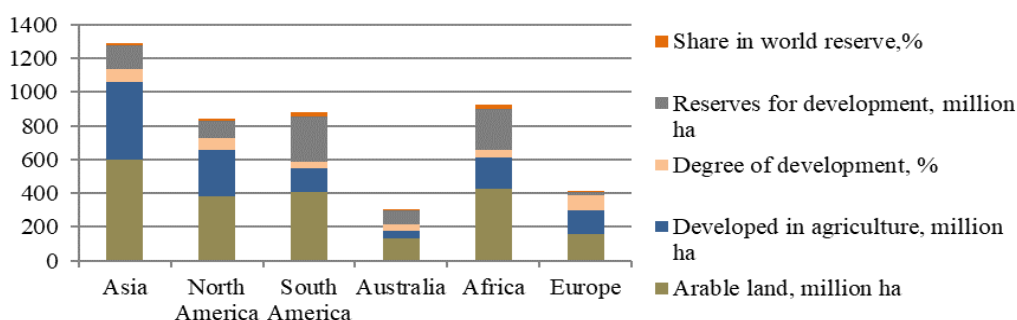
A favorable natural environment and an effective policy for the use of agricultural land resources allow to fully meet food needs in the United States and increase world exports of agricultural products. More than 190 million hectares of arable land and 220 million hectares of pastures and 20 million hectares of land are under irrigation for agricultural needs (The State of the world's land..., 2016; The world bank group, 2020; Tibério and Francisco 2012, 57-86). The main advantage of US agriculture is its high productivity. The United States competes only with Canada, Australia, and New Zealand in terms of the value of output per worker.

An important player in the agricultural market of the world is Australia, which has significant agricultural land potential. The country is the leader of the Kern Group of agricultural producers, which carries out 20% of world exports (The State of the world's land..., 2016). The effectiveness of Australian land use is due to the government's close cooperation with national associations of agricultural producers. The state initiates research, advisory and educational services, organizes international marketing services, regulates price levels, provides financial support to farmers during droughts and floods, and stimulates the development of environmentally friendly farming systems. The land resource potential of the African continent is low due to the primitive conduct of agricultural production with rapid

population growth, the introduction of monocultures, plowing of new unproductive lands, overloading the structure of agricultural land with pastures. Extensive farming methods accelerate soil degradation and depletion.

The general trend for all studied regions (Asia, Europe, North and South America, Africa and Australia) is the process of degradation of agricultural land. Thus, due to erosion, 6-7 million ha are removed from circulation annually, and due to water logging and salinization – 1.5 million ha. A serious threat to the land fund in Africa and Asia is the emergence of a desert on previously cultivated lands, which covered an area of 9 million km² (The State of the world's land..., 2016; Rastvortseva 2017, 45-54). Degradation of agricultural land is caused by their transformation into anthropogenic landscapes. These processes significantly reduce the area of reserve for land development in the world (Image 5).

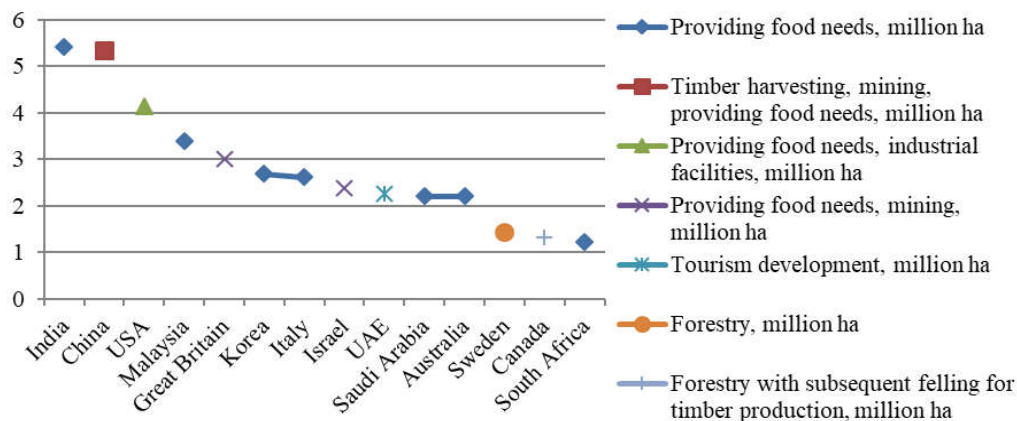
Image 5: Reserve areas of agricultural land suitable for development in the world countries



Source: calculated by the authors according to data (The State of the world's land..., 2016; The world bank group, 2020)

In the context of globalization of the economy, especially in the agricultural sector, the risks are manifested in all regions of the world with renewed vigor, because they are unpredictable and require significant costs to minimize their negative impact. In addition, external factors, such as climate change, competition with other sectors and socio-economic changes, are added to the restrictions on access to agricultural land resources in some countries. This requires a more rational use of agricultural land and increase in their fertility. This is especially true for countries dependent on imports of agricultural products. The largest importer of cereals is Japan – 126.8 million tons; Egypt – 74.4; Mexico – 73.6; South Korea – 62.6; Spain – 59.7 million tons. TOP-10 world importers of grain are the countries of Asia and Latin America, oilseeds – China – 241.4 million tons; Germany – 34.3; The Netherlands – 31.0; Japan – 30.4 and Mexico – 28.4 million tons (Shchuryk 2016, 68-74; Napolskikh and Yalyalieva 2019, 73-81; Fafurida et al. 2019, 49-57). At the same time, a significant number of countries solve their own food problems through the purchase of agricultural land (Image 6).

Image 6: Global trends in land purchase and sale in world countries, 2020

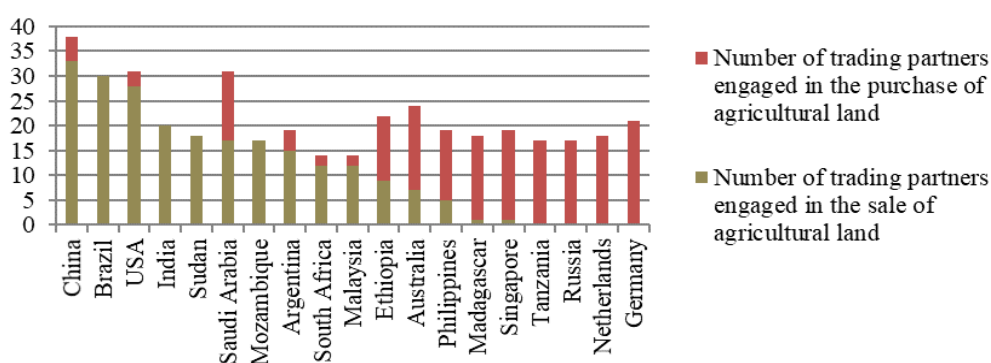


Source: calculated by the authors according to data (The State of the world's land..., 2016)

Demand for land resources is also determined by the investment factor. Analysis of global trends in the purchase and sale of agricultural land proves that the main purpose of buying land in 2005-2016 was to meet the food needs of the population – 11.6 million hectares, timber harvesting – 7.3 million hectares, mining – 6.1 million hectares, forestry – 5.7 million hectares and placement of industrial facilities – 3.2 million hectares.

Among the world leaders in concluding foreign economic contracts for the purchase and sale of agricultural land are: Great Britain, the United States, Germany, India and Saudi Arabia (Image 7). The areas of land that are sold and bought are constantly increasing: from 0.75 to 1.75% of the world's agricultural lands have changed the right of ownership or disposal as a result of international agreements. This trend may intensify as the population grows. The area of agricultural land controlled by multinational corporations is constantly expanding and the leaders in this indicator are the Democratic Republic of the Congo, Papua New Guinea and the Russian Federation.

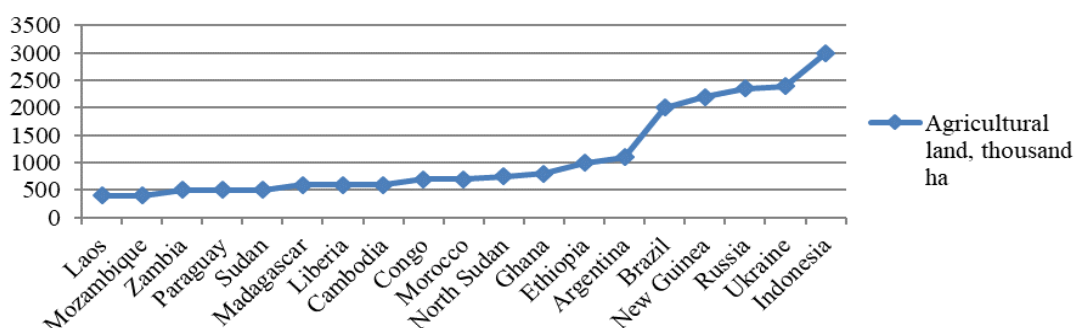
Image 7: Companies engaged in the purchase and sale of agricultural land in the world, 2020



Source: calculated by the authors according to data (The State of the world's land..., 2016)

The countries for investing in agricultural land are Indonesia, Ukraine, Russia, Papua New Guinea and Brazil (this is 46% of the total area of purchased agricultural land), (Image 8). Seven companies with foreign capital have a land bank in Ukraine of over 2 million hectares. Thus, NCH Capital Corporation controls Ukrainian land with a total area of over 400 thousand hectares. In general, since 2000, 26.7 million hectares of agricultural land around the world have come under the control of foreign investors; their share is approximately 2% arable land in the world. In the coming years, this process will become increasingly threatening for the local population, as it is typical for investors to introduce a shift method of economic activity (The State of the world's land..., 2016; Lukin 2019, 65-72; Islam et al. 2012, 159-182).

Image 8: Area of agricultural land controlled by foreign countries in the world, 2020

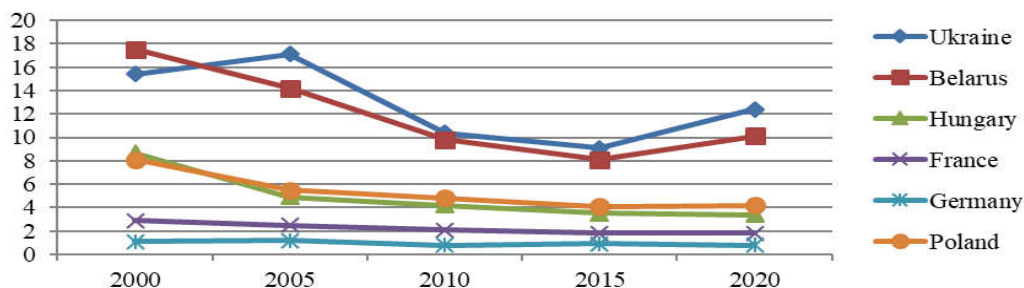


Source: calculated by the authors according to data (The State of the world's land..., 2016)

In order to assess the available land resource potential and the possibility of intensification of production, the authors investigated the effectiveness of land use potential in countries where agriculture is one of the priority sectors, and which have close natural and climatic conditions to Ukrainian. Five countries were selected (Belarus, Poland, France, Germany and

Hungary) according to the following criteria: the share of the agricultural sector in the country's GDP, natural and climatic features, the historical specifics of land reforms and economic activity (Image 9). Ukraine is less urbanized compared to the studied countries, but the share of agriculture in the country's GDP structure is the highest – 12.4%.

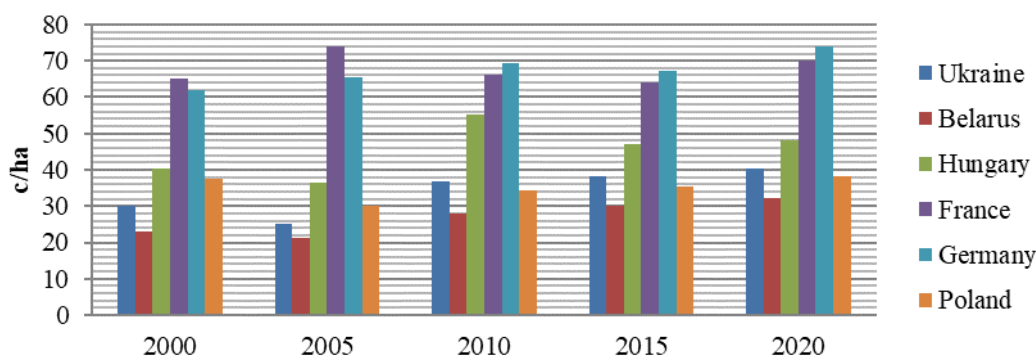
Image 9: The share of agricultural products in GDP of the world countries for 2000-2020, %



Source: calculated by the authors according to data (The State of the world's land..., 2016; The world bank group, 2020)

The dynamics of crop yields in 2000-2020 tends to increase and for 20 years has increased by 62%. In Ukraine, compared to Poland and Belarus, these performance indicators are much higher. This trend is explained by the concentration of land in integrated corporate formations of the country and the development of small enterprises in Belarus and Poland. At the same time, domestic enterprises have not yet reached the yield of 1 hectare in countries such as Hungary, France and Germany (Image 10). The analysis of socio-economic effectiveness of land use of agricultural enterprises in Ukraine was carried out based on the following indicators: rent for land shares, average monthly wages, average number of employees, etc.

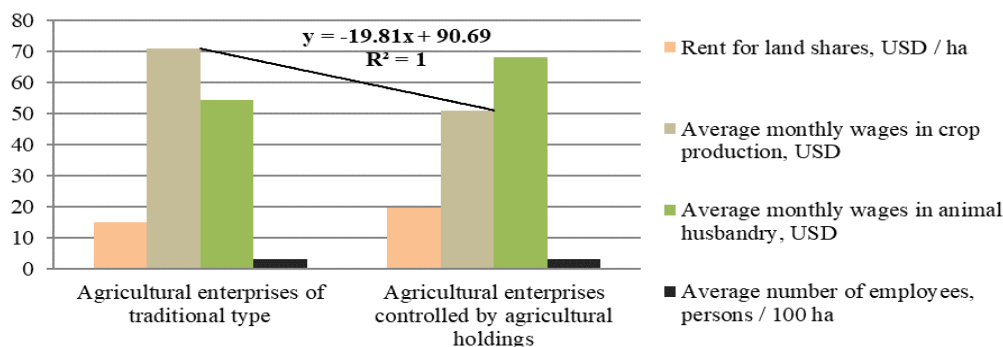
Image 10: Dynamics of grain yields in the world countries for 2000-2020, %



Source: calculated by the authors according to data (The State of the world's land..., 2016; The world bank group, 2020)

Despite the positive dynamics of growth of social benefits, their level remains low both in agricultural enterprises and in agricultural holdings (Image 11).

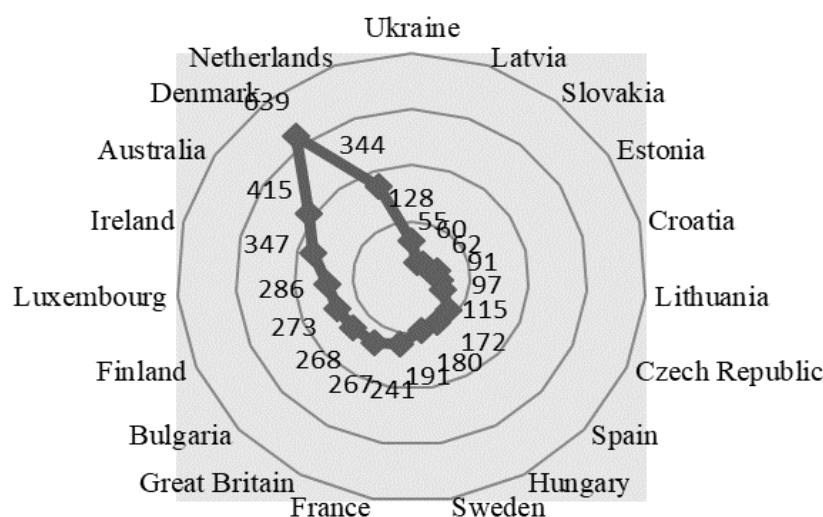
Image 11: Socio-economic results of land use of agricultural enterprises in Ukraine, on average for 2019-2020



Source: calculated by the authors according to data (The world bank group, 2020)

Payment for the lease of agricultural land in Ukraine depends on the lease term. In the country, the amount of rent is determined as a percentage of the regulatory monetary value of arable land, which for the period 2000-2020 has increased almost by 6 times. At the same time, an increase in the number of leased lands by 1% increases the rent by 3.5%. Image 12 presents a comparison of the average amount of rent for agricultural land paid by producers in Ukraine and European countries.

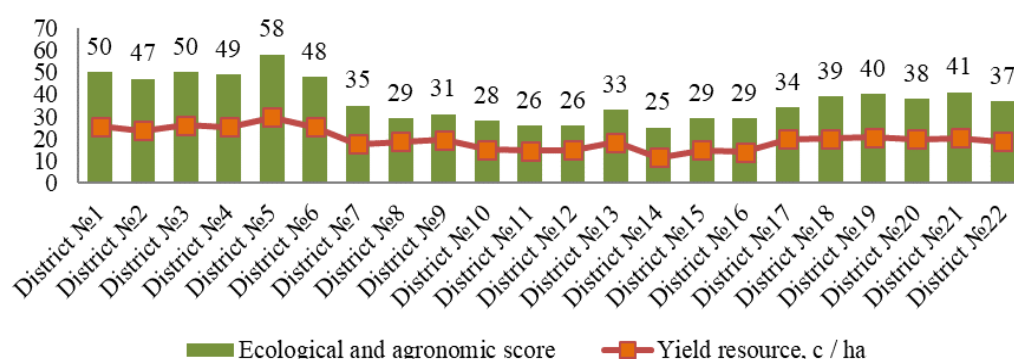
Image 12: The average amount of payment for the lease of agricultural land in some EU countries and Ukraine in 2020, USD/ha



Source: calculated by the authors according to data (The world bank group, 2020)

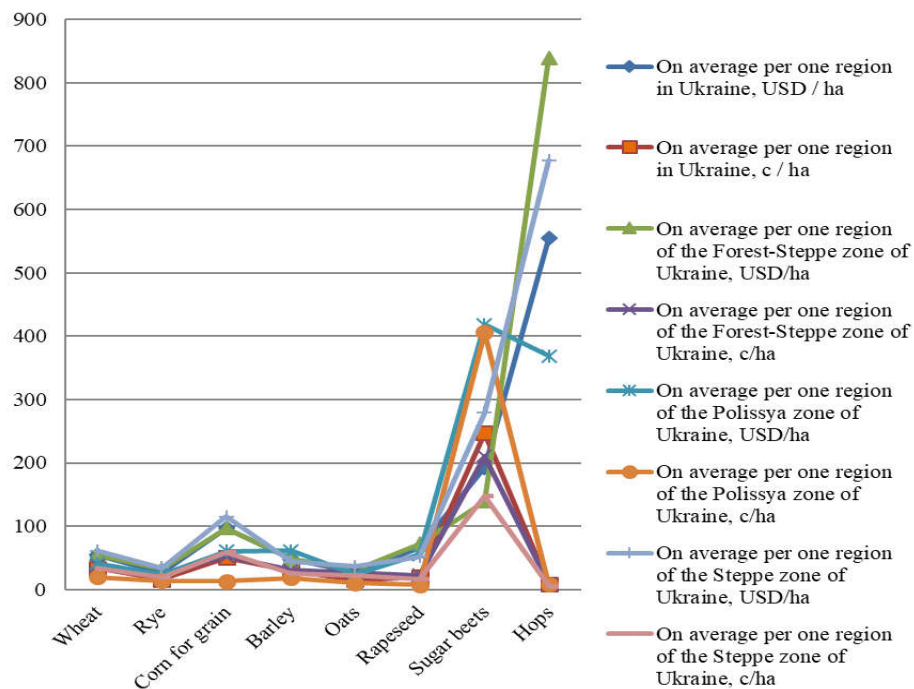
In order to assess in detail the ecological and agrochemical condition of the soil cover of agricultural lands, the qualitative condition of lands for one region in Polissya, Forest-Steppe and Steppe natural-climatic zones of Ukraine was studied. Thus, the ecological and agrochemical condition of the soil cover of agricultural lands in one region of the Steppe zone is 38 points, arable land – 39 points, in the Forest-Steppe zone – 51 points, Polissya zone – 30 points (Image 13). The analysis of economic activity of agricultural enterprises of Ukraine, grouped by natural and climatic zones proves that crops grown on lands with different scores react differently to material costs, so the same costs on different fertility soils give different results.

Image 13: Assessment of ecological and agrochemical condition of the soil cover of agricultural lands by districts per region of the Steppe natural and climatic zone of Ukraine, 2020



Source: calculated by the authors according to data (The State of the world's land..., 2016)

In particular, the production of corn for grain per 1 USD of material costs in Polissya, with an average land quality 30 points by 2.5 times lower than in the Forest-Steppe (land quality 51 points) and by 1.9 times lower than in the Steppe zone (land quality 39 points), rapeseed – by 2.4 times, wheat – by 1.5 times (in comparison with the Forest-Steppe zone), oats – by 1.4 and by 1.6 times (in comparison with Forest-Steppe and Steppe zones, respectively) (Image 14).

Image 14: Material costs and yields of crops by natural and climatic zones of Ukraine in 2020

Source: calculated by the authors according to data (State Statistics Service..., 2020)

The effect of the scale of vertically integrated use of agricultural land resource potential of agricultural holdings is presented in Table 4. The analysis of economic activity of agroholdings showed that their specifics of land use, along with advantages, have certain shortcomings in ecological and social spheres. First, when researching agricultural holdings and enterprises of the traditional type, one should take into account such a feature as the place of registration and payment of taxes. A significant number of agricultural holdings are not registered at the place of business, and in many cases, they are registered even outside Ukraine.

Table 4. Efficiency of use of land resource potential of agricultural use by agricultural holdings in Ukraine, 2020

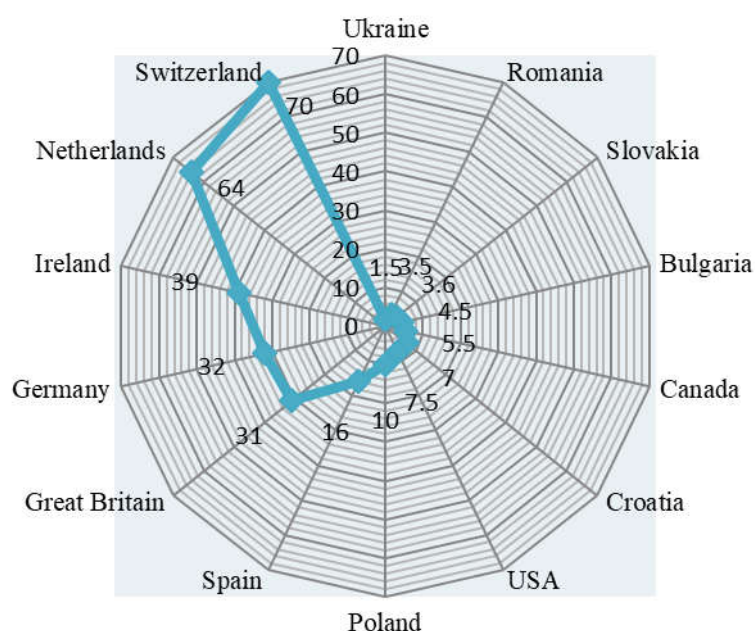
Companies	Sales revenue, million USD	Income per 100 hectares of agricultural land, thousand USD	Profit per 100 hectares of agricultural land, thousand USD
PAEAgrofirm "Svitanok"	12.63	43.56	31.58
LLC "A.T.K."	8.35	42.81	25.68
LLC Bakhmut Agrarian Union	2.89	147.52	23.0
LLC Myronivsky Khliboprodukt	62.58	94.61	20.85
Kernel Group of Companies	38.58	143.11	17.78
Group of Companies "Mriya"	42.3	36.30	17.62
LLC Astarta-Kyiv	30.58	37.08	13.30
PJSC "TAKO"	4.49	24.06	12.83
Ukrlandfarming plc	60.90	42.89	12.73
Group of Companies "Ovostar Junior"	2.62	46.97	11.42
LLC JC "Nibulon"	7.25	610.88	10.36
LLC Agro Oven	1.56	126.70	9.16
Agricultural firm "Gardens of Ukraine"	1.73	18.76	4.32
LLC "Green Valley"	1.25	242.98	4.15
LLC "Agro-Trade company"	1.68	121.77	3.73
LLC "UkrAgroCom"	1.56	13.38	2.47
LLC "Agro-Union"	0.27	55.56	2.26

Companies	Sales revenue, million USD	Income per 100 hectares of agricultural land, thousand USD	Profit per 100 hectares of agricultural land, thousand USD
PJSC "Ukrzernoprom"	2.16	10.38	2.25
JC "Nafkom-Agro"	2.45	2.49	1.23
LLC "Loture"	0.77	5.65	0.76
LLC "Avias-2000"	0.13	4.78	0.16

Source: calculated by the authors according to data (The largest agricultural holdings..., 2020)

For example, PJSC "UkrlandFarming" is registered in Cyprus, NCH Capital (Nev Century Holding) – in the USA, PJSC "Myronivsky Hliboproduct" – Luxembourg (Yasinetska 2016, 127-131; Pleshanova and Yalyalieva 2019, 29-39). Secondly, the negative consequences of agricultural holdings in the social context are low employment of the rural population, the shift method of economic activity, the payment of taxes at the place of registration, rather than the in region of economic activity. It has been established that the land holding in agricultural holdings is 4.2 times lower than the average in Ukraine, due to specialization in crop production. Image 15 shows the value of agricultural land in European countries. However, if the moratorium is lifted, the price of land in Ukraine may change significantly.

Image 15: The cost of agricultural land in Europe and Ukraine in 2020, thousand USD/ha



Source: calculated by the authors according to data (The State of the world's land..., 2016)

The results of the study show that there are two approaches to regulating the land market in the EU: one can be described as rigid, for example in Denmark, and the other as softer, for example in Germany. However, in all states, the priority in land matters belongs to farmers and the provision of national interests. The land policy of the EU countries is based on the European model of multifunctional agriculture, which is primarily characterized by the presence of small and medium-sized family farms, as well as cooperatives (Plantinga et al. 2002, 561-581). Analyzing the market turnover of land, it is necessary to note the developed market infrastructure of foreign countries, namely: banks, exchanges, auction firms, tender and tender commissions, brokerage offices and real estate organizations of authorized land management bodies, supervisory boards, consulting firms, marketing organizations, notarial institutions, insurance companies, information centers, mass media and advertising agencies, special educational institutions that train specialists to work in the land market system. The purpose of such structures is to protect the constitutional rights of landowners, increase the investment attractiveness of the agricultural sector, and prevent speculation on agricultural lands.

In the countries of the world, in particular in Europe, enough attention is paid to land protection. Thus, more 5% agricultural lands are under the ecological protection of the state. In Belgium, Spain, Germany and France, specially authorized organizations regulate the

implementation of land protection measures at the legislative level. Reclamation works are carried out at the expense of the state and with financial assistance within the framework of the Common Agrarian Policy. Such countries as Bulgaria, Estonia, Latvia, Lithuania, Poland, Romania and Hungary have similar characteristics to Ukraine in the development of the land market. The evolution of private ownership of land took place through a consistent change in the forms of ownership of former cooperatives and state farms into market-type enterprises.

The variety of factors influencing the land resource potential of agricultural use in Ukraine indicates the complexity of causal links in the process of determining the negative impact of factors on agriculture, namely: imbalance between agricultural ecosystems (arable land, pastures and hayfields), forestry and fresh water; development of water and wind erosion of lands (according to experts, losses of agricultural products in agriculture from erosion reach 8-13 million tons of conventional grain units), which leads to economic and environmental losses in the amount of 11-13 billion USD (Mesel-Veseliak and Fedorov 2016, 18-22); excessive application of mineral fertilizers and reduction of organic fertilizers, which leads to losses of humus due to mineralization in the amount of 30-31 million tons, and this figure is equivalent to 310-320 million tons of organic fertilizers. Moreover, economic and environmental losses due to erosion reach 347.98 million USD (Ciaian and Swinnen 2006, 799-815); yields on re-saline soils (due to the use of poor-quality fresh water for irrigation and violation of scientifically sound irrigation regimes and agricultural techniques) tends to decrease, in particular grain crops – by 1.54-2.04 times; row crops – by 3.1-4.2 times, in open ground vegetable crops – by 5.2 times (Lobunko 2015, 17-21; Gyulgyulyan and Bobojonov 2019, 121-134).

In order to analyze the impact of environmental factors on the efficiency of land resource use of agricultural potential in the natural and climatic zones of Ukraine, we propose to establish a relationship between economic and environmental indicators. According to the production function of the integrated indicator of ecological assessment of agricultural lands (formula 5-6), econometric modeling of the use of internal and external resources in the process of land price formation is carried out (Table 5). According to the linear regression data, the Pearson correlation coefficient (0.68) shows the average relationship, as well as the direct relationship between the studied indicators. In turn, the coefficient of determination (0.50) indicates that 50% cases of all changes in the indicators of the normative monetary valuation of a particular land plot are due to changes in the volume of organic fertilizers.

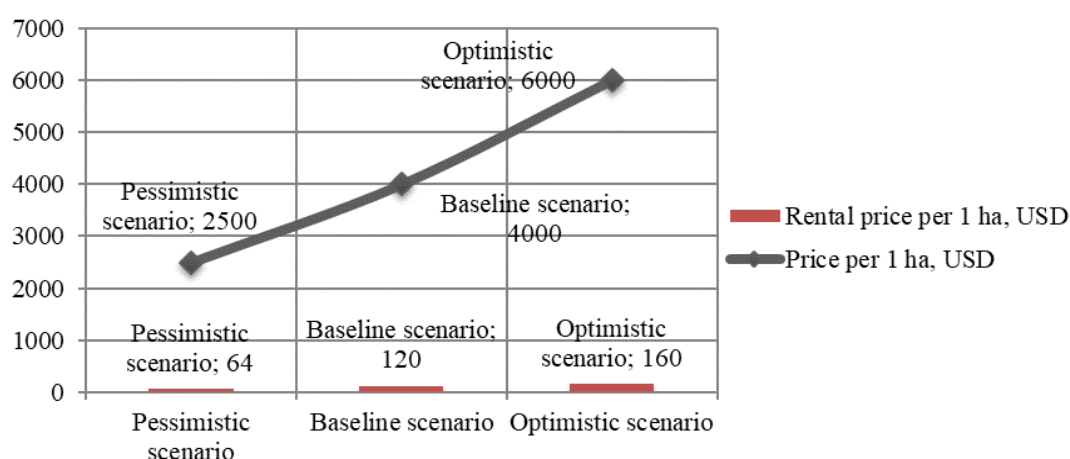
Table 5. Coefficients of ecological and economic component of normative monetary valuation of a separate land plot of agricultural use

Indicator	The values of the coefficients of the model		Correlation coefficient	Coefficient of determination
	a	b		
Ecological coefficient, units	1036.3	280.41	0.68	0.46
Destructive component, %	-7.0	7.56	-0.70	0.49
Application of organic fertilizers, t / ha	278.56	565.32	0.71	0.50
Application of min. fertilizers, kg / ha	3.094	391.88	0.69	0.48

Source: calculated by the authors

Linear regression shows (with probability 50%), that with the increase of organic fertilizers, the price of land will increase, as this improves the quality properties and fertility of the soil. In a more detailed analysis of the influence of these factors (except for less influential) on the change in the normative monetary valuation of an individual land plot, a linear multiple regression model is built. With the help of a modified method of determining the normative monetary valuation of land, a change value in the price of land in the state in the case of lifting the moratorium on the purchase and sale of agricultural land is predicted. The forecast scenario of the value of agricultural land in Ukraine under the condition of opening the land market is presented in Image 16.

Image 16: The forecast scenario of the value of agricultural land in Ukraine for 2021-2022



Source: calculated by the authors

4. Conclusions

Thus, according to the forecast in 2021-2022, the price of 1 hectare may be 6000 USD. However, when choosing a model for the formation of market turnover of agricultural land in Ukraine, it is necessary to take into account the indicators of supply and demand in the market of agricultural land, to protect the interests of producers and the country as a whole. Timely determination of the impact of environmental factors on the economic efficiency of agricultural production will allow in the control system of agricultural nature management to solve pressing environmental problems, as in modern conditions the state of the environment largely depends on providing agricultural producers with friendly environment (compliance with environmental and legal requirements at all stages of agricultural production). Thus, using the equation of dependence of environmental and economic indicators, it is possible to purposefully control the environmental status of agricultural production. In addition, for agricultural holdings it is proposed to establish the business purpose of each individual land plot in accordance with the results of ecological and economic assessment of agricultural land. This will identify factors that limit the development of crop production and develop a system of technological and management measures for the use of agricultural land, taking into account the available land resource potential of enterprises, the ecological condition of fertile land and the requirements of the agricultural market.

Thus, the studies of trends in the development of land and resource potential of agricultural use in the world in a multifunctional world economy have revealed significant reserves for improving the efficiency of land use. Significant reserves are in the use of untapped land resources. Increasing the resource segment in the agricultural sector of the economy will certainly contribute to the growth of commodity, financial segments, followed by a positive social effect. Overcoming the crisis and solving existing problems in the development of the global agricultural sector and the national economy is possible through innovation. The introduction of innovative developments will effectively transform agricultural production, stimulate small and medium-sized enterprises and, at the same time, ensure market entry, which is extremely important given the available land resources. These actions will help increase productivity, save various resources, reduce losses and food costs, increase volumes and efficiency of agricultural production.

The results of the introduction of land use innovations are reflected in the growth of capital and labor productivity, increasing the profitability of labor and other production and financial indicators of agricultural enterprises, as well as socio-economic development of rural areas. At the same time, the innovation process is significantly affected by: a wide range of agricultural products and products of its processing, differences in production technologies, a large time gap between the creation of new developments and their mass adaptation, which provides additional testing and reproduction, dependence on natural area and climate, seasonality of agricultural production. In addition, further development of land policy should

be planned in accordance with the strategy of innovative development, which includes: increasing the contribution of science and technology to the development of land use economy; ensuring progressive transformations in the field of material production; increasing the competitiveness of agricultural products on the world market; strengthening land use security.

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THE CONTRIBUTION OF COHESION POLICY TO THE DEVELOPMENT AND CONVERGENCE OF THE REGIONS OF THE EUROPEAN UNION

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Abstract

The Cohesion Policy's (CP) contribution to the development and convergence of EU regions is examined by utilizing the most complete historical data about CP payments regionally. Through the implementation of the neoclassical econometric model, the positive contribution, with a room of improvement, of CP to development and convergence of EU regions is substantiated. Moreover, the contribution of the secondary sector is emerging as the most critical. It is argued that the provision of reliable data of the implementation of CP contributes decisively towards reducing the complexity and heterogeneity of results. Also increases their potential to be utilized in assessment and design programs.

Keywords: Cohesion Policy of the European Union, Regional development and convergence, Econometric model, Data reliability and representativeness, Secondary sector

JEL classification: R11, R58, R15

1. Introduction

The Cohesion Policy (CP), (Piattoni and Polverari, 2016), is one of the most important EU policies, since it was established, to contribute to the harmonious development of regions, and reduce any lag exists in the most disadvantageous areas (European Union, 2016). At the same time, to reach this highly ambitious, twin (growth and convergence), yet controversial goal set that is in line with theories of economic growth, it is supported through five funds, European Social Fund (ESF), European Agricultural Fund for Rural Development (EAFRD), European Regional Development Fund (ERDF), Cohesion Fund (CF), and European Maritime and Fisheries Fund (EMFF), and its substantial resources amounting to 30% of EU budget.

The establishment of the CP was prompted by the need to counterbalance the negative effects that would result from the operation of the single market in 1989 (Delors, 1989, cited in Boldrin and Canova, 2001). Furthermore, it was believed that the free movement of capital and human resources would unleash centripetal forces, accumulating more benefits at the core of the EU, and raising social and economic disparities to unaccepted levels, at the same time (Rodriguez-Pose and Fratesi, 2004). However, the effort to substantiate the need for the CP based on the theories of economic growth leads to different and contradictory conclusions. In detail, the neoclassical development theory (Solow-Swan, 1956) posits that the operations of the single market ensure a uniform allocation of the factors of production, and due to their diminishing returns, in the long run, economies converge to equilibrium and therefore, the CP is unnecessary. On the other hand, the endogenous development theory (Romer, 1986), followed by the new economic geography theory (Krugman, 1991), posits that the two goals of the CP (development and convergence) cannot be met simultaneously. More precisely, it is argued that regional disparities increase at times of growth and decrease or remain constant at times of recession, due to the economies of scales and rising returns of the factors, which

result from their accumulation in the developed regions. As Guastella and Timpano (2010) mention “the debate on the role of external economies on convergence is still open”.

A milestone during the implementation of the CP is marked by the year 1988, when its radical review and transformation occur through a set of fragmented interventions within a comprehensive operation program, spanning over many years, with specific resources and targets, and participatory planning, monitoring and evaluation procedures (Manzell and Mendez, 2009).

According to Becker et al. (2010), the interest in the evaluation of the CP, i.e., in the evaluation of the impact from its implementation on the development and convergence of the EU regions, has the report of Sala-i-Martin (1996) as its starting point. In more detail, in this report, the failure of the CP is noted, estimating that development and convergence in the EU were not different from other areas, where similar programs were not implemented.

Currently, after about 25 years of significant research efforts, neither the scientific community nor the policymakers have managed to reach a common conclusion about the competition of the objectives of the CP. On the other hand, they have mainly managed to identify the factors that have a major impact on this accomplishment (Bachtrogler et al., 2020). A characteristic report is that of Berkowitz et al. (2020) who, following the research on the impact assessment methods applied to the CP, conclude that the functioning of CP remains a “black box” in the analysis, highlighting, at the same time, that the presence of representative and reliable data within the appropriate scope and territory level is critical.

Furthermore, it is argued by Fratesi and Wislade (2017) that the overall impact assessment of the CP is very difficult, since several parameters affect the analyses, and the researcher’s interest should be focused on investing the determinants that have an impact on its effectiveness. As a result, a failure to reach consistent conclusions about the benefits of the CP leads, among other things, was a growing questioning of the added value of the CP, as it characteristically emerges from the analysis of nine surveys in the paper of Crescenzi et al. (2020).

As illustrated in the following section, the heterogeneity, even contradiction of the results of the surveys are not the only critical issues, since the assumptions, conditionalities and case studies that introduced and examined by each one of them, also significant limitations to their utilization in planning future programs. Reference made by Pieńkowski and Berkowitz (2015) on the need for collaboration to be encouraged among academics, econometric analyst, and policymakers, at all levels, to develop synergies and establish a common understanding about how research results can be utilized. The following recognized in the literature as the causes of a lack of clarity in research. The range and variety of interventions within the CP and the various effects that they have on development, the different period and scope that are covered by the research and the analysis method applied. However, almost all the researchers report the limited availability of representative and reliable data as the cause of lack of clarity in analyses, both for simulation of the CP and any additional explanatory variables that should be taken under consideration in analysing, as specified in regional development theories and literature. To further elaborate, although it is accepted (Berkowitz et al., 2020; Ederveen et al., 2003; Fiaschi et al., 2018; Mohl and Hagen, 2010; Rodriguez-Pose and Fratesi, 2004) that the evaluation of the CP should take place after considering the actual payments of funds, as they distributed in the appropriate scope, intervention sector, and time of implementation, the studies that utilize the relevant data are limited. Characteristically reported that Dall’erba and Fang (2017) after reviewing 17 econometric studies which were taken from the years 1996 to 2013, included in their analysis only those studies that received actual amounts of funds for the simulation of the CP, excluding those that use proxy or dummy variables.

This paper aspires to further contribute to research, since it takes advantage of some of the most complete and accurate set of historical data published by the European Commission in April 2018 (European Commission, 2018), regarding CP payments. So far, these data have not been utilized by any research, as far as the authors of the paper at hand are concerned. Moreover, it covers the highest number of regions that can be found in literature, i.e., 237 out of 272, and expands the period of analysis up to 2016, from 2013 that it has been so far. Furthermore, it provides clear and quantified results that are based on the most parsimonious econometric model, which has a high explanatory capacity and meets the goodness of fit tests.

Therefore, it can be used for the forecast of impact during the design and evaluation of CP programs.

The study is structured around 5 sections, including the 1st section and the 5th section that refer to the introduction and the conclusions, respectively. In the 2nd section, a presentation of literature takes place and the contribution of the report to research is determined, while in the 3rd section, an analysis is conducted on the evaluation method used for the CP and the relevant data that are taken into account. This is followed by the 4th section, where a presentation of the results derived from the implementation of the neoclassical econometric model, takes place, as well as their discussion, referring mostly to the contribution of the CP to the development and convergence of the EU regions.

2. Literature review

The evaluation of the CP has been a topic of main research interest over the years. In a recent study by Butkus et al. (2019), the key features (researchers, period, the scope of analysis, method, results, and conditions for their application) of 42 papers published from 2001 to 2018, are summarized towards the evaluation of the CP. Moreover, Alexiadis (2020) recognizes that the convergence of EU regions is one of the most controversial issues in regional science. Earlier, it was reported by Dall'erna et al. (2006) that more than 100 studies investigate the impact of EU regional development policies. An analysis of only 11 of them took place, since, as it is reported by the authors, they are the only ones that are based on reliable data. This is followed by systematic summaries of research studies by Mohl and Hagen (2010) and Pinho et al. (2015). On top of that, Dall'erna and Fang (2017) gathered and evaluated 323 analyses from 17 econometric studies that were prepared from 1966 to 2013, while Pienkowski and Berkowitz (2015) also include a comprehensive literature analysis about the contribution of econometric analyses to the evaluation of CP, putting forward suggestions about how the reliability and usefulness of analyses can be enhanced.

As it emerges from literature, so far, the scientific community and policymakers have failed to agree on the impact of the CP on the development and convergence of the EU regions. Research results lead not only to different, but also conflicting results in many cases, identifying and analysing numerous sources of research heterogeneity and diversification.

However, the scientific debate is often focused on the lack of representative and reliable data for simulation of the CP, as is extensively described in the paper of Ederveen et al. (2003) for the first time. The authors point out that econometric analyses have several flaws due to the absence of data about funds allocation from the CP, especially at a regional level. Concluding that the researchers use either proxy or dummy variables, and this assumption does not contribute to reaching firm and reliable conclusions. They also refer to efforts made by the EU towards development of a CP payments database, estimating that it will be made available soon.

Subsequently, the report of Rodriguez-Pose and Fratesi (2004) is the first comprehensive effort to address the issue of the lack of data about the allocation of resources from the CP at a regional level. The authors discuss the problems that they encountered and the efforts that they made to establish sufficient and reliable data for the simulation of the CP. They refer to the absence of a database about CP payments and the criticism that the EU has received from the European Court of Auditors for this, stressing the need to also consider the time lag that exists between the annual funding commitments and the actual payments that take place during the implementation of the CP. To cover this gap, primary data and data from annual implementation reports of the CP were processed by the researchers, highlighting, in many cases, the complete lack of data about the regional allocation of funds.

Later, comprehensive data about the allocation of resources from the CP at a regional level included in the study of Esposti and Bussoletti (2008). Precisely, the researchers report that to cover the gap from the absence of a central database about CP payments made at a regional level, data retrieved from the annual reports of CP payments made both regional and sectoral programs. Although they cover the ERDF, the ESF, the EAFRD and the EMFF, their analysis is limited to the Convergence regions (i.e., regions with Gross Domestic Product (GDP) per capita (p.c.) in Purchasing power standard (PPS) that is less than 75% of the EU regions

average, i.e., 47 to 48 regions, and only for the 1989-1999 period. Also, does not include resources from the CF.

Moreover, Mohl and Hagen (2010) include a comprehensive review of how a series of econometric studies simulate the funds of the CP. They highlight the failure to distribute regionally the funds of the sectoral programs that included in the annual reports of the EU. They also note that the allocation of funds that included in them differs significantly from the actual allocation of funds from the CP to the regions. They also stress the need for the actual payments to be considered rather than the annual funding commitments, reporting that, due to the time lag, there can be major differences in the results. The above two issues (regional dimension and actual annual payments of CP funds) are the main flaws in a group of surveys (Bouayad-Agha et al., 2013; Dall'èrba et al., 2009; Dall'èrba and Le Gallo, 2008; Fayolle and Lecuyer, 2000; Le Gallo et al., 2011; Puigcerver-Peñalver, 2007; Rodríguez-Pose and Garcilazo, 2015; Rodríguez-Pose and Novak, 2013), where it is reported that the funds of the CP were taken from official publications or they were made available to them by the EU, listing, however, limited information, or no information at all, about the amount of the funds that were included in the analysis, and their distribution in space and time.

After, Fratesi and Perucca (2014) evaluated the CP in regions of various countries in Central and Eastern Europe, taking into consideration only payments by the ERDF and the CF from the database of the SWECO (2008), allocated to four areas of intervention and only for the 2004-2006 period. The same database was also used by Butkus et al. (2019) to assess the impact of the CP on EU regions for the 2000-2006 period. Also, Çolac (2015) includes in his article a rich literature on the study of the convergence, absolute, conditional β -convergence and σ -convergence of 33 states of the Central and Eastern European (CEE) and South Eastern European. What is more, Fiaschi et al. (2018) characteristically report that the use of actual payments is the most accurate variable for the simulation of the CP. However, due to the limited availability of data, and to expand the period time of their analysis beyond the 2000-2006 period, they developed a complex methodology about the distribution of actual payments to the regions, according to the GDP p.c. upon commencement of the programming period, assuming that the level of support remains constant over time.

In more recent literature, research that is based on the counterfactual method, and more specifically, on the regression discontinuity technique (Lemieux, 2010) can be found more and more often (Becker et al., 2010, 2013, 2018; Cerqua and Pellegrini, 2018; Crescenzi and Giua, 2020; Gagliardi and Percoco, 2017; Pellegrini et al., 2013; Percoco, 2017). In these research studies, the CP is simulated by using dummy variable, and takes binary values “0” and “1” depending on whether the region under investigation belongs, or not, to regions that are eligible to receive support from the CP. Therefore, it emerges that the CP is evaluated indirectly, through the benchmarking of “similar” regions “with and without the intervention”. The reason of using the binary dummy variable “0-non beneficiary” and “1-beneficiary” regions for the simulation of the CP is also followed by a group of researchers (Boldrin and Canova, 2001; De Dominicis, 2014; Falk and Franz, 2008; LeSage and Fischer, 2008; Ramajo et al., 2008), and although they are based on the neoclassical model of development, they do not take the allocation of CP resources into account.

The most recent research paper that uses actual payments for the simulation of the CP is the paper of Cerqua and Pellegrini (2018). In specific, by modifying the regression discontinuity method and introducing the variable of level of support, they estimate that the CP has a positive impact on the economic development of the EU regions. They report, without providing a more detailed reference, that, a result of data that were made available to them by the EU and external consultants, payments through operational programs by all five funds of the CP were distributed regionally for each year of the 1994-1999 and 2000-2006 programming periods, allowing thus an analysis that expands across 208 regions to be conducted with accuracy, which was not possible in the past.

3. Method and data

The estimation of the contribution of the CP to the development and convergence of the EU regions is made through the implementation of an econometric model that is founded on the neoclassical growth theory of Solow-Swan (1956) and is described in detail in the papers of Barro and Sala-Martin (1991, 1992), Sala-Martin (1996). Without underestimating the

flaws of the model, as they have been highlighted by several researchers (Durlauf, 2009; Quah, 1993; Rodrik, 2012), it is selected to be used in this paper, in order to enable the benchmarking of results, since it is used by the overwhelming majority of empirical analyses that can be found in the literature. The alternative option that refers to the application of the counterfactual method does not qualify, since it evaluated the CP indirectly, without taking into account the key variable that refers to the application of the CP, i.e., the level of support that is expressed by the allocation of funds. Furthermore, the limitation that applies to the application of the counterfactual method for “similar” regions that were either “beneficiaries” or “non-beneficiaries” of the CP, is extremely difficult to be met. In more detail, in the neoclassical growth model, development is expressed by the rate of change of the GDP p.c. in PPS, and represents the dependent variable of the model, whereas its mathematical formulation in the case of a panel data layout, i.e., combination of cross-sectional that correspond to regions and time series, is the following (Alexiadis et al., 2010; Maynou et al. 2016; Mohl and Hagen, 2010):

$$\frac{GDPPC_{i,t} - GDPPC_{i,t-1}}{GDPPC_{i,t-1}} = \beta_0 + \beta_1 \ln(GDPPC_{i,t-1}) + \beta_2 \ln(EUSF_{i,t}) + \beta_j \ln(X_{i,t}) + \mu_i + \lambda_t + u_{i,t} \quad (1)$$

where index i denotes the region ($i=1, \dots, N$), t the year ($t=2000, \dots, 2016$), $\beta_0, \beta_1, \beta_2$ and β_j the unknown coefficients that are determined by linear regression analysis. As independent variables are regarded the GDP p.c. in PPS with a time lag ($GDPPC_{i,t-1}$), the payments ($EUSF_{i,t}$) of the CP in €, which is also the key variable for the application of the CP, the contribution of which to development is investigated, and $X_{i,t}$ as independent variables that affect the conditions of development and convergence of regions, and may refer to the composition of the economy, employment, demographics, research and innovation, living conditions, etc.

In the literature (Bouayad-Agha et al., 2013; Esposti and Bussoletti, 2008; Islam, 2003), it is also recommended to use the constants μ_i and λ_t to take space and time heterogeneity into account. In specific, constant μ_i determines the non-measurable impact that the unique characteristics of each region that are constant in terms of time can have on the dependent variable. These characteristics can be associated with both inherent comparative advantages, or limitations, due to its geographical location and special structural and institutional characteristics that are identified on a national level, and which provide a different degree of freedom to each region that should be taken into consideration in the analysis. The disturbance term $u_{i,t}$ is also included, which follows a normal distribution with a mean value of zero and constant standard deviation $N(0, \sigma^2)$, and which is the remainder stochastic disturbance term of the sample, such as the omitted of independent variables that affect the dependent variable, measurement errors, and other random factors that are ignored in the mathematical expression of the model.

Convergence can be achieved if coefficient β_1 takes negative and statistically significant value during the evaluation of the model. The case, which is classified as b-convergence case, describes the process, during which, the poorer regions develop faster than the richer ones, reaching a common equilibrium in the long run, and resulting in a decrease in inequality. Additionally, the σ -convergence assumption can be identified as a process of decrease over time, of the dispersion of the GDP p.c. in the economies under investigation. The coefficient of variance (CV) is taken as a measure dispersion, which is defined as the ratio of standard deviation over the arithmetic mean. The two forms of convergence are considered as complementary, and in literature, it is recommended that they are examined simultaneously, since b-convergence provides the necessary, but not sufficient, condition for σ -convergence (Batabyal, 2017; Ederveen et al., 2003; Koudoumakis et al., 2019).

Regarding the data of this research, in order to cover the gap that was identified in the literature concerning the actual allocation of CP funds at a regional level, the details of payments that were announced by the EU on the 30th anniversary of its realization were selected to be used (European Commission, 2018). In more detail, in April 2018 the EU published, Table 1, the most complete historical data about payments from its budget made by the ERDF, the ESF the EAFRD, and the CF to 272 regions (NUTS 2) (Eurostat, 2018),

covering the 1986-2016 time period. In the publication, the distribution method of the CP funds on a regional level is described in detail, as well as an estimation of the actual annual allocation of payments, taking into account the time lag that exists between the payments that are made by the EU to member states and the actual payments that are made by member states during the implementation of the CP.

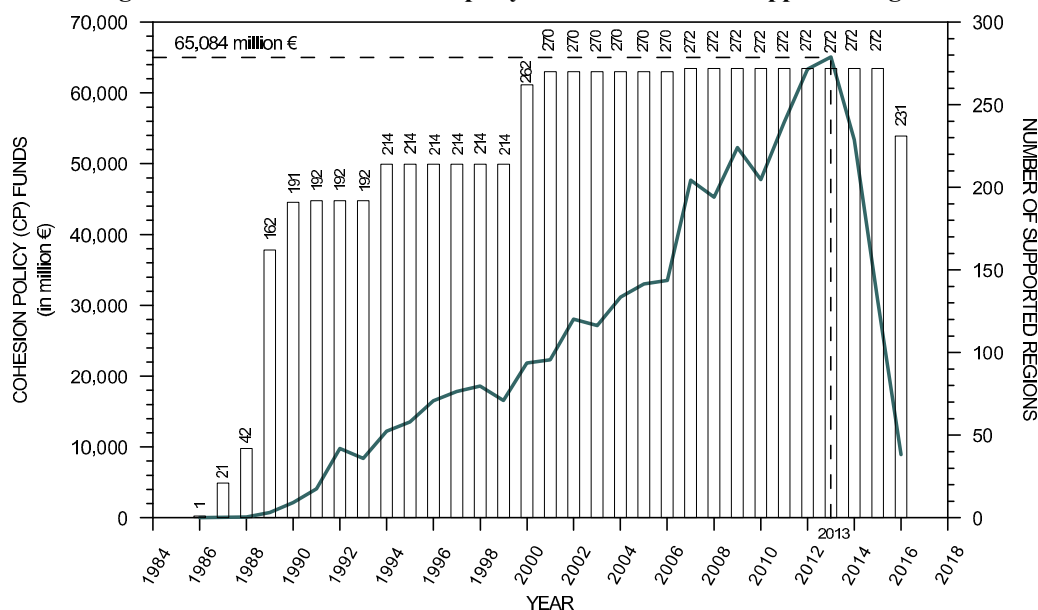
Table 1: Descriptive statistics measures of the CP funds over the 1986-2016 period

	Total funds	European Regional Development Fund	European Social Fund	European Agricultural Fund for Rural Development	Cohesion Fund
		(ERDF)	(ESF)	(EAFRD)	(CF)
Number of regions (N)	272	272	272	270	99
Sum	€787,946,112,663	€408,926,769,721	€137,003,749,868	€127,132,222,322	€114,883,370,752
Mean	€2,896,860,708	€1,503,407,242	€503,690,257	€470,860,083	€1,160,438,088
Median	€1,443,816,908	€686,711,593	€363,224,121	€267,222,882	€1,007,153,874
Max	€32,912,765,186 (ES61-Andalucía)	€21,999,684,856 (ES61-Andalucía)	€4,366,513,656 (ES61-Andalucía)	€4,092,010,590 (ES61-Andalucía)	€5,136,904,526 (PL12-Mazowieckie)
Min	€57,367,518 (FI20-Åland)	€10,748,849 (FI20-Åland)	€24,560,238 (FI20-Åland)	€1,419,704 (CZ01-Praha)	€62,533,046 (ES63-Ciudad Autónoma de Ceuta)
Standard deviation (σ_{n-1})	€3,809,937,084	€2,404,810,938	€505,278,748	€587,636,094	€911,201,504
Coefficient of variation (CV)	1.315	1.600	1.003	1.248	0.785
Max/Min	574	2.047	178	2.882	82

Source: European Commission (2018) and own processing.

Besides, from the progress in the allocation of the CP funds over time, Figure 1, it emerges that the first allocation of funds is recorded in 1986, and subsequently, especially from 1989 onwards, when the commencement of the first programming period (1989-1993) took place, with a growing rate of resources and several supported regions, the payments reach their maximum annual value in 2013, amounting to €65.1bn and 272 beneficiary regions. The declining trend is recorded from 2013 to 2016 and is due to the transition from the completion of the fourth programming period (2007-2013) to the commencement of the fifth on (2014-2020), the data of which have not been integrated yet.

Figure 1: Allocation of CP funds per year and number of supported regions.



Source: European Commission (2018) and own processing.

The remaining data that are input during the application of the econometric model, and refer to both the GDP p.c. in PPS and the independent variables $X_{i,t}$ are taken from the database of the Eurostat. The data were developed in the form of a panel, the growing use of which is due, inter alia, to their ability to reduce the problem of multicollinearity, i.e., the correlation on independent variables, as well as overcome the problem of heteroscedasticity that refers to a non-constant variance of the disturbance term in the linear model (Baltagi, 2005).

Prior to the application of the econometric model, and in order to address the strong heterogeneity of the EU regions, they are classified into three groups, according to the mean value of the GDP p.c. in PPS over the 2000-2017 period. The results of clustering the 272 regions are presented in Appendix A, Table A.1 while the descriptive statistics measures for the resources of the CP per group of regions are presented in Table 2.

Table 2: Descriptive statistics measures of the CP funds per group of regions

	GROUP (A) GDP p.c. in PPS<75%	GROUP (B) 75<GDP p.c. in PPS<90%	GROUP (C) GDP p.c. in PPS>90%	REGIONS OUTSIDE CLUSTERING
Number of regions (N)	65	51	121	35
Sum	€368,212,212,221	€180,367,182,016	€144,530,476,822	€94,836,241,604
Mean	€5,664,803,265	€3,536,611,412	€1,194,466,751	€2,709,606,903
Median	€4,167,849,709	€1,818,194,508	€694,038,893	€2,110,664,677
Max	€32,912,765,186 (ES61-Andalucia)	€14,138,130,664 (ES11-Galicia)	€9,392,688,857 (PT17-Lisboa)	€12,783,154,630 (EL30-Attiki)
Min	€302,393,879 (HR03-Jadranska Hrvatska)	€207,617,636 (BE34-Prov. Luxembourg)	€185,887,709 (BE10-Région de Bruxelles- Capitale)	€57,367,518 (FI20-Åland)
Standard deviation (σ_{n-1})	€5,358,701,364	€3,866,404,567	€1,194,466,751	€2,684,147,588
Coefficient of variation (CV)	0.946	1.093	1.166	0.991
Max/Min	109	68	51	223

Source: European Commission (2018) and own processing.

Therefore, the current research covers 237 regions or 87% of the EU regions, to which €693.110bn or 88% of the total funds are allocated, of which the 46.7% in Group A, the 22.9% in Group B and the 18.4% in Group C. The mean annual level of support is estimated at €202, €100, and €27 per citizen, which is equal to 1.63%, 0.63%, and 0.12% of the GDP, for Groups A, B and C, respectively. Moreover, the maximum annual support is €1,250 per citizen or 10.4% of the GDP for Group A, €1,060 per citizen or 6.8% of the GDP for Group B, and €439 per citizen or 2.3% of the GDP for Group C.

Much lower amounts of resources can be found in the literature. As indicated by Butkus et al. (2019) report payments of €149.8bn, Fratesi and Perucca (2014) €21.106bn, whereas Becker et al. (2010, 2013, 2018) report that the annual allocation of resources per programming period range from €10.3bn to €15.7bn. Besides, Pinho et al. (2015) report that payments amount to €28 per citizen or 1.41% of the GDP. Mohl and Hagen (2010) report payments ranging from €5.4 to €264.4 per citizen, while in the study of Esposti and Bussoletti (2008), they range from €148.9 to €443.2 per citizen. Further to that, Rodriguez-Pose and Fratesi (2004) indicate that funds are as high as 1.74% of the GDP for the Convergence regions, 0.94% of which were allocated from regional programs, and the remaining 0.84% from sectoral programs. It should be noted that 35 regions, to which €94.536bn or 12% of the total funds are allocated, are not classified into any group and are not part of the analysis, since they either present limited data or outlier residual values of the disturbance term upon implementation of the econometric model. It is characteristically reported that the following are not included in the analysis: all eight regions of Romania (RO), three out eight regions of Sweden (SE), some regions that include an entire member state, e.g. Estonia (EE00), Malta (MT00), Latvia (LV00), and also regions with special features, such as, for example, the region of Groningen (NL11) in the Netherlands, the special behaviour of which, due to exploitation of natural gas, has also been highlighted in other reports (Ederveen et al., 2003).

4. Results

The results from the application and test of goodness of fit of the econometric model for the assessment of the impact of the CP on the development and convergence of the EU regions are presented for Groups A, B and C in Table 3. Two cases can be identified, according to the number of independent variables that are included in the model: a) the basic model, which only includes as independent variables as the GDP p.c. in PPS with a time lag ($GDPPC_{i,t-1}$) and the CP payments in € ($EUSFi_t$), as well as b) the modified model, which includes additional independent variables ($X_{i,t}$) that affect significantly the conditions for the development and convergence of the regions.

Table 3: Results and tests of goodness of fit of the model

	Basic model			Modified model		
Dependent variable	Annual rate of change of the GDP p.c. in PPS, (GDPPC _{i,t} -GDPPC _{i,t-1})/GDPPC _{i,t-1}					
Period of analysis	2000-2016					
Years, (t)	16					
Group of regions	A	B	C	A	B	C
Number of regions, (i)	65	51	121	65	51	121
Observations, (N)	1,026	812	1,904	1,017	812	1,904
Results						
Constant, β ₀	0.466972***	0.815512***	1.119735***	0.667860***	1.256714***	1.165258***
Convergence, ln(GDPPC _{i,t-1}), β ₁	-0.057941***	-0.089318***	-0.106358***	-0.134659***	-0.176562***	-0.146355***
Speed of convergence				0,90%	1.21%	0.99%
Half time life ¹⁴				77 years	57 years	70 years
EU funds, (€), ln(EUSF), β ₂	0.006311***	0.005085***	-0.000375	0.003470***	0,004460***	0.000214
Participation of secondary sector in GVA, (%), ln(GVAB), β ₃				0.174608***	0,136294***	0.109927***
Goodness of fit tests						
1. Normality of residuals of disturbance term	NO	YES	YES	YES	YES	YES
Jarque Bera – JB statistics	63 (p=0%)	0.89 (p=64%)	1.7 (p=43%)	2.83 (p=24%)	0.84 (p=66%)	2.6 (p=28%)
2. Coefficient of determination, R ²	0.563356	0.663681	0.695341	0.625363	0.699741	0.724797
3. Akaike Information Criterion - AIC	-4.050578	-4.777151	-4.929839	-4.234655	-4.888104	-5.030471
4. Schwarz Criterion - SC	-3.656288	-4.383597	-4.527456	-3.832745	-4.488762	-4.625172
5. Hannan and Quinn Criterion - HQ	-3.900907	-4.626071	-4.781724	-4.082026	-4.734802	-4.881283
6. Absence of autocorrelation of residuals	YES	YES	YES	YES	YES	YES
Correlation coefficient of residuals, r _{u(t), u(t-1)}	0.138	0.177	0.094	0.128	0.180	0.070
7. Absence of multicollinearity	YES	YES	YES	YES	YES	YES
Variance Inflation Factor, (VIF)	2.29<10	2.97<10	3.28<10	2.67<10	3.33<10	3.63<10
Independent variables correlation coefficient	-	-	-	r _{EUSF, GVAB} =-0,03	r _{EUSF, GVAB} =0,27	r _{EUSF, GVAB} =-0.02
8. Absence of endogeneity	YES	YES	YES	YES	YES	YES
Correlation of independent variables and residuals of disturbance term	r _{EUSF, u(t)} =-0.034	r _{EUSF, u(t)} =0.024	r _{EUSF, u(t)} =0.015	r _{EUSF, u(t)} =-0.042	r _{EUSF, u(t)} =0.013	r _{EUSF, u(t)} =-0.009
	r _{GVAB, u(t)} =0.006	r _{GVAB, u(t)} =0.008	r _{GVAB, u(t)} =0.011			

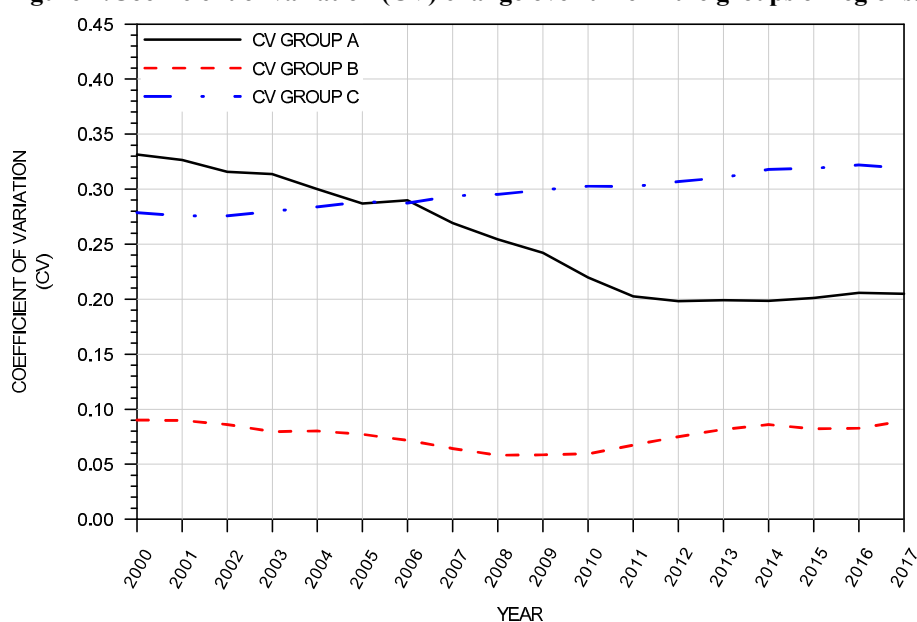
Statistical significance level, p: *** < 1%, ** < 5% και * < 10%

Source: Own processing.

According to the results of the basic model, for Group A, the assumption of normal distribution of residuals of the disturbance term is violated, as it is estimated through the statistical calculations of Jarque-Bera (1980). It is pointed out that the normality of the residuals of the disturbance term is an essential condition for the validity and reliability of the method of least squares, where the solution that is provided by the model is based (Arbia et al., 2005, Baltagi, 2005, Islam, 2003; Maynou et al., 2016). At the same time, the need is demonstrated to examine the possibility of increasing the explanatory capacity of the model, which is 56.3%, 66.4% and 69.5% for Groups A, B and C, respectively, as it emerges from the coefficient of determination R^2 . In this context, the explanatory capacity and goodness of fit of the modified model are examined through the addition of independent variables that are associated with the: a) economy, such as the percentage of participation in establishing the Gross Value Added (GVA) of the primary, secondary, and tertiary sectors, and the number of overnight stays of tourists, b) employment, such as the employment to population ratio, both overall and for employees with a tertiary education, in specific, and c) living conditions and demographics, such as population density, growth, life expectancy at birth, child mortality, and ageing index. From more than thirty alternative models that were examined in addition to the basic model, both individually and in combination with the above independent variables, it emerges that only the addition of the rate of participation of the secondary sector (GVAB) to the establishment of the GVA contributes to the satisfaction of the assumption of the normal distribution of residuals of the disturbance term throughout Groups. Also, the

explanatory potential of the modified model increases sufficiently, and amounts to 62.5%, 70% and 72.5% for Groups A, B and C, respectively, as it is presented in Table 3. It should be noted that the contribution of the manufacturing sector to development, also identifying it as the driving force behind it, has already been acknowledged from an early stage (Kaldor, 1967), while, nowadays, it plays a key role in regional development, mainly through the Strategy of Smart Specialization (Foray and Goenaga, 2013; Midelfart-Knarvik and Overman, 2002; Percoco, 2017). In terms of the effect that the sectoral composition of the economy has on development, it is reported that the negative impact of the service sector, especially in the cases where it grows disproportionately to the other two sectors of the economy, is described, and documented in the paper of Percoco (2017). At the same time, the development lag of regions that rely mainly on the primary sector is acknowledged by several researchers (Bussoletti and Esposti, 2004; Deller et al., 2003), and is attributed to the low level of technological development that can be utilized by the primary sector. Improvement is also shown by the criteria, that are used to test the model in terms of goodness of fit, providing evidence that the GVAB was fairly introduced as a new independent variable. The modified model also satisfies the following: a) the test of the absence of autocorrelation of the residuals of the disturbance term concerning the correlation of two successive values u_t and u_{t-1} , b) absence of multicollinearity test, i.e., the linear relationship between independent variables, and c) test of the absence of endogeneity for the model, i.e., the non-correlation of independent variables with the residuals of the disturbance term. In addition, the assumption of σ -convergence was examined for the three groups of regions, Figure 2, taking into account the progress of the CV over time. It emerges that there is a decrease in the dispersion of the development level of Group A, i.e., σ -convergence and a constant progress to slight increase in the dispersion of the development level of Groups B and C. It should be noted that the formulas for calculating the speed of convergence and the half-life time are described in detail by Arbia (2006).

Figure 2: Coefficient of variation (CV) change over time in the groups of regions.



Source: Own processing

5. Conclusion

The literature review revealed that, so far, the CP is evaluated by nearly the entire body of research, without reliable and representative data resulting from its implementation. This gap is attempted to be addressed by this paper, by utilizing for the first time, the most complete and accurate historical data that were published by the EU in April 2018, regarding payments by the CP funds made to 272 regions, spanning over the 1986-2016 period. In addition to covering the four main funds of the CP, these data address the two main disadvantages of the data that have been made available so far, since they include the regional dimension of

resources from sectoral programs and take into consideration in the establishment of the annual allocation of payments, the time lag that exists between the payments by the EU to member states and the actual payments made by the member states during the implementation of the CP interventions.

The actual allocation of CP funds at a regional level, along with the participation of the secondary sector, shaped up the econometric model of the neoclassical theory of development with a high explanatory capacity and the ability to satisfy goodness of fit testing and the simplicity principle. Therefore, the estimated coefficients of the econometric model are best, linear, and unbiased estimators that can be used to conclude and to forecast. This can also serve as the basis for expanding research and applying a more in-depth research approach within specific scopes, as well as evaluating the CP funds.

From the implementation of the econometric model, it was possible to calculate the positive and statistically significant contribution of CP funds to the development and convergence of regions with a GDP p.c. lower than 75% and 90% of the EU regions, i.e., Groups A and B, respectively, while for regions with GDP p.c. higher than 90% of the EU average, i.e., Group C, the contribution of the CP was estimated as positive but not statistically significant. It should be noted that the participation of the secondary sector is positive and statistically significant for the development and convergence of all the three groups of EU regions. Moreover, all the three groups of regions converge (β -convergence) during the period under investigation (2000-2016). The regions of Group B converge faster than the regions of Group C and Group A. However, in all the cases, the corresponding rate is lower than 2% to 7%, as it can be bound in the literature (Badinger et al., 2004). More specific, the rate of convergence of regions in Group B is 1.21% while it is 0.99% in Group C, and 0.90% in Group A, in general, in accordance with the results reported by Karras (2010) for regions of Europe. This conclusion gives weight to the view of several researchers (Becker et al., 2013; Ederveen et al., 2003; Rodriguez-Pose and Garcilazo, 2015) that regions with developed institutional and administrative capacity, at it, applies, in regions on Group B, make more efficient use of CP funds. It is also in concordance with what is reported by Crescenzi (2009) and Bondonio and Greenbaum (2006), that regions with a relatively higher level of development, CP programs are more effective, leading to the paradoxical conclusion that the CP achieves less where more is needed, i.e., in less developed regions.

It is also emerging that there is a decrease in the dispersion of the development level of Group A, which implies σ -convergence, is interrupted after 2011. However, this is in fact what is believed to be the results of the economic crisis of 2009. At the same, it is found out that there is a stable to a slight increase in the dispersion of the development level of Groups B and C, confirming that β -convergence is a necessary, but not sufficient condition to also satisfy σ -convergence. The low rate of convergence and low positive contribution of CP resources indicate that there is much more room for improvement when it comes to the effectiveness of the CP.

It can be understood that the provision of reliable and representative data from the application of the CP is in everyone's interest, and mostly the EU's since it can evaluate and communicate the significant benefits of its policy on a well-grounded basis, improving the design of new programs with the CP, as well.

6. References

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Appendix A

Table A.1: Classification of regions into groups

Num	Region	Group	Num	Region	Group	Num	Region	Group	Num	Region	Group			
1	AT11 - Burgenland	B	56	DE92 - Hannover	C	111	ES70 - Canarias	B	166	IT11 - Provincia Autonoma di Bolzano	C	221	RO42 - Vest	A*
2	AT12 - Niederösterreich	C	57	DE93 - Linzburg	B	112	FI19 - Länsi-Suomi	C	167	IT12 - Provincia Autonoma di Trento	C	222	SE11 - Stockholm	C
3	AT13 - Wien	C	58	DE94 - Weser-Ems	C	113	FI18 - Helsinki-Uusimaa	C	168	IT13 - Veneto	C	223	SE12 - Östra Mellansverige	C
4	AT21 - Kärnten	C	59	DEA1 - Düsseldorf	C	114	FI10 - Etelä-Suomi	C	169	IT14 - Friuli-Venezia Giulia	C	224	SE21 - Småland med Järna	C*
5	AT22 - Steiermark	C	60	DEA2 - Köln	C	115	FI11 - Pohjois- ja Itä-Suomi	C	170	IT15 - Emilia-Romagna	C	225	SE22 - Sydsvetige	C*
6	AT31 - Oberösterreich	C	61	DEA3 - Münster	C	116	FI20 - Åland	C*	171	IT11 - Toscana	C	226	SE23 - Västergöt	C
7	AT32 - Salzburg	C	62	DEA4 - Demold	C	117	FR10 - Île de France	C	172	IT12 - Umbria	C	227	SE31 - Norra Mellansverige	C
8	AT33 - Tirol	C	63	DEA5 - Aynberg	C	118	FR21 - Champagne-Ardenne	C	173	IT13 - Marche	C	228	SE32 - Mellerta Norrland	C
9	AT34 - Vorarlberg	C	64	DEB1 - Koblenz	C	119	FR22 - Picardie	B	174	IT14 - Lazio	C	229	SE33 - Övre Norrland	C*
10	BE10 - Région de Bruxelles-Capitale	C	65	DEB2 - Trier	C	120	FR23 - Haute-Normandie	C	175	LT00 - Lietuva	A	230	S03 - Vzhodna Slovenja	A
11	BE21 - Prov. Antwerpen	C	66	DEB3 - Rheinbessen-Pfalz	C	121	FR24 - Centre	C	176	LU00 - Luxembourg	C	231	S04 - Zahodna Slovenja	C
12	BE22 - Prov. Limburg	C	67	DEB4 - Saarland	C	122	FR25 - Basse-Normandie	B	177	LV00 - Latvija	A*	232	SK01 - Bratislavský kraj	C
13	BE23 - Prov. Ost-Vlanderen	C	68	DEB5 - Dresden	C	123	FR26 - Bourgogne	C	178	MT00 - Malta	B*	233	SK02 - Západe Slovensko	A
14	BE24 - Prov. Vlaams-Brabant	C	69	DEB6 - Chemnitz	B	124	FR30 - Nord - Pas-de-Calais	B	179	NL11 - Groningen	C	234	SK03 - Stredné Slovensko	A
15	BE25 - Prov. West-Vlanderen	C	70	DEB5 - Leipzig	C	125	FR41 - Lorraine	B	180	NL12 - Friesland	C	235	SK04 - Východné Slovensko	A
16	BE31 - Prov. Brabant Wallon	C*	71	DEE0 - Sachsen-Anhalt	B	126	FR42 - Alsace	C	181	NL13 - Drenthe	C	236	UK11 - Tees Valley and Durham	B
17	BE32 - Prov. Hainaut	B	72	DEE0 - Schleswig-Holstein	C	127	FR43 - Franche-Comté	B	182	NL21 - Overijssel	C	237	UK12 - Northumberland and Tyne and Wear	B
18	BE33 - Prov. Liège	B	73	DEE0 - Thüringen	B	128	FR51 - Pays de la Loire	C	183	NL22 - Gelderland	C	238	UKD1 - Cumbria	C
19	BE34 - Prov. Luxembourg	B	74	DK01 - Hovedstaden	C	129	FR52 - Bretagne	C	184	NL23 - Flevoland	C	239	UKD3 - Greater Manchester	C
20	BE35 - Prov. Namur	B	75	DK02 - Sjælland	B	130	FR53 - Poitou-Charentes	B	185	NL31 - Utrecht	C	240	UKD4 - Lancashire	B
21	BG31 - Severozapaden	A	76	DK03 - Sydlandmark	C	131	FR61 - Aquitaine	C	186	NL32 - Noord-Holland	C	241	UKD6 - Cheshire	C*
22	BG32 - Severen iztochen	A	77	DK04 - Midtjylland	C	132	FR62 - Midi-Pyrénées	C	187	NL33 - Zuid-Holland	C	242	UKD7 - Merseyside	B
23	BG33 - Severozichen	A	78	DK05 - Nordjylland	C	133	FR63 - Limousin	B	188	NL34 - Zeeland	C	243	UKF1 - East Yorkshire and Northern Lincolnshire	B
24	BG34 - Yugozichen	A	79	EL00 - Eest	A*	134	FR71 - Rhône-Alpes	C	189	NL41 - Noord-Brabant	C	244	UKF2 - North Yorkshire	B
25	BG41 - Yugozapaden	A	80	EL30 - Attiki	C*	135	FR72 - Auvergne	B	190	NL42 - Limburg	C	245	UKF3 - South Yorkshire	B
26	BG42 - Yuhlen Izentralen	A	81	EL41 - Voreto Aigato	A	136	FR81 - Languedoc-Roussillon	B	191	PL11 - Łódźkie	A	246	UKF4 - West Yorkshire	C
27	CY00 - Kypros	C	82	EL42 - Noto Aigato	A	137	FR82 - Provence-Alpes-Côte d'Azur	C	192	PL12 - Mazowieckie	B	247	UKF1 - Derbyshire and Nottinghamshire	B
28	CZ01 - Praha	C	83	EL43 - Kriti	A	138	FR83 - Corse	B	193	PL21 - Malopolskie	A	248	UKF2 - Leicestershire, Rutland and Northamptonshire	C
29	CZ02 - Stredni Čechy	C	84	EL51 - Anatoliki Makedonia, Thaki	A	139	FR91 - Guadeloupe	A	194	PL22 - Śląskie	A	249	UKF3 - Lincolnshire	A
30	CZ03 - Jihozápad	B	85	EL52 - Kentriki Makedonia	A	140	FR92 - Martinique	B	195	PL31 - Lubelskie	A	250	UKG1 - Herefordshire, Worcestershire and Warwickshire	C*
31	CZ04 - Severozápad	A	86	EL53 - Dytiki Makedonia	A*	141	FR93 - Guyane	A*	196	PL32 - Podkarpackie	A	251	UKG2 - Shropshire and Staffordshire	B
32	CZ05 - Severovýchod	A	87	EL54 - Ipeiros	A	142	FR94 - Réunion	A	197	PL33 - Świętokrzyskie	A	252	UKG3 - West Midlands	C
33	CZ06 - Jihovýchod	A	88	EL61 - Thessalia	A	143	HR03 - Jadranska Hrvatska	A	198	PL34 - Podlaskie	A	253	UKH1 - East Anglia	C
34	CZ07 - Stredni Morava	A	89	EL62 - Ionia Nisia	B*	144	HR04 - Kontinentalna Hrvatska	A	199	PL41 - Wielkopolskie	A	254	UKH2 - Bedfordshire and Hertfordshire	C
35	CZ08 - Moravskoslezsko	A	90	EL63 - Dytiki Ellada	A	145	HU10 - Közép-Magyarország	C*	200	PL42 - Zachodniopomorskie	A	255	UKI3 - Essex	B
36	DE11 - Stuttgart	C*	91	EL64 - Sterea Ellada	A	146	HU21 - Közép-Dunántúl	A	201	PL43 - Lubuskie	A	256	UKI1 - Inner London	C
37	DE12 - Karlsruhe	C	92	EL65 - Peloponisos	A	147	HU22 - Nyugat-Dunántúl	A	202	PL51 - Dolnolaskie	A	257	UKI2 - Outer London	C
38	DE13 - Freiburg	C	93	ES11 - Galicia	B	148	HU23 - Dél-Dunántúl	A	203	PL52 - Opolskie	A	258	UKJ1 - Berkshire, Buckinghamshire and Oxfordshire	C
39	DE14 - Tübingen	C	94	ES12 - Principado de Asturias	B	149	HU31 - Észak-Magyarország	A	204	PL61 - Kujawsko-Pomorskie	A	259	UKJ2 - Surrey, East and West Sussex	C
40	DE21 - Oberbayern	C	95	ES13 - Cantabria	B	150	HU32 - Észak-Alföld	A	205	PL62 - Warmińsko-Mazurskie	A	260	UKJ3 - Hampshire and Isle of Wight	C
41	DE22 - Niederbayern	C	96	ES21 - País Vasco	C	151	HU33 - Dél-Alföld	A	206	PL63 - Pomorskie	A	261	UKJ4 - Kent	C
42	DE23 - Oberpfalz	C	97	ES22 - Comunidad Foral de Navarra	C	152	IE01 - Border, Midland and Western	(**)	207	PT11 - Norte	A	262	UKK1 - Gloucestershire, Wiltshire and Bristol/Bath area	C
43	DE24 - Oberfranken	C	98	ES23 - La Rioja	C	153	IE02 - Southern and Eastern	(**)	208	PT15 - Algarve	B*	263	UKK2 - Dorset and Somerset	B
44	DE25 - Mittelfranken	C	99	ES24 - Aragón	C	154	ITC1 - Piemonte	C	209	PT16 - Centre	A	264	UKK3 - Cornwall and Isles of Scilly	A
45	DE26 - Unterfranken	C	100	ES30 - Comunidad de Madrid	C	155	ITC2 - Valle d'Aosta/Vallee d'Aoste	C	210	PT17 - Lisboa	C	265	UKK4 - Devon	B
46	DE27 - Schwaben	C	101	ES41 - Castilla y León	B	156	ITC3 - Liguria	C	211	PT18 - Alentejo	A	266	UKL1 - West Wales and The Valleys	A
47	DE30 - Berlin	C	102	ES42 - Castilla-La Mancha	B	157	ITC4 - Lombardia	C	212	PT20 - Região Autónoma dos Açores	A	267	UKL2 - East Wales	C
48	DE40 - Brandenburg	C	103	ES43 - Extremadura	A	158	ITF1 - Abruzzo	C	213	PT30 - Região Autónoma da Madeira	B*	268	UKM2 - Eastern Scotland	(**)
49	DE50 - Bremen	C	104	ES51 - Cataluña	C	159	ITF2 - Molise	B	214	RO11 - Nord-Vest	A*	269	UKM3 - South Western Scotland	(**)
50	DE60 - Hamburg	C	105	ES52 - Comunidad Valenciana	B	160	ITF3 - Campania	A	215	RO12 - Centre	A	270	UKM5 - North Eastern Scotland	C*
51	DE71 - Darmstadt	C	106	ES53 - Illes Balears	C	161	ITF4 - Puglia	A	216	RO21 - Nord-Est	A	271	UKM6 - Highlands and Islands	C*
52	DE72 - Gießen	C	107	ES61 - Andalucía	A	162	ITF5 - Basilicata	B	217	RO22 - Sud-Est	A*	272	UKN0 - Northern Ireland	B
53	DE73 - Kassel	C	108	ES62 - Región de Murcia	B	163	ITF6 - Calabria	A	218	RO31 - Sud - Muntenia	A*			
54	DE80 - Mecklenburg-Vorpommern	B	109	ES63 - Ciudad Autónoma de Ceuta	B	164	ITG1 - Sicilia	A	219	RO32 - Bucarest - Ilfov	C*			
55	DE91 - Braunschweig	C*	110	ES64 - Ciudad Autónoma de Melilla	B	165	ITG2 - Sardegna	B	220	RO41 - Sud-Vest Oltenia	A*			

(*) Regions (N = 31) that were not included in the analysis of the econometric model of the corresponding group, due to the outliers of the residuals of the disturbance term.

(**) Regions (N = 4) that were not classified into group, due to limited time series data.

Source: Eurostat and own processing.

A MODEL FOR THE JOB DEMAND FORECASTING IN THE ARCTIC ZONE OF THE RUSSIAN FEDERATION BASED ON TIME SERIES

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Abstract

The Russian Federation is the largest country in the world, whose territory includes the Arctic regions. The area of the land territories of the Arctic Zone of the Russian Federation (AZRF) is approximately 3.700,000 km². The population of the Arctic Zone of Russia is approximately 7 million people, which is equal to 5% of the population of the entire Russian Federation. The purpose of this study is to investigate and analyse regression models for predicting the time series of the number of jobs in the labour market of the Russian Federation, to select an adequate model characterised by a minimum average relative error and a maximum lead time, or to select several adequate models for different forecasting periods: short-term, medium-term and long-term. The study examines the possibilities of predicting the situation in the labour market of the Arctic Zone of the Russian Federation, the demand for specialists in various industries using regression models for forecasting a time series. The simulation was performed using the Statistica software. As a result of the conducted studies, adequate forecasting models were obtained in the time period from 01.01.2020 to 01.01.2021, taking into account the epidemiological situation in the country. Thus, the best model with the smallest error was determined.

Keywords: labour market, regression models, education, autocorrelation function, autoregression.

JEL classification: I15, J11, J01

1. Introduction

The current situation in the Russian Federation can be characterised by significant differences in the structure of employment, the level of wages in the labour market and the distortion of the motivational mechanism of human labour. From the standpoint of neo-institutionalism, the uniqueness of the labour market of the Russian Federation is conditioned by certain mechanisms of formal pressure (for example, laws) and informal pressure (for example, the opinion of society), which ensure the implementation of legal norms. Today, despite state regulation, the labour market of the Russian Federation is the least institutionalised in the structure of the modern economy of the state. Institutional transformations in the labour market of the Russian Federation are at the initial stages of development, so the main role and task of the state is to accelerate the purposeful process of forming formal institutions. The prospects for the economy of the Russian Federation are

determined, and also largely depend on the choice of the employment model, the use of existing regulatory methods to eliminate the current imbalance.

The “Strategy for the Development of the Arctic Zone of the Russian Federation and National Security until 2020” records negative demographic processes. For example, such processes as the outflow of labour resources, the lack of an effective training system, the lack of a balance between demand and supply for labour in territorial and professional conditions. Therefore, it is possible to predict the probability that the regions of the Arctic Zone would experience a shortage of qualified personnel, which is also evidenced by the demographic processes observed in the Arctic in the period after the collapse of the Soviet Union.

The main feature of the modern labour market in Russia and, in particular, the Arctic Zone of the Russian Federation (AZRF) is its constant variability. This is determined by individual trends in the development of the demographic situation, characterised by an increase in average life expectancy; replacement of the natural population loss by migration growth; a relatively low level of officially registered unemployment (Faberman et al., 2020; Mitze & Javakhishvili-Larsen, 2020; Villamil et al., 2020; Csoltai & Demeter, 2020; Kozhevnikov, 2019; Lincaru et al., 2016). In such conditions, forecasting the demand for specialists for a period (in the interval) of several years is a difficult task, which is currently poorly studied by Russian researchers. At the same time, the need for such developments is high.

Objective information about the trends in the development of the labour market, the demand for specialists in various industries and qualifications is necessary for a number of persons and organisations: school graduates planning to receive education and determining the future field of activity; employment services that assist in the employment of the population and provide services for retraining the unemployed; specialists planning to change activities due to various circumstances; educational institutions that make a plan for the release of specialists in various areas for the subsequent period; employers, including construction organisations (Kosse & Tincani, 2020; Martin & Wang, 2020; Asaul et al., 2020; Csoltai & Demeter, 2020a; Krishnapillai & Kinnucan, 2020).

The current state of the labour market is influenced by a number of factors: seasonality, the general direction of development, and random variables. Thus, the situation in the labour market in 2020 was largely determined by the complex epidemiological situation conditioned by the spread of coronavirus infection, which adjusted the activities of many enterprises and, accordingly, their need for personnel. In such conditions, there was a tendency of a high outflow of specialists in the Russian Arctic, against the background of the following factors: a decrease in the flow of visitors, a decrease in migrant quotas, the problem of mass training of qualified personnel, low involvement of representatives of small indigenous peoples in economic activity. At the same time, according to studies (Maltseva et al., 2019; Demeter et al., 2018; Zakharova et al., 2016; Korchak, 2015; Asprogerakas, 2012), more than 60% of the migration outflow from the Russian Arctic are citizens of working age who have higher or secondary vocational education. There are a number of problems that hinder the creation of an effective system of training personnel with higher education, necessary for the development of AZRF:

- low level of state funding for the development of science, innovations, and education;
- lack of a common digital information network for the region;
- underdevelopment of information technologies associated with difficulties in accessing broadband internet;
- increasing outflow of young people from the regions of the Russian Arctic to other subjects of the Russian Federation to receive education and subsequent employment;
- insufficient development of the contract form of training of specialists and student contracts, conditioned by the lack of interest of employers and gaps in the legislation that allow terminating such a contract at any time after completing training;
- non-proliferation of the system of preferential educational loans;
- lack of elaboration of the issues of training and involvement of small indigenous peoples of the Arctic in economic activities of economic entities;
- lack of attention to the issues of securing personnel with higher education, including the teaching staff of universities (Andronov, 2020; Shirokova, 2017).

The purpose of this study is to investigate and analyse regression models for predicting the time series of the number of jobs in the labour market of the Russian Federation, to select an

adequate model characterised by a minimum average relative error and a maximum lead time, or to select several adequate models for different forecasting periods: short-term, medium-term and long-term.

2. Methods and Materials

The use of time series models is effective for studying the trends in the development of a quantity at any time interval and predicting its further changes. Based on the analysis of this value recorded at certain intervals, using formal mathematical methods, based on extrapolation, short-term forecasting is performed with the assumption that the trend will continue. However, at certain points in time, it is possible to change the trend, the occurrence of a turning point, which occurs as a result of a significant influence of random variables (stochastic models). Improving the accuracy of time series forecasting in conditions of high uncertainty of the external environment is possible by using expert methods (Chuchueva, 2012; Boks & Jenkins, 1974). To date, statistical regression models and structural models, in which the dependence between external factors, actual and predicted values of the time series is structurally set, have become the most widespread for predicting the time series. In this paper, the prediction of the number of vacancies represented on the labour market was performed using models of the following classes: autoregression (linear autoregression model is listed), moving average smoothing, exponential smoothing, and neural network (Table 1).

Table 1. Analysis of statistical models from the standpoint of forecasting the number of jobs

No.	Models	Advantages	Disadvantages
1	Linear regression models Non-linear regression models	Simplicity, flexibility, uniformity of analysis and design, the highest speed of obtaining results (linear), transparency of intermediate stages of calculations	Low adaptability, lack of ability to model nonlinear processes Complexity of determining the type of functional dependence, complexity of determining model parameters
2	Autoregressive models	Simplicity and transparency of modelling, uniformity of analysis and design	A large number of model parameters, the complexity of their identification, resource intensity, low adaptability, linearity and, accordingly, the lack of the ability to model non-linear processes Lack of flexibility
3	Exponential smoothing	Simplicity and uniformity of analysis and design, high adequacy for long lead times	
4	Neural network models	Non-linearity, adaptability, scalability, uniformity of analysis and design	The lack of modelling transparency, the complexity of choosing an architecture, high requirements for the consistency of the training sample, the complexity of choosing a learning algorithm and the resource intensity of the learning process

To improve the forecast accuracy, several forecasting methods were used, and the results obtained were compared on their basis. The forecast accuracy was considered optimal if the results differ by no more than 10%.

Forecasting was performed for various lead periods, and the model was selected for short -, medium-, and long-term periods. To improve the accuracy of forecasting for the long-term period, a combined approach was used, based on the use of several methods, for example, expert and statistical, which ensures high accuracy of the forecast. The adequacy of the model was assessed by comparing the data obtained as a result of forecasting and the actual data for the past period (with a shift of several steps back). The accuracy of the criterion was estimated by the average relative error:

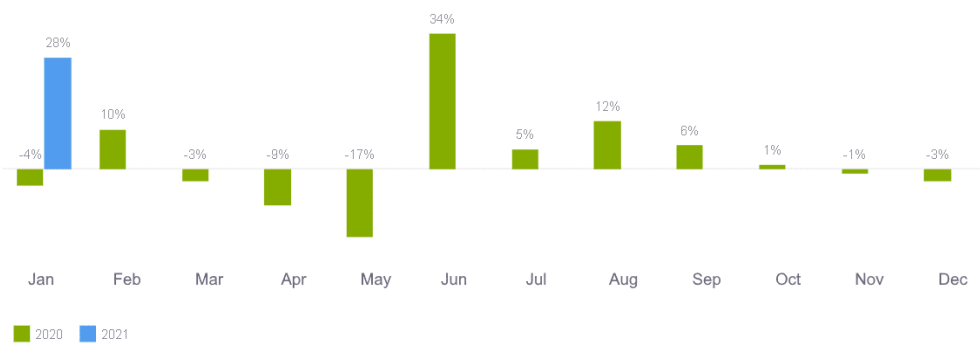
$$\delta = \frac{1}{p} \sum_{i=1}^p \left| \frac{\hat{y}_i - y_i}{\hat{y}_i} \right| 100\%, \quad (1)$$

where: p – lead period, y_i , \hat{y}_i – actual and forecast values, respectively.

Data on available jobs in Russia and in the Russian Arctic from the HeadHunter (2021) website for the period from 01.01.2020 to 01.02.2021 were used as actual values, which is

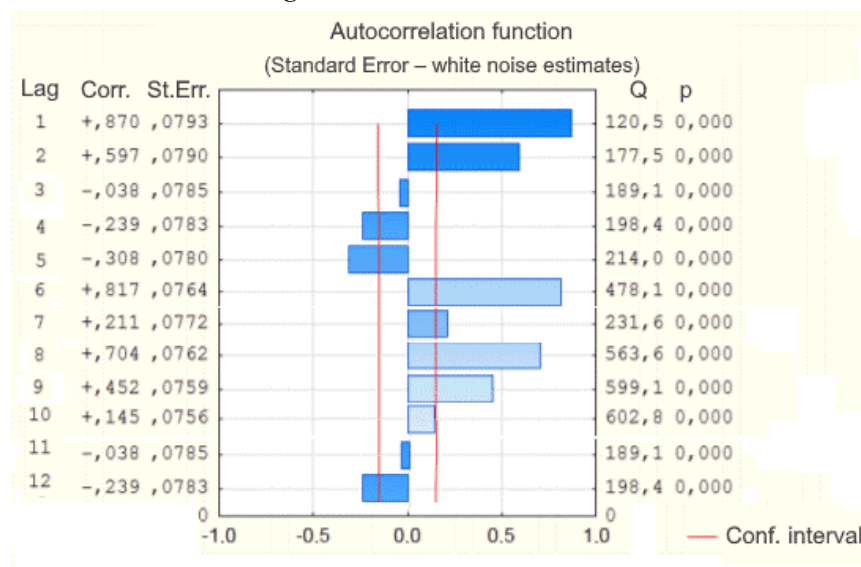
currently one of the most popular when solving personnel issues on the part of employers and job seekers. The dynamics of changes in the demand for specialists of various professions in the labour market is shown in Image 1. Notably, the state of the labour market in this period is not typical. This period is characterised by a significant impact of a complex epidemiological situation, which was manifested in the following features: a general decrease in the number of jobs (the exception is the construction industry in the summer), the offer of remote work, the demand for unskilled employees (couriers, housing maintenance specialists, etc.).

Image 1: Dynamics of demand for specialists in the Russian Arctic



The forecast of the further development of the labour market was carried out using the Statistica software, which is conditioned by the wide capabilities of the programme in analysing any type of data. To determine the parameters of the model, an autocorrelation operation was carried out at the preparatory stage (Image 2), as a result, the presence of seasonal growth was established, indicating the presence of annual seasonality.

Image 2: Autocorrelation function



3. Results and Discussion

As a result of the classical seasonal decomposition of the Census I, the compositions of the series are assessed, the irregular components of the model, seasonal, uptrend and cyclical are identified and evaluated. The spread of values changes over time, which shows the variability of statistical indicators, such as the mean and variance. The frequency autocorrelation function demonstrates attenuation and excitation, which is due to the non-stationarity of the time series characterising changes in the number of jobs during the spread of coronavirus infection, considered for the AZRF. The components of the time series were estimated using the classical seasonal decomposition of Census I, which allowed distinguishing irregular, seasonal and trend-cyclic components (Belyaev et al., 2020; Napolskikh & Yalyalieva, 2019; Baburin et al., 2018; Kallioras et al., 2016).

The presence of a spread of values of the time series changes, which illustrates the fluctuations of the mean and variance. Notably, irregular components are stationary processes, they are characterised by the presence of a single emission. The non-stationarity of the time series is confirmed by the periodic attenuation of the autocorrelation function (Rastvortseva, 2017; Belyakova et al., 2017; Loskutov et al., 2009). To eliminate noise components and abnormal outliers, the Statistica software performed filtering using a 4253H filter based on a sequence of transformations of the original series through a four-point moving median using centring, five-point median smoothing and a three-point moving median using Henning weights. The adequacy of the model, as mentioned above, was assessed by comparing the data obtained as a result of forecasting with the actual values for the period 01.01.2020 to 01.01.2021.

The prediction of a linear autocorrelation model is based on the assumption that the predicted value is in a linear relationship with a certain number of its previous values:

$$\hat{y} = a_0 + \sum_{i=1}^p a_i y_{t-i} + \varepsilon_t, \quad (2)$$

where: \hat{y} – forecast at time t , y_{t-i} – actual data ε_t – random component (white noise) a_i – autoregression coefficients.

During the correlation analysis, the influence of 6-2 previous samples on the predicted value was studied and it was found that the greatest weight characterises the 3 previous samples sufficient to adjust the developed model. The study of adequacy showed that the relative error increases significantly with the growth of the horizon: June – 7%, July – 16%, August – 26%. The moving average smoothing model is used for stationary processes, MA(q) (Moving Average) has the following form:

$$\hat{y}_t = \sum_{j=1}^q b_j \varepsilon_{t-j}, \quad (3)$$

where: q – order of the model b_j – model parameters, ε_t – the random component (white noise).

The Statistica software was used to develop the model. It is necessary to exclude seasonal and trend components to stationarise time series. The order q was determined by calculating the difference between $D(-1)$ of the first lag, which has a significant value, and $D(-12)$, which allowed excluding the seasonal component. The re-constructed autocorrelation function retained one peak, and the partial autocorrelation function decreases exponentially, which is typical for one significant parameter MA(1). Its value was determined by applying the student's criterion – 0.44, the confidence probability – 95 %. The developed model showed high accuracy. The autoregressive integrated moving average (ARIMA) was built using the Statistica software. The autoregression model (AR) also refers to stationary models. The values of the mathematical expectation and variance for this class of models are constants. Due to the non-stationarity of the studied phenomena, including those considered in this paper, the indicator of the adequacy of the model does not correspond to the necessary values.

To eliminate this discrepancy, the difference operator of the order d : Δ^d is introduced. The calculation of the time difference operator of the 1st and 2nd order is carried out, respectively:

$$\Delta X_t = X_{t-1} - X_t, \quad (4)$$

$$\Delta^2 X_t = \Delta^2 X_{t-1} - \Delta X_t. \quad (5)$$

The formal notation of the ARIMA model (h, d, q) has the form:

$$\Delta^d X_t = c + \sum_{i=1}^p a_i \Delta^d X_{t-i} + \sum_{j=1}^q b_j \Delta^d \varepsilon_{t-j} + \varepsilon_t, \quad (6)$$

where: ε_t – stationary time series, c, a_i, b_j – model parameters.

This allows making a prediction with the necessary accuracy (adequacy), in addition to stationary time series, also non-stationary time series with a trend and series with a seasonal component, subject to a small modification (SARIMA – seasonal autoregressive integrated moving average). The extension of the model taking into account external data (ARIMAX – autoregressive integrated moving average extended), which can be used as data of the same structure or data from other sources. This study uses the external data from the previous readings of the values of the series (-1, -2, -3, -12). For this moment, the forecast values of

external data for future periods are being implemented. At the initial stage of the neural network model development, the existing structures of neural networks were analysed. A model implementing the Mamdani algorithm (Vasylytsiv et al., 2021; Abdurakhmanov & Zokirova, 2019; Chandra Das & Ray, 2019; Gubanov & Voroshilov, 2019; Kotlyarov & Loskutov, 2004) on a hidden layer, obtained by the automated neural networks (ANS) processor, demonstrated high accuracy. The structure of the neural network is shown in Image 3.

Image 3: The structure of a neural network implementing the Mamdani algorithm

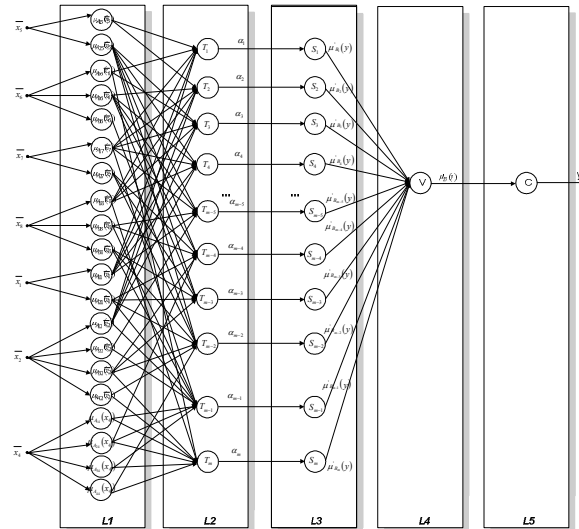


Table 2 shows the monthly results and average relative errors obtained by comparing all forecast models for the second half of 2020.

Table 2. Analysis of monthly results and average relative errors obtained by comparing all forecast models for the second half of 2020

Month	Moving average	ARIMA	Neural network, Mamdani algorithm
01.01.2020	2	2	2
01.02.2020	2	3	2
01.03.2020	2	1	2
01.04.2020	0	0	1
01.05.2020	1	0	1
01.06.2020	2	2	2
01.07.2020	2	1	2
01.08.2020	3	2	2
01.09.2020	3	3	2
01.10.2020	2	2	2
01.11.2020	2	2	1
01.12.2020	1	1	2
Average relative error	1.8	1.6	1.75

Based on the data in Table 2, it can be concluded that the errors on all the presented models differ slightly. But the ARIMA model turned out to be the most accurate, the error value was 1.6%.

4. Conclusions

In the course of the study, the main goal was achieved, which was to investigate and analyse regression models for predicting the time series of the number of vacancies in the labour market of the Russian Federation. Several adequate models were selected, which are characterised by a minimum average relative error and a maximum lead time, for various forecasting periods: short-term, medium-term, and long-term.

This study investigated a number of problems that hinder the development of an effective system of training personnel with higher education, necessary for the development of AZRF. Analysis of statistical models from the standpoint of forecasting the number of available jobs. Thus, to improve the forecast accuracy, several forecasting methods were used, and results obtained on their basis were compared.

Forecasting was performed for various lead periods, and the model was selected for short-, medium-, and long-term periods. The forecast of the further development of the labour market was made with the help of the Statistica software, since this programme has extensive capabilities in the analysis of any type of data. Summing up the study results, it was revealed that the errors on all the presented models differ slightly. But the ARIMA model turned out to be the most accurate, the error value was 1.6%.

As a result, the authors highlight the need to predict data for employers of the Russian Arctic, both in the conditions of the usual life cycle and in the conditions of the spread of coronavirus infection. The authors suggest that overcoming the restrictions imposed by the current situation in the country should be at the top of the list to ensure a wider application of appropriate forecasting methods and achieve accurate and profitable forecasts based on big data in the future.

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DEMOGRAPHIC, GEOGRAPHICAL, AND ECONOMIC ASPECTS AMONG THE GREEK JEWRY, 1919-2019

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Abstract

This article discusses demographic, spatial and economic aspects of Greek Jewry in Israel from 1919 to 2019, focusing on its spatial distribution and its demographic processes over the years. This study is based on historicist and interpretive content analysis and on processing and analysis of statistical reports by the Central Bureau of Statistics, as well as analysis of the findings of questionnaires from 2008 and 2019 transmitted among Greek immigrants and their descendants in Israel. The findings show that after the Holocaust, most of the Greek Jews lived in Israel. Many of them settled mainly in urban centers, near the Israeli coastal plain, in the center of the country (Tel Aviv, Bat Yam and Rishon Lezion) or in Haifa. The waves of immigration from Greece to Israel are continuing, but the number of immigrants has diminished greatly over the years. In recent decades, only a few dozen have emigrated to Israel. Demographically Greek Jewry in Israel is characterized by an education rate that is higher than the general average in the country; with a higher level of secularism than the national average; with a low fertility rate compared to other Jewish women in Israel and with a higher income than the average in Israel. It is also found that among the first generation, only a few hundred are still alive today. It was also revealed that the total number of Greek Jewry today, is 58,238 people and not 10,300 people as shown in the CBS publications of 2018.

Keywords: Jewish Demography, Israel, Greek Jews , Greek immigrants, Jewish Greek Economy

JEL classification:

1. Introduction

The sovereign territory of contemporary Greece was home to a number of Jewish communities – some even from the ancient times of Greece and Rome, others putting down roots after the Spanish and Portuguese Expulsion of Jews at the end of the 15th century and beginning of the 16th century (Ginio, 2014). However, accurate data about the size of the Greek Jewry up until the 20th century is lacking; as such, only historical-demographical estimations exist (Meron, 2008; Meron, 2014).

More official, national, and precise data about the size of the Greek Jewry can be found in the 1920 population census that included almost all of the Jews who remained within the final borders of Greece (Meron, 2008; Meron 2015). According to the census, the number of Jews living in Thessaloniki was about 61,000 (including immigrants) and living in Greece in general was about 72,000. According to Meron (2008) eight years later, in the 1928 census, the number of Jews in Thessaloniki was 60,484 and 72,791 Jews throughout Greece.

In 1919, the British Mandate in Israel began to conduct organized documentation of all Jewish immigrants who arrived in Palestine – including Jewish immigrants from Greece (Israeli CBS, 2019). These records, combined with the Greek censuses as of 1920, provide more reliable data about the demographic patterns of the Greek Jewry.

This article discusses spatial and demographic aspects of the Greek Jewry in Israel, from the first official documentation in the 1919 Central Bureau of Statistics (CBS) up until 2019. An emphasis is placed on their places of residence in towns across Israel in light of demographic processes (e.g., immigration, religiousness, education, and feeling of national and ethnic belong), its scope during the said period, and changes in the size of the Greek Jewry after the Holocaust.

The research process is based on the analysis of interpretive and historicist content, statistical reports (provided mainly by the CBS) regarding Greek Jewry in Israel, and data collected through questionnaires that were completed by Greek Jewry and their descendants in 2008 and in 2019 in Israel. The objective of the study is to present geographic and demographic characteristics of the Greek Jewry in Israel and to compare it to the Greek Jewry in the diaspora.

2. Historical-Theoretical Background

In July 1913, following the Balkan Wars, Greece expanded its territory for the first time since receiving independence in 1832. For example, Greece gained the territory of Macedonia, including the port city of Thessaloniki which was home to the largest Jewish community in expanded Greece before World War I (WWI). In 1912, the Jewish population in Macedonia included about 61,000-80,000 people, with an additional estimated 10,000 people in Greece. According to Ginio (2016), about 10,000 Jews lived in Greece outside Thessaloniki before the Balkan Wars. In other words, prior to WWI, there were 71,000-92,000 Jews living in Greece. It seems, therefore, that during this period of time, Greek Jewry reached its demographic peak (Ginio, 2014; Kamen, 1988; Linfield, 1929; Meron, 2008; Meron, 2014; Molcho & Nechama 1965; McKitterick & Allmand, 1984).

Later, between the two World Wars, the Greek Jewry significantly decreased in size, mainly due to unfavorable Greek policies, led by Venizelos, towards the Greek Jewry. This included spatial Hellenization, lack of tolerance towards remaining minorities following population exchanges, and the increasing number of antisemitic incidents, especially the Campbell attack of June 1931, during which Greek nationalists killed one Jew and injured others, and vandalized Jewish property in the Campbell Neighborhood in Thessaloniki. This pogrom led to the massive migration of about 10,000 Jews from Greece (Ginio 2016; Meron, 2008; Molcho 2014; Recanati 1972).

Records show that prior to the Nazi invasion in April 1941, 75,062 Jews lived in Greece. More than 65,000 of them¹ (83% of the total Jewish population in Greece) were later murdered in concentration camps, died of starvation, died in the forced labor camps, were killed during underground and military activities, were executed, or took their own lives². In Thessaloniki, home to an estimated 50,000-56,500 Jews prior to this huge destruction, only 6,000 Jews remained – about 10%-15% of the Jewish population in Thessaloniki prior to the Nazi invasion (Fleming, 2014; Ginio, 2016; Recanati, 1972).

3. Post-Holocaust Greek Jewry in Greece (1946-2019)

After the Holocaust, only about 10,026 Jews remained in Greece (Yozgof-Orbach, 2020), who were now living mainly in large cities. Their largest concentration migrated from Thessaloniki – were few Jews remained after the Holocaust – to Athens, were about half of the Greek Jewry were lived there in 1946 (4,930 Jews). At that time (After the Holocaust), there were about 1,950 Jews in Thessaloniki, 726 in Larissa, and 645 Jews in Volos (Ginio 2016; Molcho & Nechama 1965). In total, 82% of the Greek Jewry lived in these four cities, while the remainder was spread out as individuals or families in other parts of Greece. After World War II (WWII) and with the establishment of the State of Israel, about two-thirds of the surviving Greek Jewry left Greece, migrating to Israel, the United States (USA) – about 1,000 Greek Jews arrived in 1951-1952, Canada, Australia, South Africa, and South America – mainly Brazil and Argentina (Felming 2014; Molcho and Nechama 1965; Recanati 1972). Overall, during the year of the establishment of Israel, there were about 19,700 first and second generation Greek Jews in Israel, about 15,000 in the USA, about 10,000 in Greece, 5,000 in France, and a similar or smaller number in South American countries³. In total, it could be cautiously estimated that after the Holocaust, there were 60,000-70,000 Greek Jews

¹ There were only about 60,000 Jews according to a 1973 World Jewish Congress document, 42-43.

² According to Fleming (2014), only 8,000 Jews were left in Greece after the Holocaust.

³ Estimates of Greek Jewry in Israel, USA, and France are based on the maximum estimates of first and second generation. For example, in Israel, 8,277 immigrants during 1919-1947 gave birth to 11,380 children, based on the average 2.75 children per woman.

and their descendants around the world, with one-third of them residing in Israel (Meron, 2014; Naar, 2007 ; Rivlin, 1999)

In 1951, according to the records of the Greek Jewry communities, 6,325 Jews remained in Greece (Clogg, 2002). Two years later, the Greek police published a report whereby the Greek Jewry was comprised of 5,945 people (Rivlin, 1999). According to a different source, there were 7,000 Jews in Greece – 1,000 living in Thessaloniki (Yozgof-Orbach, 2020); a second source states 6,112 Jews, 1,590 in Thessaloniki (Rivlin, 1999); finally, a third source mentions that in 1959, about 5,000 Jews were living in Greece, 1,279 of them in Thessaloniki (ibid). In 1973, the World Jewish Congress (WJC) wrote that there were about 2,800 Jews living in Athens, about 1,150 in Thessaloniki, and 450 in Larissa. All in all, about 5,000 people were estimated to be living in Greece at that time (WJC, 1973).

Since then, it seems that only minor changes have occurred among the Greek Jewry and its geographic distribution – or at least that is how this data has been presented by Greek Jewry communities and official Greek government records on minorities. At the start of the third millennium, there were about 5,000 Jews in Greece, with 1,400 living in Thessaloniki and about 3,200 in Athens (The Balkan Human Rights, 2003; Triandaflidou, 2010). According to demographer and statistician Sergio Della Pergola, about 4,300 Jews were living in Greece in 2016 (Della Pergola, 2016). In a 2017 report issued by the US Department of State on International Religious Freedom, 5,400 Jews were reported to be living in Greece in 2017 (0.05% of all Greek residents); in a newspaper interview for the Jerusalem Post in August 2019, the number of Jews living in Greece at the time was estimated to be 5,000-7,000. Table 1 summarizes the main estimations for the number of Jews living in Greece in general and in Thessaloniki in particular from 1912 to 2019 (International Religious Freedom Report, 2017).

Table 1. Estimation, Jews in Greece and Thessaloniki, 1912-2019⁴

Year	Total number of Jews in Greece (including Macedonia, Thessaly, and Tarika	Weight (in %) of Thessaloniki Jews out of all Jews in Greece	Number of Jews in Thessaloniki
1912	92,000	88%	70-000-81,000 ⁵
1940	77,500 ⁷	73%	56,500 ⁶
1947	10,371	19%	1,950
2000	5,000	28%	1,400
2019	4,000-8,000 ⁸	19%-37%	1,000

4. Migration of Jews from Greece in the 20th Century

Documentation of Greek Jewry migration in modern Greece (Including Macedonia and Thessaly) can be found from the 16th century. Various estimations from the 16th-17th centuries state that no more than a few hundred Jews left Greece, migrating mainly to Israel and settling in Jerusalem, Tiberias, and Tzfat. A smaller group migrated, as individuals or families, within the Ottoman Empire, and a few migrated as individuals to Western Europe (mainly merchants and rabbis). However, these data should be regarded as rough estimations based on temporary, partial, and sometimes even demographically incorrect assumptions (Kamen, 1988; Rivlin, 1999). Continuous and reliable demographic data about the migration of Greek Jewry to other countries can only be found from the beginning of the previous century. Meron (2014) estimates that about 40,000 Jews migrated from Greece to other

⁴ Data regarding Thessaloniki Jewry was found in a number of sources, including: Kamen (1988), Molcho&Nechama (1965), McKitterick & Allmand (1984), Ginio (2014), Meron (2014), Meron (2008), Rupin (1934), The Balkan Human Rights (2003)

⁵ According to the Union des Associations Israelites Delegation from Europe and America, the number of Jews in Thessaloniki at the end of 1912 was 70,000 – not 81,000. See Ginio (2014).

⁶ Meron (2014) states that a record from the Jewish Community Archives in the city before the German occupation in 1941 only mentions about 40,000 Jews.

⁷ According to Rupin (1934), there were about 120,000 Jews in Greece in 1939.

⁸ According to the Union of Jewish Communities (2019) in 2019 there were 5,000-7,000 Jews .

destinations during 1908-1947. Naar (2007) claims that during 1917-1941, about 35,000 Jews migrated from Thessaloniki alone to other countries, including 2,222 Greek Jews who arrived in the USA during 1903-1924. According to other estimations, however, only during 1922-1923 did 8,000 Greek Jews migrate to the USA (Naar, 2007; Rivlin, 1999).

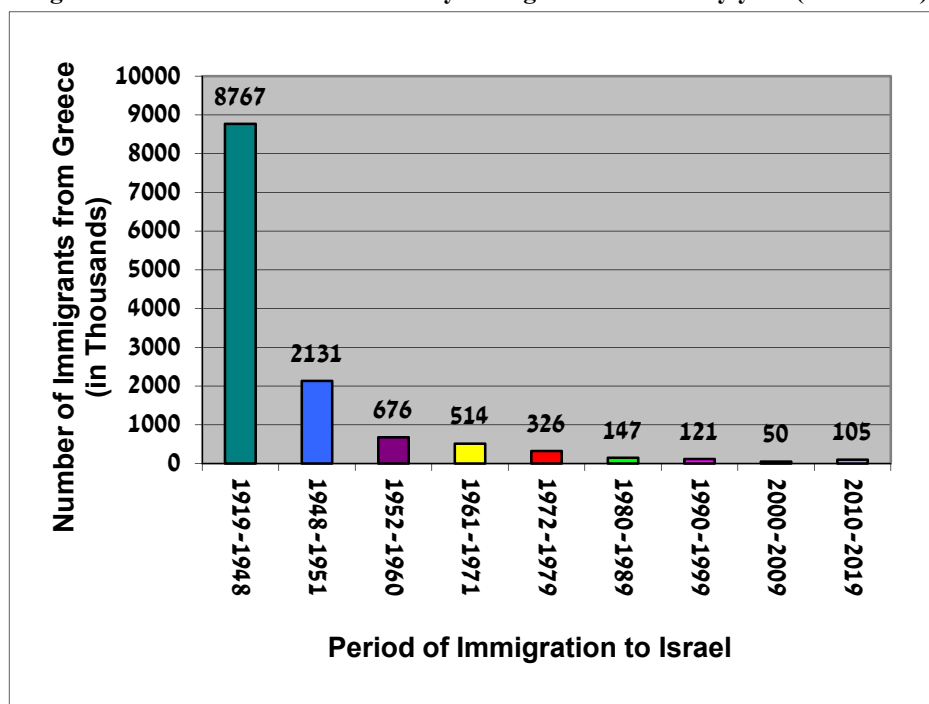
Estimations about the number of Greek Jews who migrated to Israel also vary from source to source. While some state that during 1931-1936, about 10,000-20,000 Greek Jews migrated to Israel (Meron, 2014; Molcho & Nechama, 1965; Recanati 1972) Yet these numbers do not match those presented by the CBS, whereby only 8,765 Jews migrated to Israel from Greece during 1919-1948. Secondary migration destinations during 1900-1948 included France (mainly during 1917-1926), Turkey (until 1913), Egypt, Latin America (mainly Argentina, Brazil, and Mexico), and Australia. Based solely on existing estimations, regardless of their reliability, about 50%-70% of Greek Jews migrated to Israel and the USA. The remainder migrated to additional destinations as mentioned (mainly France and Latin America).

5. Migration of Jews from Greece to the Land of Israel and the State of Israel

Based on data presented by the CBS about the migration of Greek Jewry to Israel prior to the establishment of the State, as presented in Figure 1 and Table 2, from 1919 and until May 1948, only 8,765 Greek Jews migrated to Israel from Greece (CBS, 2019; Yozgof-Orbach, 2019). These data are lower than those presented in the literature by Molcho and Nechama (1965) and Recanati (1972, Volume I) – who estimate the migration of about 10,000-20,000 Jews from Greece to Israel. These data have no basis in the official statistical records of the State of Israel and are probably based on the declared intentions of Jews in Greece who do not actually migrate to Israel, Greek Jews who left Israel and returned to Greece or migrated elsewhere, those who migrated to Israel illegally, and based on inflated numbers and estimations made by Zionist institutions in order to receive additional support and budgets.

Meron (2013/4) presents the more accurate data of 6,624 Greek Jews for the years 1919-1938. This does not include the years 1939-5/1948 when about 2,100 Jews migrated to Israel from Greece⁹. According to the Ministry of Interior and the CBS, 4,070 Jews migrated from Greece to Israel after the establishment of the State of Israel (May 1948-2018). During 2000-2018, only 155 Jews migrated to Israel from Greece – an average of eight people per year. Based on the documented records of the CBS from the past 100 years (1919-2018), as shown in Figure 1 and Table 2, about 12,827 Jews migrated from Greece to Israel, with 68% arriving before the establishment of the State of Israel in May 1948 (Meron, 2013; Meron, 2014).

⁹ This calculation is based on the difference between data presented by the CBS and Meron (2014). This number is not completely accurate, but reflects that number of Greek Jews who arrived in Israel during 1939-1948.

Figure 1. Distribution of Greek Jewry immigrants to Israel by year (1919-2019)

Source: Based on CBS data from various years

Table 2. Immigration of Greek Jewry to Israel, 1919-2018

Greek Jews who migrated to Israel (in absolute numbers)	Years	Period
165	1923-1919	Before the Holocaust at the time of the Hebrew Settlement
691	1931-1924	
5,073	1938-1932	
996	1945-1939	WWII
1,026	1948-1946	
8,767	1919-1948 Total	
2,131	1951-1948	State of Israel prior to the Law of Return
676	1960-1952	State of Israel after the Law of Return
514	1971-1961	
326	1979-1972	
147	1989-1980	
121	1999-1990	
50	2009-2000	
105	2018-2010	

Source: CBS (1950), CBS (1952), Table 5 (p.26), CBS (2019) Meron, (2013)

In fact, from 1919 and up until the beginning of the 1930s, only a small number of Greek Jews migrated to Israel – perhaps even less than 1% of all Jews who migrated to Israel from Europe during that said period (101,952 people) (CBS, 1952). This small number may be because Zionist movements and organizations only became officially active throughout Greece in the 1920s (Rosen, 2014). As seen in Table 2, their accomplishments could be seen within a short period of time, as the number of Greek Jews who migrated to Israel doubled during 1924-1931 and was six times the number of those who migrated during 1919-1923. In addition, as mentioned, during the 1920s, many Greek Jews who left Greece migrated to the West, mainly to the USA and South America rather than to Israel.

In the 1930s, migration from Greece to Israel strengthened seven-fold. This is probably not only because of the closing or limiting of the borders in the West and the strengthening of the Zionist activity in Greece, but also because of the increased antisemitism and the Campbell Pogrom in June 1931, which according to Ginio (2016) and Molcho and Nechama (1965) led to the migration of about 10,000 Jews from Greece to other countries around the world.

During WWII (1939-1945), the number of Jewish migrants from Greece to Israel diminished to a meagre 165 people each year. During the last two years of the Holocaust (1946-1948) about 1,000 Jews chose to migrate to Israel. From May 1948, and up until 2019, about 4,070 Jews migrated from Greece to Israel. During the period of mass migration, prior to legislation of the Law of Return in July 1951, the State of Israel saw the migration of 2,131 Jews from Greece. Since then, this number has continuously declined, with only 50 migrants during the first decade of the third millennium. On the other hand, during the current decade (2010-2019), when this decline in the migration of Greek Jewry could have been expected to continue in light of the diminishing migration potential, the number of migrations increased – perhaps due to the increasing antisemitism in Greece and the financial crises in Greece in contrast to the stable Israeli economy.

6. Greek Jewry in Israel

Since the 1920s, the Greek Jewry in Israel has tended to settle in municipal towns, mainly Tel Aviv (Florentine, Jaffa, and Shapira neighborhoods), Bat Yam, and Haifa (Kiryat Eliezer, Hadar, and Sprinzak neighborhoods), and to some extent in Jerusalem as well (Yemin Moshe, Talpiot, and Katamon neighborhoods), where Greek Jew Romaniotes settled, and where an ancient concentration existed from the 16th century up until the 19th century (Barkan, 1970; Kamen 1988). Additional ancient concentrations could be found in Tzfat and Tiberias, yet these were abandoned upon or prior to the establishment of the State of Israel, during the first decades of the 20th century. Moreover, during the 1930s and 1940s, some Greek families settled in rural-agricultural towns, and were partners to the establishment of Zur Moshe (1937), Tal Shazar (1948), Naveh Yemin (1949), and Dor (1949). In most of these towns today, the Greek Jewry accounts for about 15%-30% of the town's population, except for Zur Moshe, where Greek Jewry accounts for 32% of its residents – which is the highest percentage of this population's concentration in Israel (Beit HaTfutsot 2019; CBS, 2019 ; Rabbi Meir Baal HaNes, 2019 Yozgof-Orbach, 2008).

During the sixth and seventh decades of the 20th century, the initial deployment of the Greek Jewry in Israel slightly changed with their migration to new towns in the Gush Dan area, including Ramat Gan, Holon, Rishon LeZion, Givatayim, Herzliya, and Petah Tikva. In 2010, there were more than 300 Greek Jews and their descendants in each of these towns. At the same time, smaller concentrations of 150-250 people were living in Ramat HaSharon, Kiryat Bialik, Ashdod, Kiryat Ono, and Yavne (Yozgof-Orbach, 2020).

From the 1970s, these populations in Tel Aviv and Haifa began to migrate to new or well-established neighborhoods. For example, some migrated from Jaffa and Florentine to neighborhoods in the north of the city, such as Bavli and Old North, and later – Ramat Aviv. Similarly, families and individuals from Kiryat Eliezer, Hadar, and Sprinzak in Haifa migrated to the Carmel neighborhoods, such as Ahuza, Denya, and Ramot Sapir, and to Kiryat Motzkin and Kiryat Bialik.

The residential pattern of the Greek Jewry in Israel – and in Greece before and after the Holocaust – is prominently municipal. Analysis of data presented by the CBS for 2008-2018, shows that about 98% of Greek Jews lived in municipal towns across Israel¹⁰. This population also prominently resided in the Gush Dan area. Analysis of data about first and second generations in Israel shows that about 83% of the Greek Jewry live in the extended Tel Aviv Metropolitan (from Netanya to Ashdod) and about 65% live in eight towns throughout the Tel Aviv Region. An additional indication regarding the deployment of this population is related to the number and locations of Greek Jewry synagogues in Israel. According to Leon (2008), most synagogues – which play a significant role in the lives of Jews of Sephardic-Middle

¹⁰ This finding relates to Greek and Bulgarian Jews combined. About 2% (1.8%) of Greek Jews lived in rural towns.

Eastern origin – are no longer ethnically homogenous, even though they were originally established as familial or cultural-ethnic institutions, with the aim of preserving their diversified cultures of origin. (Leon, 2008; Yozgof-Orbach, 2008; Yozgof-Orbach, 2020).

Examination of websites and official listings of synagogues show that in 2019, there were only nine active synagogues for Greek Jewry in Israel: three in *Tel Aviv*: Hechal Yehuda Synagogue (Recanati) at 13 Ben Saruk Street, Rabbi Meir Baal HaNes at 312 Dizengoff Street, and Mekor Haim Synagogue on Mekor Haim Street; two synagogues in *Jerusalem*: Kahal Zion Synagogue (located at 91 Derech Yafo) and Avraham and Ohel Sara for Jews from Ioannina (Romaniotes) (located at 3 Gilboa Street) ; one synagogue in *Haifa*: Rabbi Chaim Haviv (located at 126 Allenby Street in the Kiryat Eliezer Neighborhood); one synagogue in *Ramat Gan* for Balkan Jewry at 6 Orah Street; one synagogue in Ramat Gan for Greek and Turkish Jewry located at 52 Israel Taiber Street; and one synagogue in *Zur Moshe*. (Synagogue database, 2019)

It could be said that the synagogues for Greek Jewry in Israel are not just an indication of the size of this population, but also a reflection of its affiliation with the Jewish religion and tradition and its desire to preserve its legacy and identity. It may also be assumed that many of those who frequent these synagogues are first or second generation Greek Jews in Israel.

7. The Greek Economy

The evolving of the Greek economy, from the time of its independence and up until the end of the Greco-Turkish War in 1922, was shaped by two conflicting trends. The first stemmed from the significant increase in the size of the country's area, population, and resources, thereby presenting an opportunity for accelerated financial development. On the other hand, the second trend led to economic stagnation and developmental delay, and stemmed from the need to focus on military and security needs, rehabilitate areas that were harmed during the war, and assist numerous Greeks who had been uprooted from their homes and forced to migrate to areas ruled by the Greeks (Mazis, 2016). These two trends derived significantly from geo-political moves in Greece, the country's ongoing conflict with the Ottoman Empire and with its neighbors in the Balkans, and its attempts to unite most of the Greek diaspora within the borders of emancipated Greece (Clive, 1987).

For example, following World War I, Macedonia became a part of Greece, including the city of Thessaloniki, where a large Jewish minority resided and was involved in its economy. While the Jews in Thessaloniki dealt in a variety of professions and were not identified with a particular socioeconomic group, they typically worked in the private sector, either employed by others or self-employed. A number of Jewish families were especially influential from a financial perspective (Meron, 2015; Naar, 2007).

8. The economy of the Jewish Settlement from the onset of the British Mandate to the establishment of the State of Israel

For many years, both Palestine and Greece were part of the Ottoman Empire and were influenced by its financial management methods, rules, and taxation. However, this changed after World War I, with the transferring of Palestine to British Rule, the influence of the Balfour Declaration, and the increased Jewish migration to the area (especially from Eastern Europe). In relation to the Jewish settlement, Palestine saw a new and somewhat unique economic structure that differed from the previous economic structure from the time of the Ottoman Empire. This structure even differed from that seen in other Mediterranean countries, including Greece (Recanati, 1972)

From the onset of the British Mandate in Palestine in 1917 and up until the establishment of the State of Israel in 1948, the Jewish Settlement worked to create an economic framework that was discrete from that of the Arab majority. Moreover, this framework was greatly influenced by the ideological approach of the Settlement's Zionist Leadership that was comprised mainly of supporters of the socialist concept.

In line with the ideology of the Jewish Settlement's leadership, attempts were made to create an economic structure based on socialist principles. Notable examples included the organization of farming activities similar to communes that were described in the socialist utopia books, where the financial resources are jointly owned (kibbutz); attempts to organize

all Jewish workers in one professional union (Histadrut: General Organization of Workers in Israel), which over time became the largest employer in the Jewish Settlement; healthcare services provided by a cooperative organization that charged a member fee and provided medical services to all members (Kuppat Holim); and transportation services provided by organized cooperatives (Clive, 1987; Recanati, 1972; Rivlin, 1999)

The economy of the Jewish settlement in Palestine differed significantly from that of the USSR, which served as an exemplary structure and included a most significant private sector. The reason was, among others, due to the inability to prohibit practical ownership of production means because the laws and enforcement were up to the British Rule, who were displeased with the concept of socialism. The economy of the Jewish Settlement also differed from that of the USSR in the reservations of some of its leaders regarding the elimination of the private sector. Yet the economic ambience significantly favored the public and cooperative sectors that were based on socialism, rather than the private sector that was based on yielding profits. A range of groups worked hard to implement and enhance this principle, including the main education system (except for the religious education¹¹), the most popular newspapers, the largest youth movements, and most of all – the Histadrut HaClalit and the Jewish Agency (Meron, 2013).

Therefore, there is therefore no theme whereby the large companies that were established at that time mainly belonged to the Histadrut and its associated branches, or set up cooperative organizations; on the other hand, the private sector was classically comprised of individual initiatives or small/medium employees.

9. Migration from Greece

Earlier in the article, the migration from Greece to Palestine was described, including its demographic and geographic components. Before leaving Greece, the Jewish migrants, who were of different socioeconomic backgrounds, had dealt in a variety of trades, had a range of professional skills, and had various degrees of wealth (Ginio, 2014)

Characterizing the economic aspects of Jewish immigrants from Greece prior to their migration to Israel and studying their integration in the Zionist economy upon their arrival in Israel, and their contribution to its development, would require numerous focused studies. This article, therefore, presents an initial attempt to examine the migration of a number of affluent Jewish families from Thessaloniki to Palestine and their impact on the economic ambience that prevailed during the Mandate and the first decades of the State of Israel: Recanati and Carasso (Fleming, 2008)

This does not mean that the contribution of the Greek Jews to the economy in the Jewish Settlement focused solely on these or other affluent families. Despite their relatively small number compared to all Jewish immigrants, the Greek Jews had a distinct impact in areas relating to seamanship, such as shipping, and managing and maintaining ports – thanks to their relative advantage in these fields that they acquired in Thessaloniki when the city was a large and central port in the Aegean Sea (Meron, 2008; Meron, 2013)

Greece was especially hard hit by the global economic crisis that began in 1929, and even had to deal with suspending debt repayment to foreign creditors, a significant devaluation of the drachma, and increased unemployment. These reasons encouraged Jews to migrate, mainly to western countries, but also to Palestine. Although most of the immigrants were very poor and were attempting to rebuild their lives outside Greece, some were very wealthy people who hoped that a new country – in this case, Palestine – would enable them to establish and manage successful businesses (Rosen, 2014)

Compared to Greece, the economic ambience in Palestine under the British Rule was more favorable towards large businesses that did not maintain personal ties with the government. In Greece, the government was increasingly interested in being involved in the economy, while issuing sanctions, quotas, and depreciation of the local coin. However, the British Rule in Palestine believed in free trade, minimal governmental involvement, ensuring a steady

¹¹ Over time, the Socialist concept began to seep into the religious groups in the Jewish Settlement, despite their conservative nature.

currency linked to the British Pound Sterling, and encouraging private initiatives (Meron 2013).

Although the Zionist leadership in the Jewish Settlement believed in socialist concepts, which supposedly were less convenient for conducting capitalistic activities, it was also motivated by additional considerations – perhaps even more important than the implementation of economic ideas – and were related to the national aspirations of the Zionist Movement. During most of the Mandate, and even more so during the great financial crisis, the British Rule defined quotas for migration to Palestine according to the Settlement's economic ability to integrate new immigrants. In this aspect, the migration of wealthy Jews who intended to set up new businesses achieved two important goals for the Zionist Leadership: (1) The British Rule happily issued immigration certificates to wealthy Jews, thereby making it easier for the Jewish Settlement to grow; and (b) The migration of wealthy Jews who established significant businesses in Israel also created additional employment and increased the economic activity of the Settlement and its financial capabilities, which in turn enabled the Settlement to ask the British Mandate to increase the immigration quota to Israel (Meron, 2008; Meron, 1014).

In summary, since the 1920s, a number of wealthy families immigrated from Greece to Palestine (such as Recanati, Carasso, Florentine, Mano, and Gatenio) because of the situation in Greece, the business opportunities in Palestine, and for nationalist-Zionistic reasons. These families brought with them significant capital combined with a burning entrepreneurial desire as well as strong ties to Jewish Sephardi families in the Mediterranean Basin and to international companies across Europe. This enabled them to become a part of, and even lead, the business and economic activity in their new land. Their economic activity was based on classical capitalistic principles that differed from those that were prominent in the Jewish Settlement at the time, i.e., enhancing a shared economy (Papadaskalopoulos & Nikolopoulos, 2018).

For example, Leon Recanati and his partners (who were mainly originally from Thessaloniki or Sephardi Jews from other places) founded a private bank (Eretz Yisrael Discount Bank Ltd., which is presently named Discount Bank) that quickly became one of the largest banks in the country. In the financial and social reality during the British Mandate and the first few decades of the State of Israel, this was extremely meaningful. The banking system was (and still is) extremely centralized and the addition of another large bank significantly increased competition and customers' ability to receive credit, thereby invigorating the financial activity. Even more importantly for our topic, the other large banks were tightly bound to the shared economy and were founded and owned by public entities who had a socialist financial agenda: The Histadrut, the General Socialist Zionist Leadership, and the Religious Zionist Leadership that was a type of socialist. For many years, this bank was the only large privately owned bank in Israel (Gross, 2009).

With regards to transportation, which was controlled by cooperatives and shared organizations, families from Thessaloniki (Carasso, Mano, and others) set up private companies for cars, shipping, and transportation that were based on business consideration. Unlike the large cooperatives in the field, these were private initiatives based on these families' relevant experience and international ties (Gross, 2009).

Even in the field of real estate, that was identified with the Zionist Movement who saw great importance in purchasing land for building new neighborhoods and towns, there were a few families from Thessaloniki who operated differently in the 1930s. While most large areas of land were purchased by the cooperative for establishing towns or neighborhoods with shared collective characteristics, wealthy Thessaloniki families such as Florentine and Carasso bought land across Palestine, especially in the Tel Aviv Region, as part of a classic economic framework, as private entrepreneurs. Although they were motivated by ideological and Zionist motives, they were also motivated by classic economic principles of yielding profits (Gross, 2009; Meron, 2013).

This does not mean that the wealthy families from Thessaloniki strove to undermine the socialist principles of the Settlement or to confront the Jewish leadership. They were families who successfully became part of the socioeconomic elite of the Jewish Settlement. They later supported initiatives of the State of Israel and benefitted from its Protection Policy, while

ensuring amicable ties with the professional unions and playing by the rules that the latter dictated.

However, in a reality where most of the central market activities were conducted in line with socialist principles, and that were supervised, guided, and directly or indirectly belonged to the State and its institutions, the existence of large capitalistic companies was a breath of fresh economic air. These meaningful private companies clearly proved their vast contribution to the economy, many of which were owned by Thessaloniki Jews. They were also one of the reasons why at the end of the 1940s and beginning of the 1950s, the State's leadership decided to maintain a varied and mixed economy in Israel, despite its socialist tendencies – rather than attempting to dictate an economic order as was happening at the time in Eastern Europe (i.e., the “Communist Bloc”), which based its economy on nationalizing medium and large-sized private companies and completely controlling the countries' economies.

10. Examining the weight of Greek Jewry in Israel

When evaluating the overall weight of the Greek Jewry in Israel, it is insufficient to only address the CBS data about first and second generations as presented in Table 3. Instead, third and fourth generations should also be included in such calculations, to provide a more comprehensive picture.

Table 3. Greek Jewry in Israel by generation, 1972-2025

Total number of first and second generation Greek Jewry in Israel	Born in Greece	Born in Israel (second generation)	Year
19,600	8,500	11,100	1972
17,600	7,400	10,100	1983
16,600	6,500	10,100	1987
15,000	5,100	9,800	1994
13,600	3,700	9,900	2000
12,400	2,400	10,000	2007
11,050	1,250	9,800	2014
10,300	800	9,500	2018
9,200	250	8,950	2025 forecast

Source: Based on CBS data from various years

The CBS relates to third and fourth generations as Israelis, regardless of their forefathers' country of origin, or their affiliation to that culture, tradition, and language. As such, in December 2017, there the CBS reported only 10,900 Greek Jews in Israel, with more than half of them aged 65 and older. While many third and fourth generations may only be part Greek, they can identify with Greek Jewry through their parents and grandparents. Therefore, ignoring this group is demographically and culturally incorrect and distorts the weight of the Greek Jewry in Israel. If third and fourth generations are considered an integral and inseparable part of the Greek Jewry in Israel, then instead of 10,000, there will be 58,238 Greek Jews living in Israel (as shown in Table 4). This dramatic increase is almost five times the size of the conservative estimations presented by the CBS for 2018. Moreover, this finding enables the in-depth and methodological discourse on this population, including its legacy, development, needs, and problems. In turn, relevant and practical policies will take into account the younger generations in order to nurture and preserve them.

Naturally, the third and fourth generations, who have been influenced and shaped almost solely by the Israeli culture, society, and space, may have hardly preserved their affiliation with the Greek Jewish (Ladino) culture and legacy, yet have been impacted by them to some degree – through their curiosity and exposure to Greek/Sephardic traditions within their families. It would seem, therefore, that the demographic marginality of Greek Jews in Israel and their aspiration to become an integrated part of the widespread Israeli melting pot society and policy – which is dominant among small migrant groups – led the first generation of unmarried migrants, as well as later generations, to not preserve marriages and community ties within the Greek Jewish community. As such, their identities have been shaped as Jewish-

Israeli, rather than as per their geographic roots or ethnicity as Sephardic or Balkan, and even less so as Greek Jewish.

Table 4. Total size of Greek Jewry in Israel, 1972-2025

Total: First-fourth generation	Fourth generation	Third generation	Second generation	Born overseas	
57,470	32,539	15,731	8,950	250	2025
58,238	31,121	16,817	9,500	800	2018
56,754	28,433	17,272	9,800	1,250	2014
54,317	25,563	16,354	10,000	2,400	2007
51,864	22,341	15,923	9,900	3,700	2000
48,152	17,525	15,727	9,800	5,100	1995
35,713	3,396	14,817	10,100	7,400	1983
31,764	*****	12,164	11,100	8,500	1972

Source: Based on CBS data from various years and on the 2008 and 2019 research

11. Demographics of Greek Jewry in Israel based on research findings

Statistical expression of these claims can be seen in the 2008 pilot study on the status of the Ladino culture and language among Israelis from Ladino speaking countries (Yozgof-Orbach, 2008), whereby about half (47%) of the first and second generation Greek Jewry in Israel who participated in the study had not married someone from Greece or other Ladino countries. A follow-up study from 2018-2019 (yozgof-Orbach, 2020) found that only 25% of the Greek Jewry participants had married someone from Greece or other Ladino countries, and all of whom were aged 65 and older¹². In light of these findings, estimating the size of the Greek Jewry in Israel based solely on inter-communal marriages will yield lower numbers that do not reflect the true size of the Greek Jewry and will not enable the understanding of its demographic trends and processes. Therefore, third and fourth generations should also be considered, providing they are at least 25%-part Greek Jewish and as such could be affiliated with the heritage, culture, or language of Greek Jewry. However, fifth-generations or those with less than 25% Greek Jewish origins should not be considered, as they will most likely lack affiliation to Greek Jewry.

A study from 2008 found that the average number of children in Greek Jewry families in Israel was **2.75** per woman. In 2019, the average number of children among first and second generations was **2.7**, and **2.82** among third and fourth generations. These numbers are significantly smaller than the 3.16 fertility average among Jews in Israel.¹³ These findings assist in the conducting of additional statistical calculation, cautiously estimating the overall size of the Greek Jewry population in Israel (first, second, third, and fourth generations). Table 4 presents this data, based on a number of assumptions:

- Fertility rates among first and second generations is 2.75 children per women, and 2.82 among third and fourth generation.
- The number of immigrants from Greece to Israel during 1919-2018 was 12,831.
- Data about first and second generations are based on CBS data.
- The number of third and fourth generation Greek Jews in Israel is based on estimated fertility rates (Assumption a.), death rates, and fertility age, based on the age pyramid¹⁴.

¹² Based on a study where only 16 of the 100 participants defined themselves as Greek Jewry. In a similar study in 2008, only 17 of the 100 participants defined themselves as such.

¹³ Calculations were conducted based on the average number of children stated by Greek Jewry mothers in Israel in a questionnaire in 2008 and in 2019. For average fertility rates in Israel see: the 2016 CBS Report on Births and Fertility.

¹⁴ For each year in Table 4, numbers were estimated according to before, during, and after fertility age; adults who had given birth and died; fertility rate based on the 2008 and 2019 research; estimations of people who had died and population of fertility age.

From the intriguing data that stems from the complex statistical analysis presented in Table 4, a fourth generation of Greek Jewry in Israel could be found in the 1980s. This finding is feasible considering that about 68% of Greek Jews immigrated to Israel during 1919-1947. As the Greek Jewry migrated to Israel earlier than many other communities, they naturally started their next generations earlier than others, and also diminished earlier. This can be seen in the decrease in the number of first-generation Greek Jewry in Israel, which was only about 700 by 2019. As this number is expected to continue to decrease, by 2030, only a few dozen first-generation Greek Jews in Israel will remain. In 2018, the number of third generation Jews also began to diminish – a trend that will continue over the years. Moreover, in 2018 – as seen in Table 4 – the Greek Jewry in Israel reached its maximum potential (58,238 people) regarding the number of residents in Israel with a 25% or higher affiliation to the Greek Jewry. Finally, by 2025, the demographic presence of Greek Jewry in Israel will have almost diminished completely.

The research conducted in 2008 and 2019 referred to all Ladino-country natives living in Israel (especially Turkish, Greek, Bulgarian, Yugoslavian, and Spanish Moroccan). In both studies, a convenience sample was conducted. While this was not representative of all such natives and their descendants¹⁵, it does take into account the gender ratio in Israel, the geographic distribution presented in the 2008 CBS reports regarding immigrants from these countries, and the weight of each group of origin out of all the diaspora. As such, in both studies, Jews from Turkey, for example, were given greater sample representation than Jews from Greece and Bulgaria and their descendants, and Jews from Bulgaria and their descendants were given greater representation than Jews from Greece and their descendants. The over-representation of a certain group of origin in the studies stems from their absolute number out of all Jews from Ladino countries and their descendants in Israel.

To further analyze the demographic data of Greek Jewry in Israel, comparative analysis was conducted based on two research studies, in order to create an updated demographic profile of this population and their descendants. The findings of the focused research studies, from each study individually and from both combined, indicate that with regards to education, degree of religiousness, and ethnic belonging – not significant differences were found between the 2008 findings and those from the later 2019 study. For example, in the 2008 study, 56% of the participants stated that they are secular, 31% traditional, and 13% religious. This snapshot hardly changed a decade later, with 53% of the participants claiming to be secular, 41% traditional, and 6% religious. For sake of comparison, according to a 2018 CBS report, 45% of Jews in Israel define themselves as secular, 25% as traditional, and 30% as religious-ultra orthodox (CBS, 2018).

The relatively low tendency for religiousness among the Greek Jewry in Israel, as with most Jews from Ladino countries in Israel, is not a new or surprising finding. However, it should be noted that the past decade has seen an increase, albeit a small one, in the weight of the religious-traditional block (about 47% of participants) among the various generations of Greek Jewry in Israel. Based on the two studies, it is hard to determine whether this trend will result in the degree of religiousness among Greek Jewry in Israel equaling that of the country's average, as data from the previous decade is missing, and as such – conclusions based on these relatively small samples should be made with caution.

No change was seen regarding feeling of ethnic belonging among the Greek Jewry in Israel. In the 2008 study, 67% of the participants defined themselves as Sephardic and 33% as European. Ten years later, 61% of the participants defined themselves as Sephardic, 33% as European, and the remainder (6%) as Middle Eastern. Perhaps their strengthened Middle Eastern identity and their descendants is related more to social and cultural processes that have taken place in Israel than to a conscientious and inbred definition that is passed down from generation to generation. Either way, about one-third of Greek Jewry define themselves as European, and about two-thirds as the descendants of the Spanish and Portuguese expulsion. Moreover, about 80% of the participants in both studies stated that they had not encountered any discrimination against them based on their country of origin. The 20% who had encountered such discrimination (rarely or frequently) were all aged 55 and older.

¹⁵ Mainly due to budgetary and technical limitations for achieving a more representative sample.

In addition, data from the two studies clearly show that the level of education among Greek Jewry in Israel is higher than the country's average. For example, 59% of the participants in the earlier study and 62% in the later one held a first degree or higher compared to an average of 47% and 53% respectively among the entire Jewish population in Israel (CBS, 2018). Moreover, an average of about 30% from both studies have a vocational high school education, and the remainder have certificate-and-special-programs diplomas or studied at the Yeshiva. In general, these findings are in line with the educational structure of Jews in Israel from Ladino countries which is higher than the nationwide average. This may be due to their inclination to reside in areas (mainly in the center of the country) where academic education is more readily accessible and due to socio-cultural factors that impact these Jews in both Israel and in Greece (Athens, Thessaloniki, and Trikala.) Interestingly, a significant decrease could be seen in the level of income among the Greek Jewry in Israel between the 2008 and the 2019 study. In the earlier one, 53% of the participants stated that their level of income was higher than average, 23% stated average income, and 24% stated that their level of income was lower than average. In comparison, in the later study, only 32% of the participants stated that their level of income was higher than average, and about two thirds (68%) stated average income (31%) or stated that their level of income was lower than average (37%). Two main reasons may explain this difference: The aging of the Greek Jewry, as after retirement, income levels decrease, and the increased cost of living in Israel since 2010.

12. Summary

This article examined the demographic patterns of Greek Jewry in Israel over the past century, from 1919 to 2019. By combining, analyzing, and processing data gathered from multiple sources, it seems that after the Holocaust and following their large-scale migration from Greece to Israel, the Greek Jews mainly settled in large municipal towns near the coast, in the center of Israel (Tel Aviv, Bat Yam, and Rishon LeZion) or in Haifa. Marginally, some Greek Jews also settled as a cohesive community in rural towns, including Zur Moshe, Dor, Naveh Yamin, and Tal Shazar. While Greek Jews continue to immigrate to Israel, their numbers have significantly decreased over the years, with only a few dozen immigrating over the past few decades – mainly as the Greek Jewry in the Diaspora continues to diminish.

From a demographic point of view and based on two different studies conducted in 2008 and in 2019, Greek Jewry in Israel had above-average levels of education, below-average degrees of religiousness, and below-average levels of fertility compared to other communities in Israel. They also had slightly above-average incomes, yet this decreased as the first and second generations aged. The findings also indicate that only a few hundred first-generation Greek Jews remain in Israel today. By 2025, this number may be lower than 250. However, for the first time, this paper exposes that the Greek Jewry includes 58,238 people, not 10,300 as presented by the CBS (2018), when taking into account third and fourth generation descendants whose ethnic origin is at least 25% Greek Jews and who theoretically could have an affinity or sense of belonging to the heritage, culture, and community of the Greek Jewry in Israel. This number, which is almost six times greater than that of first and second generations, conveys the demographic potential of the Greek Jewry in Israel and could be utilized for strengthening this community over the next few years.

First and foremost, taking in account third and fourth generations of Greek Jewry in Israel could lead to the comprehensive understanding of this community – leading to significant political, communal, financial, and educational outcomes. Including people with a 25% Greek Jewry origin in the headcount of this community could encourage community leaders, business people, and researchers to strengthen their relationships with the younger generations, who will then determine or impact the future of this community in Israel. This could contribute on a number of levels, including preserving the legacy of the Greek Jewry in Israel and memorializing it in the public and academic spheres and in the Zionist, Jewish, and cultural discourse. Such success could reinforce the heritage of the Greek Jewry among future generations (fifth and sixth) and may greatly determine whether there will be a continuation of Greek Jewry in Israel, including its heritage, unique characteristics, language, and all that it has acquired since leaving Greece. However, it is important to remember that these decades

(2010-2030) are the last demographic golden age for Greek Jewry in Israel, after which most descendants will have less than 25% Greek Jewish origins.

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ADDRESSING SPATIAL JUSTICE AT LOWER TERRITORIAL LEVELS. SOME INSIGHTS FROM THE CENTRAL AND EAST EUROPEAN COUNTRIES' PERSPECTIVE

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Abstract

The current approaches of territorial inequalities from the perspective of territorial cohesion in relation to the European Social Model bring into discussion the concept of spatial justice, which combines place-based with people-based prosperity and points to adequate social and spatial integration models. It has been supported by the “Europe 2020” strategy and will get even stronger emphasis in the new programme period, 2021-2027. In this context, the analysis of territorial inequalities at deeper level of spatial disaggregation gets a special significance for the design of the future regional policies, which will incorporate an important spatial justice component. It will entail a growing need for data at NUTS3 and LAU levels as well as for microdata (usually obtained on the occasion of population censuses). At international level there is already a growing interest in doing research at these levels by both institutions that support cohesion policy and individual authors. Starting from these overall considerations this paper proposes an overarching review of selected relevant studies undertaken in Central and Eastern Europe in order to highlight significant aspects of deeper territorial inequalities, as useful hints for the prioritisation of the EU funds allocation to less developed areas and for laying good foundations for the regional policies in these countries. The paper brings about a twofold contribution, namely a discussion of the difficulties that have to be faced for the construction of appropriate databases and proper methodologies as well as the emphasis on those territorial inequalities that are better captured at deeper disaggregation levels.

Keywords: territorial cohesion; spatial justice; overarching review; territorial inequalities; disaggregation level

JEL classification: R11, R12, R19

1. Introduction : Facts, Theory, Hypotheses

Since its inclusion in the Lisbon Treaty (2007/2009) as a main, third dimension of the European Union's Cohesion Policy and, at the same time, of the European Social Model, territorial cohesion has been approached from various perspectives, aiming to explore how the territorial characteristics influence the sustainable development of the EU as a whole and how they are correlated with the economic and social dimensions within Cohesion Policy.

While, at global scale, it is largely acknowledged that “the concentration of economic activity is inevitable and usually desirable for economic growth”, the usually resulted “large spatial disparities in welfare levels that accompany this concentration” (World Bank, 2009, pp. i-ii) are viewed differently, pointing to the need to keep these disparities reasonable intervals of variation.

Initially, territorial cohesion was conceived in terms of “helping achieve a more balanced development by reducing existing disparities, preventing territorial imbalances and by making both sectoral policies which have a spatial impact and regional policy more coherent” (Laissey, 2004, p.1). In the next stages, the balanced territorial development of the EU spaces has been connected to the aim of making sure that “people are able to make the most of inherent features of the areas in which they live” (European Commission, 2019, p.1). This vision is developed by the Territorial Agenda 2020 (EU Council, 2011), that addresses territorial cohesion as “a set of principles for harmonious, balanced, sustainable territorial development”, which “enables equal opportunities for citizens and enterprises, wherever they are located, to make the most of their territorial potentials” (p.3). In this context territorial

cohesion reinforces the solidarity principle, seeking to promote convergence between the economies of the more developed and lagging behind territories.

These approaches bring into the spotlight the territories and their people, offering a solid background for the idea of 'spatial justice'. According to this concept (Davies, 1968; Lefebvre, 1968; Lefebvre, 1972; Harvey, 1973; Dufaux et al., 2009; Soja, 2009; Soja, 2010) social justice is embedded in space and the interactions between space and society create a fertile seedbed for those territorial policies and plans open to holistic constructions, which combine place-based with people-based prosperity (Mendez (2011), referring to Winnick (1966)).

As a result, the door is open for broader development policies models, with open-ended spatial boundaries, which "respond to the functional needs of places at different territorial scales, not pre-defined on the basis of political or administrative borders" (Mendez, 2011, p. 12). Such models can be considered a response to the criticism of the 'one-size-fits-all' policy, which "does serious injustice" to the uneven development of various territories (Birch, 2017, p.129) as well as to the 'statistical condition' for territorial justice, which shows that it depends on "the dimensions of needs and provisions that are compared" (Boyne and Powell, 1991, p. 263). In this way, place-sensitive, combined with people-sensitive solutions can be outlined, taking into consideration the structural opportunities, potential and constraints of each area (Iammarino et al., 2017). They lay the groundwork for better policies – more realistic and more viable, for better types of interventions, especially for lagging and declining areas, which come into spotlight as a potential source of "revenge of places that don't matter", fuelled by "continued economic, social and territorial conflicts" that erode the economic, social and political foundations on which current and future well-being is based (Rodriguez-Pose, 2018, p. 205).

Research studies performed in this respect point out that the deeper the territorial disaggregation level, the better depicted the 'geography of discontent' of the 'left-behind places' (McCann, 2019). And tapping into their unused potential is "not only not detrimental for aggregate growth, but can actually enhance both growth at a local and a national level" (Barca et al., 2012, p. 149). In line with these orientations the European Commission and the World Bank, in cooperation with the EU member states launched a poverty mapping project which provided a set of high-resolution poverty maps for small geographical areas in the EU countries (at NUTS3 level or lower level) by means of the information provided by national population censuses and household income surveys (World Bank, 2012). It was based on the previous World Bank-funded research undertaken by Elbers et al. (2003), who proposed a set of area homogeneity assumptions necessary for poverty mapping in order to offer adequate estimates for small areas. The better measuring of territorial inequalities at local level proved to be useful for the targeting of development assistance as well as for decentralisation of spending decisions. At the same time, the local level analyses prove to be very useful when it comes to territories with specific characteristics (Panagou et al., 2018). In a broader framework, the estimated disaggregated data and those provided by Eurostat have served for multi-scale evaluations of the territorial inequalities, from locality to region and state level, considering their political implications in the discussions on territorial cohesion (IMAJINE, 2017).

This view, which serves to the implementation of the "Europe 2020" strategy, will get an even stronger emphasis in the 2021-2027 programme period of the EU, when a more social Europe and a Europe closer to citizens are two of the five main objectives (together with a smarter, greener and more connected Europe) that will drive the EU investments. The Cohesion Policy will further support the locally-led development strategies and will add new criteria for better reflecting "the reality on the ground" (European Commission, 2019, p.1).

In line with these orientations this paper proposes an overarching review of selected relevant studies undertaken in Central and Eastern Europe at lower levels of territorial disaggregation, able to offer an orientation with regard to the EU funds priority allocation to the deprived areas and to ground the policies and decisions at national and sub-national level in these countries. Such studies make it possible to identify small areas such as municipalities, communes, etc. confronted with high poverty risks and, on this basis, to give additional substance for the negotiations with the European Commission in the budget cycle for the 2021-2027 programme period. The focus on the Central and Eastern Europe has a particular

significance for the territorial dimension of the Cohesion Policy, considering that their accession to the EU considerably raised the amplitude of spatial inequalities in the EU, not only between states but also between regions (Monfort, 2020; Colak, 2015; Xanthos et al., 2012). Thus, all CEECs have a GDP per capita (PPS) below the EU average (Table 1), while six out of the ten NUTS2 level regions with lowest development level also belong to the CEECs (Table 2).

Table 1. GDP per capita in CEECs, 2019

Member State	GDP per capita (PPS) (euro)	% of the EU-27 average
Bulgaria	16500	53%
Croatia	20300	65%
Czech Republic	28900	93%
Estonia	26100	84%
Hungary	22800	73%
Latvia	21500	69%
Lithuania	26000	83%
Poland	22700	73%
Romania	21700	70%
Slovakia	21900	70%
Slovenia	27700	89%
EU-27 average	31200	100%

Source: Eurostat

Table 2. The lowest regions in the 2019 EU ranking

NUTS2 Region	Member State	GDP per capita (PPS)	
		euro	% of the EU-27 average
Mayotte	France	10100	32%
North-West	Bulgaria	10100	32%
North-Central	Bulgaria	11000	35%
South-Central	Bulgaria	11600	37%
South-East	Bulgaria	12500	40%
North-East	Bulgaria	12800	41%
North Aegean	Greece	13600	44%
North-East	Romania	13700	44%
Eastern	Greece	14100	45%
Macedonia&Thrace			
Epirus	Greece	14600	47%

Source: Eurostat

Moreover, in the last decade the need to move ‘beyond GDP’ has been stressed, requiring to extend the focus in order to include the ‘social dimension of regional disparities’ at the same time with the increase of the geographical granularity, by extending the scope of the database to NUTS3 level and even lower level, for ‘zooming in’ on territorial specificities. In this way, favourable conditions for addressing territorial inequalities through the lens of spatial justice are created (RELOCAL, 2018).

Based on these overall considerations, this paper has started from two working hypotheses, namely:

H1: One size does not fit all: apart from the territorial inequalities revealed by the ‘classical’ NUTS2 level analyses, more diverse, sometimes different from the traditional ones, disparity patterns are highlighted at lower levels of disaggregation.

H2: The exploration of territorial inequalities at deeper disaggregation levels contributes to a more solid support for adequate, more diversified territorial cohesion policy measures, combining people-based with place-based characteristics, with favourable impact on spatial justice.

Accordingly, the paper is structured in three main parts: in the beginning, the research methodology is explained, followed by a systematic presentation of the main findings and a discussion of their significance. The final messages in support of deepening the territorial level of spatial analyses are incorporated in the concluding remarks section.

The contribution of this paper is twofold: first, it addresses, on a comparative basis, the challenges encountered in terms of constructing appropriate databases and feasible methodologies for examining territorial inequalities at lower levels of disaggregation in CEECs, which can serve as starting point for future research aiming to bring appropriate

responses to these difficulties; second, it highlights important socio-economic issues in terms of territorial inequalities and spatial justice that are captured with highest accuracy at deeper disaggregation levels, with a particular relevance for CEECs in relation to the spatial distribution of the EU funds.

2. Methodology

The methodology derives from the purpose of an overarching review of the studies undertaking disaggregated territorial analyses in the CEECs, i.e. unlike most of the reviews in this field, which are topic-specific, the aim has been to provide an all-embracing view, enveloping a variety of relevant issues addressed by such analyses, with focus on topic, spatial level, data sources, methodological approach, main findings/highlights and limitations/further possible developments. The whole analytical framework has been conceived so as to reflect the basic characteristics of each issue, novelty and results robustness.

As far as the topic is concerned, the selection has been made depending on diversity, relevance and timeliness of the issues approached from territorial cohesion perspective.

A particular attention has been paid to the spatial level, in order to point out the particular details brought about by LAU1 and LAU2 and micro (individual) level. With regard to LAU1 and LAU2, it has to be mentioned that the two levels of the local administrative units (the upper level (LAU1, defined but not existing in all countries) and the lower level (LAU2, referring to municipalities or equivalent units)) were in force until 2016 inclusively. Starting from 2017 there is just one level of LAUs, as subdivisions of the NUTS3 territorial level, covering the whole territory of the EU member states. They are “administrative for reasons such as availability of data and policy implementation capacity” (Eurostat, 2019, p.1). In our review, most of the selected papers refer to LAU2, which is still compatible with the current LAU. However, two studies undertaken at particular levels existing in Czech Republic (micro-regions between LAU1 and LAU2) and in Hungary (micro-regions assimilated with LAU1) have been spotlighted in order to reveal additional details that can be provided by territorial analyses performed at ‘unconventional low levels of disaggregation’.

When it comes to data sources, the aim has been to discuss, in almost all cases, research based on multiple sources, which required higher efforts for incorporating them in a coherent approach. Of a particular interest has been the combination between data from governmental institutions with those obtained by specific surveys. Census data have been also considered.

The methods of investigation have been targeted based on robustness of the proposed solutions as well as in connection with the problems faced in terms of data accessibility and time constraints and limitations suggested to be solved by further research.

Last, but not the least, the highlights/main messages conveyed by each study played an important role in the selection process.

3. Main findings

The main findings from each of the selected papers, resulted in accordance with the proposed analytical framework, are presented in Table 3.

Table 3. A selection of disaggregated territorial analyses in CEECs. Overarching review

Article/ Country/ Criteria for analysis	Findings
Novosak et al., 2017, Czech Rp.	
Topic	<i>Regional distribution of Structural Funds (SF) and regional disparities among Czech micro-regions</i>
Spatial level	Administrative districts of municipalities with extended power (micro-regions between LAU1 and LAU2)
Data source(s)	Ministry of Regional Development (for projects submitted for structural funding); Czech Statistical Office (for explanatory variables)
Methodology	Principal component analysis; descriptive and inferential statistics; regression modelling
Highlights	More SF are allocated for the social pillar of sustainable development in socially disadvantaged micro-regions compared to the allocations for the economic pillar in economically disadvantaged micro-regions. Micro-regions with better economic conditions receive relatively more SF, indicating an ambivalent evidence with regard to the SF distribution based on the rationale of diminishing the intra-state territorial disparities at micro-regional level.
Limitations/Further possible developments	Equity vs. efficiency goals of regional policies: should more SF be allocated to lagging regions or to the most competitive ones? Other (than regional disparities) determinants of the spatial distribution of SF to be explored: regions' absorption capacity, political interests, spatial interactions
Lincaru et al., 2015, Romania	
Topic	<i>Territorial profile of public expenditures</i>
Spatial level	LAU2
Data source(s)	Ministry of Finance; Ministry of Regional Development and Public Administration; National Institute of Statistics; ESRI Romania (geodata)
Methodology	GIS models based on ESDA (Exploratory Spatial Data Analysis); Neighbourhood analysis/contiguity and spatial weighting; LISA (Local Indicators of Spatial Associations)
Highlights	Spatial heterogeneity for attributes regarding the socio-economic indicators is higher than that for local budget indicators. Higher variation for the spatial heterogeneity degree with regard to labour market indicators at LAU2 level.
Limitations/Further possible developments	Useful hints for an integrated approach of territorial development supported by Structural Funds
Rosik et al., 2015, Poland	
Topic	<i>Impact of road investment (especially from EU funds) on accessibility improvement and territorial cohesion</i>
Spatial level	LAU2
Data source(s)	National Institute of Statistics; Polish Ministry of Transport; Polish Highway Code Regulations
Methodology	Potential accessibility model
Highlights	The substantial contribution of EU funds to multiplying the length of motorway and express road. Improved accessibility at national and international scale. Diversity of situations at interregional scale (better situation in densely populated core regions and voidships covered by the Regional Operational Programme of Eastern Poland). In general terms the EU funds concentrated on improving the general road efficiency rather than on equity issues.
Limitations/Further possible developments	The need to consider the importance of non-infrastructure factors on potential accessibility (e.g. changes in border regions, demography, etc.) as well.

Article/ Country/ Criteria for analysis	Findings
Jakobi et al., 2018, Hungary	
Topic	<i>Spatial inequalities regarding ICT access</i>
Spatial level	LAU1 (micro-regions)
Data source(s)	Hungarian Central Statistics Office; Surveys of GKIeNET (Hungarian ICT research company)
Methodology	Index of information accessibility
Highlights	Differences reflected by city hierarchy. Regional differences between East and West of Hungary connected to the overall development level differences. E-government inequalities.
Limitations/Further possible developments	The influence of geographical environment constraints has not been considered. How to create inclusive e-government for overcoming the digital divide, reflected in social, economic and regional inequalities?
Siseroova and Hudec, 2014, Slovakia	
Topic	<i>Factors explaining prosperity in Slovak municipalities</i>
Spatial level	LAU1
Data source(s)	Statistical Office of the Slovak Republic, Population and Housing Census 2011, Ministry of Labour and INEKO (Institute for Economic and Social Reforms) databases
Methodology	Municipal Prosperity Index, Moran test of spatial autocorrelation
Highlights	Location has strong impact on municipalities' prosperity in terms of proximity to capital city, the presence of a large manufacturer or industrial park in/close to municipality, proximity to tourist attractions, etc.
Limitations/Further possible developments	Shortage of statistical data on municipalities, which made it necessary to combine manifold sources of information. Difficulties to apply a similar approach at lower territorial levels. A new term regarding municipal and district prosperity is proposed, using mixed but reliable data sources.
Bohman et al., 2019, Croatia and Serbia	
Topic	<i>Spatial inequality in Croatia and Serbia</i>
Spatial level	LAU2 (municipalities)
Data source(s)	Croatian Bureau of Statistics
Methodology	Estimation of spatial inequalities regarding population, employment, unemployment rates, wages using 'most different' and 'most-similar' approaches
Highlights	Patterns of change in labour market are explored. Regions where major cities are located are leaders of recovery after the economic and financial crisis, whereas rural areas are still lagging behind. Capital city and urban areas in general display durable trends of population and job concentration.
Limitations/Further possible developments	LAU2 units are divided by administrative borders, not by function. One common local labour market can belong to different municipalities. However, the advantage is that LAU2 level, as the lowest aggregation level, can be clustered into other categories.
Ubareviciene and van Ham, 2016, Lithuania	
Topic	<i>Population decline in Lithuania: Who lives in declining regions and who leaves?</i>
Spatial level	LAU2; Individual level (geo-coded micro-data)
Data source(s)	2001 and 2011 Lithuanian Census
Methodology	Logistic regression models (binary and multinomial)

Article/ Country/ Criteria for analysis	Findings
Highlights	Residents with low socio-economic status and older residents prevail among the population of rapidly declining areas. Successful people are “the most likely to leave” (p.1). The downward spiral of shrinking areas is negatively influenced by the selective migration process. At national level the socio-spatial polarisation is growing: in the largest city-regions the share of population with higher socio-economic status exceeds the national average; the elderly and lower socio-economic status population is dominant in declining rural areas.
Limitations/Further possible developments	Shortcomings derived from data constraints (only the change in residence one year before the census date is captured; the migrants’ characteristics are known only after the move; intra-urban and intra-rural information is not provided; no information on the motives/reasons of internal migration; etc.). Further research required with regard to: the socio-spatial polarisation in relation to selective migration by destination; living conditions and needs of the shrinking regions inhabitants.
Cosier et al., 2014, Slovenia	
Topic	<i>New indicators for a better understanding of disparities in Slovenian rural areas</i>
Spatial level	LAU2
Data source(s)	Statistical Office of the Republic of Slovenia; Ministry of Higher Education, Science and Technology; Amis web application; Surveying and Mapping Authority; Slovenian Forest Office; Municipal administrations
Methodology	Calculation of single and multi-level, multifactor composite indicators
Highlights	New composite indicators resulted, such as: indicators of economic vitality, indicators of structural weakness, indicators of development potential, indicators of public debt and investment, indicators of fibre-optic broadband connectivity across the country, indicators of biomass heating self-sufficiency, etc. More diverse disparity patterns that do not necessarily confirm the traditional ones
Limitations/Further possible developments	Incomplete series of data or not up-to-date
Mocanu et al., 2017, Romania	
Topic	<i>The quality of dwellings in the Romanian Danube Valley</i>
Spatial level	LAU2
Data source(s)	National Institute of Statistics – Tempo Online; Romania’s Census 2011
Methodology	Calculation and mapping of Dwelling Quality Index, with three secondary indexes: the dwelling stock index; the dwelling development index; the dwelling comfort index.
Highlights	Important differences in terms of quality of dwellings between urban and rural areas. The factors involved in dwelling quality for rural areas are different from those for urban areas. Poor drinking water supply and sewage networks in the whole area.
Limitations/Further possible developments	The question of non-authorised, unhealthy dwelling structures that tend to extend.
Koulov, B. et al., 2017, Bulgaria	
Topic	<i>Valuation of ecosystem services in mountain regions</i>
Spatial level	LAU1
Data source(s)	National Statistics Institute, Ministry of Agriculture and Food, Ministry of Environment and Water
Methodology	GIS mapping of ecosystem services based on the integrated biophysical and economic evaluation.

Article/ Country/ Criteria for analysis	Findings
Highlights	Ecosystem classes and subclasses are identified, the ecosystems state is assessed on a favourable-satisfactory-unfavourable-poor scale and, finally, the ecosystem services are valued taking into consideration their interactions.
Limitations/Further possible developments	Lack of data, leading to exclusion of various ecosystem services. The spatial valuation of ecosystem services can serve as a benchmark for future valuations, able to reveal underreported and/or underevaluated services. Support for sustainable territorial development rational, equitable funding.

Source: author's analytical framework and review

4. Discussion

A bird's eye view of the above findings indicates that even if, according to the EU general rules, the distribution of the EU funds for regional development is done in inverse proportion to the GDP per capita of the NUTS2 regions, amended by population density, at lower territorial levels the distribution appears more balanced, considering, on the one hand, equity/efficiency issues and, on the other hand, the implications of spatial justice, which requires a rational combination between place-based and people-based prosperity. Novosak et al. (2017) and Lincaru et al. (2015) have offered the best illustration of this finding.

Moreover, the deeper the disaggregation of the territorial level, the more diversified the needs of each area, suggesting integrated approaches of the development goals, able to combine and respond both economic and social necessities (Lincaru et al., 2015; Cosier et al., 2014).

A diversity of situations at LAU2 level are exposed in terms of road infrastructure and ICT accessibility in Poland and Hungary, respectively (Rosik et al., 2015; Jakobi et al., 2018), housing quality in Romania (Mocanu et al., 2017), selectivity of migration processes in Lithuania (Ubarevičienė and van Ham, 2016), prosperity of Slovak municipalities (Siserovala and Hudec, 2014), ecosystem services in mountain regions in Bulgaria (Koulov, 2017), etc., explored by means of adequate methods (accessibility models, GIS, regression models, etc.).

In order to find the best match between analytical aspects and the overall picture, single and multi-level, multifactor composite indicators seem to be a frequently applied solution (Cosier et al., 2014; Jakobi et al., 2018; Mocanu et al., 2017).

A synthesis of these aspects is presented by means of the word cloud technique (www.wordclouds.com) in Figure 1, with regard to the highlights resulted from our review and in Figure 2, with regard to the methodologies applied.

One of the most sensitive issues remains the sources of data, which requires reliable solutions for treating incomplete or not up-to-date series or for combining data provided by various institutions. Also, the data source (official statistics, surveys organised for special purposes) entails specific processing procedures (descriptive statistics, inferential statistics, exploratory spatial data analysis) and well-tailored statistical and econometric models (principal component analysis, local indicators for spatial associations, logistic regressions, etc.).

5. Concluding remarks

The selected studies reviewed have provided relevant aspects for territorial cohesion and spatial justice in CEECs. Thus, they proved that the lower the level of disaggregation, the more diverse the disparity patterns in terms of both territorial characteristics and the real needs of people living in a certain area. Even more, disparities that “do not confirm the traditional disparity patterns” have been detected, pointing to the need for “nuanced understandings” (Cosier et al., 2014, p.162) in order to avoid negative impacts and to prevent from weakening various development drivers.

Consequently, the studies based on LAU1, LAU2 and microdata have offered a more detailed view on the ‘inside’ of overall regional disparities as well as on certain, well-targeted aspects of these disparities (from Structural Funds allocation to the territorial profile of public expenditures, impact of road investment on accessibility improvement, mobility patterns, etc.), supporting the ground for more accurate policy measures, based on integrated approaches.

In other words, the diversity of disparity patterns revealed at lower levels of disaggregation creates a more robust basis for differentiated decisions regarding the use of the EU structural funding, with direct implications on the results of the financial assistance process.

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MEASURING REGIONAL DEVELOPMENT DISPARITIES: SOME METHODOLOGICAL CONTRIBUTIONS AND EVIDENCE FROM ARMENIA AND SERBIA

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Abstract

There are manifestations of regional development disparities in almost every country, but this phenomenon is especially dangerous in those countries that have only one "center of gravity". Significantly more developed capital can transform itself from "center of gravity" to a "black hole" by emptying the potential of the regions. To prevent such a destructive scenario, it is firstly necessary to disclose the roots of regional development disparity, and the reasons for its subjective perception. Without these steps, any intervention, policy, or measure taken or implemented by the state can aggravate further disproportion or at least be ineffective. Only after discovering the above-mentioned roots, it will become possible to develop a comprehensive strategy for overcoming regional disproportionate development and derive from it a complex of effective measures. All these goals are intended to be achieved within the framework of the research funded by the Science Committee of the Ministry of Education, Science, Culture and Sports of the Republic of Armenia within the support program for young researchers (project code: 19YR-5B038). This paper focuses mainly on discussion of regional disparity measurement tools and development of a tool appropriate not only for accurate measurements, but also for serving as a motivational tool for authorities. Calculations have been made for Armenia and Serbia, taking into consideration several key similarities of economic, social, and cultural nature, which have significantly influenced the perception of local governance and role of communities, as well as the mindset toward socioeconomic processes in general.

Keywords: regional development, regional disparity, measurement, development indicator, governance

JEL classification: H700, H770, H830, R500, R580

1. Introduction

The disproportionate development of territories, although it may sound disturbing, is a natural phenomenon: at least the territories have different natural resources, conditions, opportunities, and threats, which historically determine the quantitative and qualitative progress of human resources and technologies, the development of infrastructures and institutions. The development of territories, of course, can be cyclical, but even in that case only some people will live on wealth, although being interchanged. Therefore, measured, justified, moderate and at the same time targeted intervention is needed to ensure a balanced territorial development. Thus, the fact that regional disparity is a natural phenomenon probably forces us to study not only the obstacles to proportionate development (which is a rather widespread approach among public administration bodies and researchers), but also the reasons for the development disparity.

The United Nations Development Program (UNDP) annually publishes the Human Development Index (HDI) indices for almost all countries. According to the 2018 report, 37 countries (including Armenia) are in the range of 0.723 to 0.796 by HDI. The total population of these countries exceeds 2 billion 236 million, making about 30 percent of the world's population (UNDP 2018). The mentioned range shows the diversity of HDI values of the Armenian regions (marzes and Yerevan) according to the database created by the Radboud University Nijmegen, the Netherlands (Institute for Management Research, n.d.). Thus, one can say that the territorial diversity of human development in Armenia corresponds to the diversity of human development of around 30% of the world's population (Table 1).

Table 1. HDI of Regions of Armenia (2017)

Region	HDI	Countries with similar HDI value
Yerevan	0.796	Seychelles (0.797), Costa Rica (0.794)
Kotayk	0.760	Venezuela (0.761), Brazil (0.759)
Armenia	0.756	Lebanon (0.757), Republic of North Macedonia (0.757)
Syunik	0.755	Thailand (0.755), Algeria (0.754)
Shirak	0.753	China (0.752), Ecuador (0.752)
Vayots Dzor	0.747	Colombia (0.747), Saint Lucia (0.747)
Aragatsotn	0.739	Fiji (0.741), Mongolia (0.741)
Tavush	0.735	Jordan (0.735), Tunisia (0.735)
Ararat	0.730	Jamaica (0.732)
Lori	0.726	Tonga (0.726)
Armavir	0.724	Saint Vincent and the Grenadines (0.723)
Gegharkunik	0.723	Saint Vincent and the Grenadines (0.723)

Source: Institute for Management Research, n.d.

Though all the regions of Armenia are currently considered to be of a high level of development (according to the UNDP methodology), the variety of HDI values is 73 points (maximal value of 0.796 in Yerevan and minimal value of 0.723 in Gegharkunik), which is a significant range. The gap between the capital and the marzes is especially significant: Yerevan is, in fact, very close to a very high level of development (threshold: 0.800), whereas most regions are closer to the medium human development zone (upper threshold: 0.700).

The range of values of sub-national HDI is not that huge in Serbia. In 2016-2019, values from 0.786 to 0.799 may be observed in Sumadija and West Serbia, South and East Serbia, and Vojvodina (Institute for Management Research, n.d.). However, those regions have only a below average HDI, as the values for Belgrade were 0.822-0.834, which means, that as in case of Armenia, the gap between the Serbian capital and the regions is especially significant.

A very simple, but extremely inclusive indicator of regional development disparities is the average market price of a 1 square meter area in apartment buildings (Table 2).

Table 2. Average Market Prices of Area in Apartment Buildings in Towns and Administrative Districts of Yerevan (as of November 2018)

Town or Administrative District	Price per 1 square meter, drams	Town or Administrative District	Price per 1 square meter, drams
Kentron, Yerevan	563800	Spitak, Lori	98200
Arabkir, Yerevan	385200	Berd, Tavush	95800
Davtashen, Yerevan	297000	Vedi, Ararat	95500
Kanaker-Zeytun, Yerevan	285600	Armavir, Armavir	94700
Tsaghkadzor, Kotayk	285000	Vayk, Vayots Dzor	87200
Avan, Yerevan	261000	Gyumri, Shirak	87000
Achapnyak, Yerevan	260200	Sevan, Gegharkunik	84600
Erebuni, Yerevan	257000	Sisian, Syunik	83500
Shengavit, Yerevan	253200	Ararat, Ararat	82600
Nor-Nork, Yerevan	248600	Aparan, Aragatsotn	82100
Malatia-Sebastia, Yerevan	246200	Vanadzor, Lori	78800
Nubarashen, Yerevan	170000	Charentsavan, Kotayk	74500
Abovyan, Kotayk	164500	Talin, Aragatsotn	73200
Goris, Syunik	137500	Stepanavan, Lori	67500
Nor Hachn, Kotayk	128500	Metsamor, Armavir	66500
Vagharshapat, Armavir	127800	Hrazdan, Kotayk	62500
Martuni, Gegharkunik	123000	Noyemberyan, Tavush	62300
Yeghegnadzor, Vayots Dzor	121900	Artik, Shirak	61000

Town or Administrative District	Price per 1 square meter, drams	Town or Administrative District	Price per 1 square meter, drams
Yeghvard, Kotayk	120600	Ayrum, Tavush	60200
Ijevan, Tavush	116650	Tashir, Lori	58600
Dilijan, Tavush	114000	Vardenis, Gegharkunik	56500
Ashtarak, Aragatsotn	111500	Gavar, Gegharkunik	54200
Masis, Ararat	108050	Maralik, Shirak	51300
Jermuk, Vayots Dzor	107500	Alaverdi, Lori	51000
Artashat, Ararat	107200	Chambarak, Gegharkunik	40500
Kapan, Syunik	106500	Akhtala, Lori	38300
Kajaran, Syunik	104200	Shamlugh, Lori	28300
Meghri, Syunik	102500	Tumanyan, Lori	23500
Byureghavan, Kotayk	99300	Dastakert, Syunik	21400

Source: Statistical Committee of the Republic of Armenia 2018c

The picture shown in Table 2 generally corresponds to the description of disproportional development of the regions by HDI. Only Tsaghkadzor can compete with Yerevan in fact. The disparity becomes even more evident by the fact that the prices for apartments in the "cheapest" district of Yerevan are about two times higher than in Gyumri, which is considered to be the second city of the country (170 thousand and 87 thousand drams per 1 square meter respectively). If comparing the highest and lowest values presented in Table 2 to evaluate the distance between the poles, the scale is about 26:1 (the real difference is several times greater if considering real estate market prices in rural areas). The same scale is about 9:1 in Serbia, if comparing prices in the most expensive municipality of Savski venac in Belgrade and the "cheapest" town Bor in Borska oblast (Republic Geodetic Authority of the Republic of Serbia, n.d.).

It is noteworthy that even poverty is quantitatively and qualitatively disproportionate. Particularly, in 2017 only 27.7% of the poor population of Armenia lived in Yerevan (32% in other cities and 40.3% in rural areas), whereas the residents of the capital make up more than 36% of the population. As for the quality of poverty, the poverty depth in Yerevan is 3.6%, while in other cities and rural areas it is 4.7% and 4.8% respectively (Statistical Committee of the Republic of Armenia 2018b).

It seems that the regional disparity is very much evident, and the factors making it should have been properly studied and fully disclosed long ago, and the public administration system should have overcome the apparent disproportionality by a set of measures. However, in practice, neither Armenia, nor Serbia has formulated a concept of regional development and has launched a clearly targeted strategic approach yet. There are several documents, such as the Territorial Development Strategy of the Republic of Armenia for 2016-2025 (in which the provision of proportion is included in the defined vision) or the Operational Program of Territorial Development of the Republic of Armenia for 2018-2020, but one single, clear, and utilized approach is essentially missing (Government of the Republic of Armenia 2016, 2017). The proportionate development of territories is mentioned among programs and priorities listed on the official website of the Ministry of Territorial Administration and Infrastructure of the Republic of Armenia (n.d., 2013), but only programs compiled in 2013 could be found in grounds. Perhaps one of the reasons for such a mess is the lack of a united strategic approach and an ideology.

The situation is not much better in Serbia. After the expiration of the Regional Development Strategy of Serbia 2007-2012, there has been a lull in terms of the regional aspect of development. The adoption of the National Plan of Regional Development for Serbia, and in particular the regional policy action plan, is delayed. With the closure of the Ministry of Economy and Regional Development, regional issues are being neglected in domain of public policies. In doing so, regional disparities in Serbia are among the largest in Europe. In this context, it is worrying that public policy makers do not attach adequate importance to the preparations for the opening of Chapter 22 (tackling with regional development issues) in the process of the European Union (EU) accession. Therefore, the Republic of Serbia is using EU Cohesion Policy funds insufficiently to ensure a balanced regional development, which is its constitutional obligation. Occasional and inconsistent

activities aimed at supporting the development of underdeveloped areas only produce sporadic and insufficiently sustainable results (Rikalović, and Molnar 2020, 145).

2. Methods

2.1. Common methods of measuring regional development disparities: advantages and disadvantages

Regional disparity is a ubiquitous issue. It exists in almost all countries to different extents, and almost the whole world strives to combat it. However, before developing policies and actions, and before allocating resources to the “holy war” against the regional disparity, it is essential to answer a simple question: what regional development disparity is, or what we try to reduce. It seems that these are very simple questions, but no answer, clear and acceptable to all, exists yet.

It is logical to use the same indicators while measuring disparity, setting goals, planning concrete actions, and evaluating achievements.

Gross domestic product (GDP) per capita in a region compared to GDP per capita in the country is used as an indicator of proportionality in the “Republic of Armenia 2014-2025 Strategic Program of Prospective Development” (Government of the Republic of Armenia 2014). Moreover, predictions have been made and goals have been set based on the factual figures in 2012 and previous years (Table 3).

Table 3. GDP per capita in regions compared to GDP per capita in Armenia by base scenario of development and by goals of policy scenario

	Factual %	Base scenario of development, %				Policy scenario, %			
	2012	2015	2017	2021	2025	2015	2017	2021	2025
Yerevan	151.7	151.5	152.4	154.0	155.3	136.0	127.6	123.5	121.8
Aragatsotn	82.6	81.7	80.1	77.1	74.1	79.0	79.3	84.6	92.0
Ararat	71.1	71.4	71.0	70.2	69.7	74.3	81.1	84.1	87.1
Armavir	67.0	66.5	65.2	62.8	60.6	68.3	74.6	77.4	80.2
Gegharkunik	69.7	68.7	66.9	63.3	60.0	75.9	83.3	85.6	87.1
Lori	52.7	53.1	53.2	53.4	53.7	58.3	69.3	91.5	100.5
Kotayk	78.4	79.3	80.0	81.5	83.1	83.4	90.2	91.9	93.5
Shirak	59.7	59.3	58.5	56.9	55.4	61.4	70.4	79.7	85.6
Syunik	133.5	136.7	139.0	143.8	149.1	130.6	125.8	119.5	115.8
Vayots Dzor	57.7	57.3	56.7	55.4	54.2	62.7	71.6	79.6	83.3
Tavush	62.6	61.8	60.9	59.0	57.2	68.2	78.3	81.2	84.2

Source: Government of the Republic of Armenia 2014

These predictions are worth comparing to factual figures (Table 4).

Table 4. GDP per capita in regions compared to GDP per capita in Armenia (2015-2018)

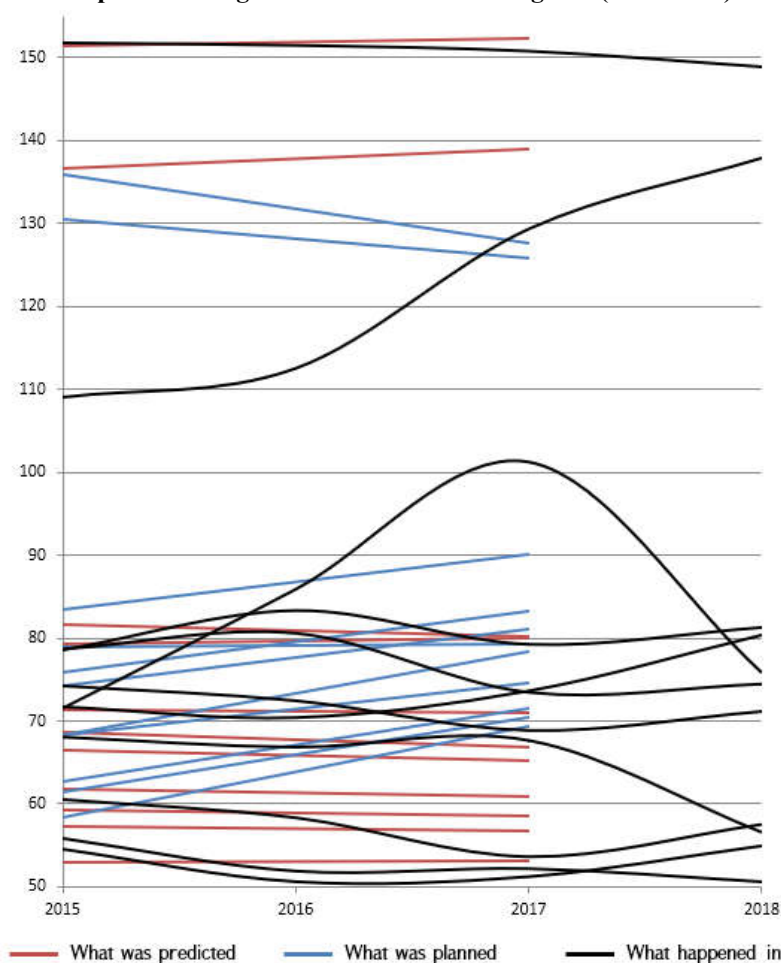
	2015, %	2016, %	2017, %	2018, %
Yerevan	151.8	151.5	150.8	148.9
Aragatsotn	78.6	80.5	73.4	74.4
Ararat	78.5	83.4	79.2	81.3
Armavir	74.2	72.4	68.8	71.1
Gegharkunik	55.9	51.9	52.2	50.6
Lori	68.0	66.8	67.6	56.6
Kotayk	71.7	70.4	73.6	80.3
Shirak	60.6	58.4	53.7	57.6
Syunik	109.0	112.5	129.4	138.0

	2015, %	2016, %	2017, %	2018, %
Vayotz Dzor	71.5	85.9	101.3	75.8
Tavush	54.5	50.6	51.2	54.9

Source: Statistical Committee of the Republic of Armenia, n.d.b

Thereby the Armenian government had predicted that the disparity would deepen, but in case of implementation of policy and planned actions, the differences of GDP per capita values among regions would be significantly reduced. In other words, without intervention the regions would continue “moving away”, while with the planned intervention the regions would “close in”. The factual trends, however, differed from both predicted and planned values (Figure 1).

Figure 1: GDP per capita in regions compared to GDP per capita in Armenia: predictions and plans of the government and factual figures (2015-2018)



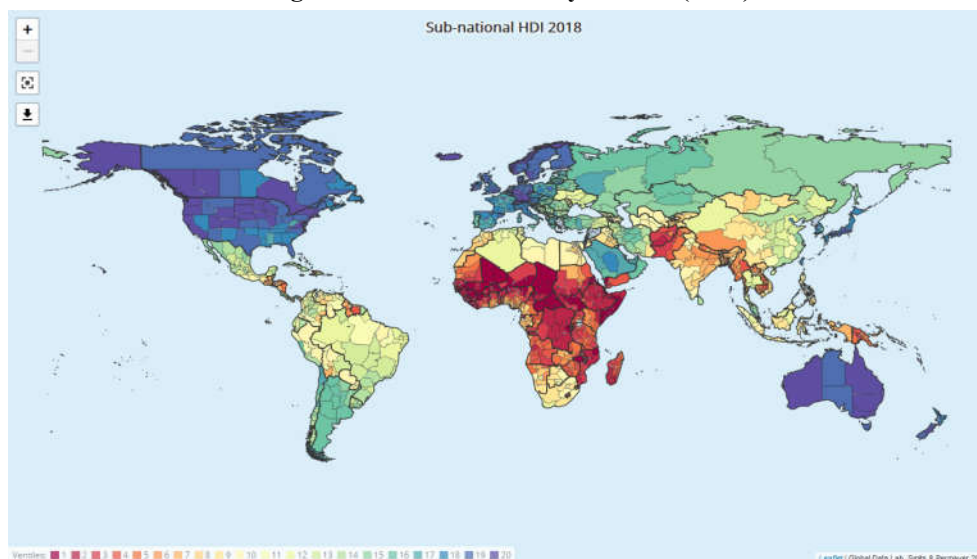
Source: Created by authors based on data from Republic of Armenia 2014-2025 Strategic Program of Prospective Development and Statistical Committee of the Republic of Armenia

Of course, the factors of the displayed tendencies may be studied and understood. For example, maybe some population has moved from regions to the capital, or maybe some economic processes have affected regions in different ways depending on the structure of regional economy, or maybe the tendencies have been resulted by some changes in just one of the regions. Many hypotheses may be listed, but in this case the approval of such hypotheses is not important, as it becomes obvious that the indicator used by the government brings no opportunity of planning and implementing targeted actions. It shows neither success nor failure.

Several other indicators of regional development disparity are used in international practice. Perhaps the most widely used ones are designed on the basis of the HDI. Radboud University (Nijmegen, the Netherlands), in particular, uses the Subnational Human

Development Index, and a database has been created by including data on 1765 regions of 187 countries (Image 1).

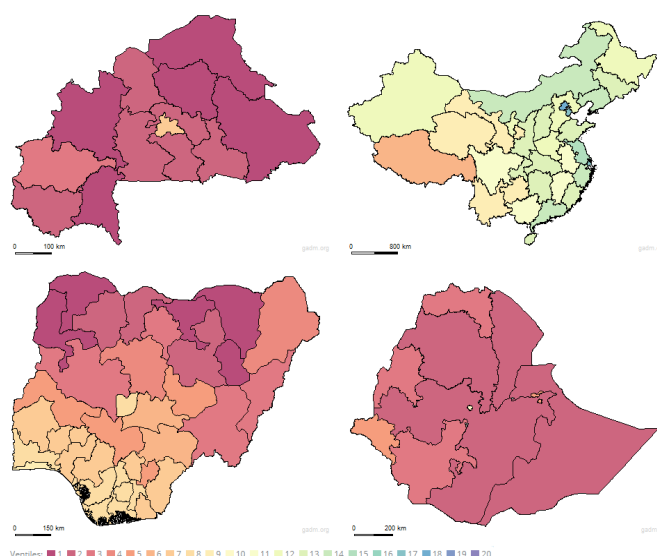
Image 1: Subnational HDI by ventiles (2018)



Source: Institute for Management Research, n.d.

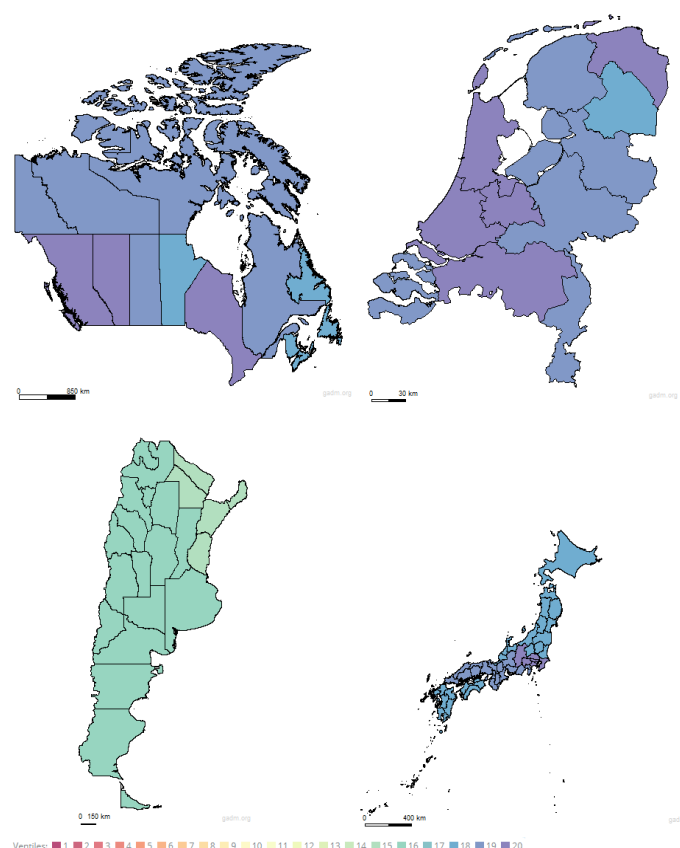
The mentioned database obviously makes it possible to draw some general picture of regional disparity in the world and in particular countries. For instance, as it is known and may also be concluded from the Subnational HDI values, China, Burkina Faso, Nigeria, Ethiopia have very disproportionately developed regions (Image 2).

Image 2: Subnational HDI in Burkina Faso, China, Nigeria, and Ethiopia by ventiles (2018)



Source: Compiled by authors based on maps of the Database of Global Administrative Areas and data from Global Data Lab of the Institute for Management Research

If not taking into consideration microstates and countries with very small numbers of administrative division units, then the Netherlands, Canada, Japan, and Argentina are among countries with the most proportionally developed regions by the same approach applied (Image 3).

Image 3: Subnational HDI in Canada, the Netherlands, Argentina, and Japan by ventiles (2018)

Source: Compiled by authors based on maps of the Database of Global Administrative Areas and data from Global Data Lab of the Institute for Management Research

Besides visualizing disparity, the database of Subnational HDI values provides ground for calculating several more measurable indicators of disparity, such as the difference of Subnational HDI values of the most developed and the least developed regions of a country, or variance-to-mean ratio (Table 5).

Table 5. The range and variance-to-mean ratio of Subnational HDI values in different countries (2018)

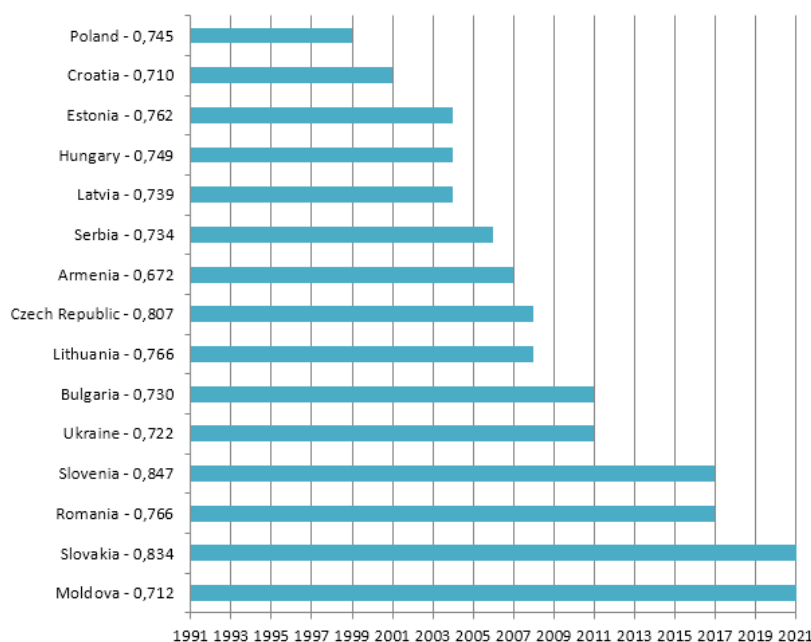
(2010)

Range (maximal – minimal)		Variance-to-mean ratio (%)	
Countries with smallest range / variance-to-mean ratio			
Libya	0.013	Libya	0.77
Ukraine	0.017	Kuwait	0.96
Kuwait	0.019	Ukraine	0.99
Barbados	0.021	Barbados	1.12
Bosnia and Herzegovina	0.029	Trinidad and Tobago	1.36
Countries with smallest range / variance-to-mean ratio with 10 or more regions			
The Netherlands	0.050	Argentina	1.94
Canada	0.055	The Netherlands	1.99
Japan	0.055	Japan	1.99
Argentina	0.061	Germany	1.99
Greece	0.063	New Zealand	2.07
Countries with largest range / variance-to-mean ratio			
China	0.359	Chad	22.57
Burkina Faso	0.341	Eritrea	20.65
Nigeria	0.334	Mali	18.69
Ethiopia	0.280	Nigeria	18.53
Eritrea	0.274	Somalia	18.44
Mali	0.271	Ethiopia	18.26
Chad	0.265	Burkina Faso	17.92
Guinea	0.262	The Gambia	17.69
Papua New Guinea	0.261	Guinea	17.41
Cameroon	0.259	Central African Republic	16.82
Armenia	0.076	Armenia	3.21
Serbia	0.042	Serbia	2.06

Source: Calculated by authors with Apache OpenOffice Calc based on data from Global Data Lab of the Institute for Management Research

The success in overcoming regional development disparities may be evaluated by the number of years needed for all the regions of a country to achieve the level of the most developed region. For example, if taking 1991 as a base year, the highest Subnational HDI was in Yerevan – 0.672, and only in 2007 all the Armenian regions had achieved that level. Thus, 16 years were needed. It is worth comparing countries of Eastern Europe by this indicator, as the “transformation” period in those countries started almost in the same years (Figure 2).

Figure 2: Years needed for achieving the highest Subnational HDI of 1991 in all regions in some countries of Eastern Europe



Source: Created by authors based on data from Global Data Lab of the Institute for Management Research

For sure, available databases allow researchers to develop many statistical solutions, which can be much more “elegant” than the presented calculations (Pourmohammadi, Valibeigi, and Sadrmousavi 2014; Lukis Panjawa, Rizky Samudro, and Maqnu Soesilo 2018; Guastella, and Timpano 2010). However, such statistical solutions, although reflecting regional disparities, have at least one obvious and important shortcoming: it is difficult to set goals for those indicators and to connect them to the activities of state and local authorities.

The same shortcoming exists in the case of the Gini index, which is used by several organizations and individuals to evaluate regional development disparities. For example, the Organization for Economic Co-operation and Development (OECD) tries to measure the most differentiated factors of welfare by Gini index and some other indicators (Theil entropy index, Malmquist index, and others). According to OECD (2016) studies, regional development disparity is mostly significant in such fields as security, incomes, employment, environment, and GDP per capita. Conclusions of this kind are certainly very valuable, and they indicate the fields with need for additional attention. However, those indicators do not guide decision-makers anyhow. Besides that, OECD countries have many similarities, and the used methods do not consider the fact that different perceptions of development and welfare exist in different countries and regions. Employment is a priority in one region, and environment is a priority in another. These perceptions should be taken into account in all the cases when multi-dimensional evaluation is carried out. At this point we would avoid calling those perceptions subjective, as an existence of some regularity cannot be excluded.

However, in conditions of measurability issues in social sciences, at least hundreds of attempts to measure disparity, and the replication crisis in science, a simpler approach of one-dimensional evaluation became quite attractive and perhaps even justified (Fidler, and Wilcox 2018). Evaluations based on education, employment, incomes, salaries, poverty rates are

among such approaches (Korres, and Kokkinou 2011; Correia, and Alves 2017; Prodromidis 2012; Diniz, and Upadhyay 2010). Demographic indicators are also used, such as natural growth, migration figures, etc. Each of these has some specific logic (Wilkinson, and Pickett 2010; Lamande et al., n.d.; Novkovska 2017). For example, the education level describes potential of development, unemployment describes compliance of opportunities to needs in a region, incomes, salary, and poverty describe regional resources and efficiency of their use, natural population growth and especially migration may describe the overall attractiveness of regions. Nevertheless, the comprehensiveness of evaluation is endangered almost for sure if being guided by any one-dimensional approach.

Therefore, many methods have been developed to evaluate regional development disparity, but the applicability of those methods is worth some critical treatment at least. Having no desire to overburden researchers, authorities, or anybody else with one more method with questionable usability, first we find it necessary to outline what characteristics an indicator of regional development disparity should have, and only after that consider designing such an indicator.

2.2. Requirements for methods of measuring regional development disparities

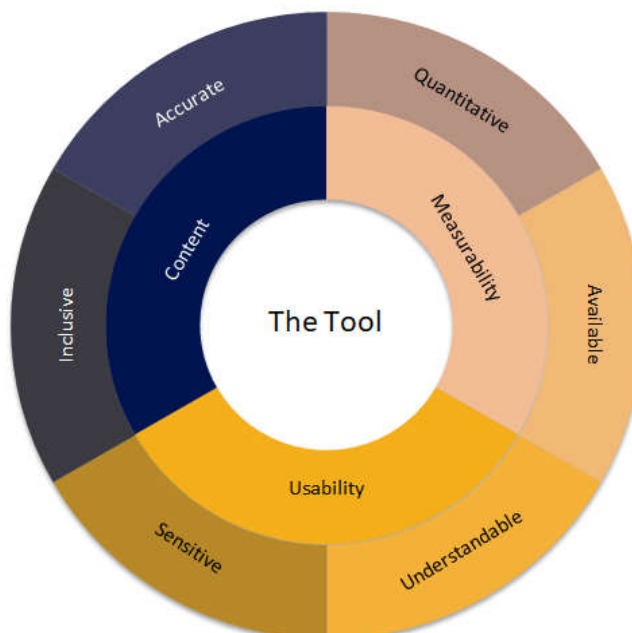
Keeping in mind the idea of designing a measurement tool ideal enough for being implemented as a key performance indicator for authorities responsible for regional development and its parity, it is essential for an indicator or complex of indicators to be:

- **Inclusive.** An indicator should take into consideration all the aspects or dimensions of regional development. On the one hand, an absolute inclusiveness might be ensured: all economic, social, environmental, and other factors should be taken into consideration. On the other hand, however, if all factors are included, it will become necessary to determine the weight of each factor. Therefore, it is reasonable to consider an indicator inclusive if all components of development important to the local population are taken into account.
- **Accurate.** An indicator shouldn't result in false judgements or wrong activities. For instance, no decrease of disparity should be recorded if there was a decrease in the most developed region. In other words, an indicator should clearly differentiate positive and negative trends. This is also important while planning activities and making decisions.
- **Quantitative.** It should be possible to measure an indicator quantitatively, which would make evaluation of progress, comparisons, and setting of measurable goals feasible. Moreover, an indicator should be insensitive to various influences of subjective nature.
- **Available.** Data needed for measurements should be available. No huge new efforts should be required each time measurements are done. For example, regular pricey surveys are not acceptable.
- **Understandable.** The meaning of an indicator should be clear to policymakers and the public. For example, what would happen if asking a random citizen or even a head of community about the figures of HDI in their region, or ask them to interpret its value of 0.750? Being understandable is necessary for making the results of decrease in disparity visible and tangible, as well as for guiding the public in its efforts of regional development.
- **Sensitive.** Decreasing regional disparity is not a self-propelled process: many resources are allocated to it. Those resources are managed mostly by state and local authorities (although there are many cases of private organizations or individuals taking remarkable roles in the development of certain regions). It should be visible for those authorities how their decisions and activities affect an indicator (Ziaril, and Mohammadi 2016). Surely, it is not mandatory for that effect to be direct, but it should be possible to evaluate the indirect impact as well. Thus, the content of an indicator should be sensitive to decisions made and activities carried out.

Ideally, if all the mentioned characteristics are ensured, it becomes real to evaluate activities of officials responsible for decreasing regional development disparities through the same indicator.

Considering the presented characteristics as the standard and guideline for methods of evaluation of regional development disparity (Figure 3), a tool is to be designed, which can reliably serve as a ground for recording, evaluating, and overcoming disparity with its content, measurability, and usability.

Figure 3: The suggested standard of methods of evaluation of regional development disparity



Source: Created by authors

The first step could perhaps be the identification of most inclusive descriptors. What does it include to be a developed region? Overall, the threshold of being developed is when a proper level of quality of life may be ensured in a region without significant difficulties, and it is mostly ensured in fact. In other words, in a region there should be:

- Sufficient infrastructure ensuring access to goods and services needed for the good quality of life
- Conditions and opportunities for generating legal incomes
- Conditions contributing to the stability of conversion of incomes into goods and services

Sufficient infrastructure covers availability of roads and necessary transportation flows, trade and various services, and any general features of the area which are important for locals (Constantin, Nastaca, and Geambasu 2021). Each component of sufficient infrastructure may be separately evaluated with some specific indicators. However, all those components affect real estate prices in a region. From this point of view, real estate prices (in particular, prices of residential properties) are perhaps the most inclusive indicator. Moreover, market prices are almost impersonal, as being resulted by numerous deals. Of course, there are various preferences among actors of real estate markets, but if in case of other indicators some weighting of preferences is needed, then in case of market prices the preferences are already weighted through market mechanisms. Therefore, residential property prices are a good indicator of sufficient infrastructure. However, it is mostly true for urban areas, while in rural areas the real estate market may perform with a bit different logic.

Conditions and opportunities for generating legal incomes refer to forming incomes in a region through labor, entrepreneurship, or any other legal activity. In other words, there should be a proper number of jobs with proper remuneration in a region, as well as there should be a capital market developed enough for ensuring efficiency of savings. Incomes of the population, poverty rate, jobs, employment rate, unemployment rate, average salary, investments, and many other indicators may be considered for this domain (Hirobe 2014, 2020; Alexiadis, and Ladas 2011; Sokolowicz 2011). The most understandable one is

perhaps average salary. As some components of the capital market are not well developed in many countries (including Armenia), and incomes generated through the capital market are mostly relevant to people with higher incomes, the average salary becomes a more important indicator for evaluation of regional development. However, depending on the extent of distribution, the average salary may reflect the opportunities for forming incomes not accurately. Though it seems that the average salary should be complemented with other indicators, the tandem with residential property prices reflects the distribution of incomes, as higher rates of unemployment or poverty usually negatively affect the property prices in a region, for example, through increase of the crime rate: analyses of crime rates and residential property prices outside the center of 223 cities show moderate correlation (Numbeo, n.d.b, n.d.c).

Conditions contributing to the stability refer to low level of obstacles or threats, which could reduce or interrupt conversion of incomes into goods and services. Such threats may be environmental, in the field of health care, concerning the availability and quality of food and water, be related to crimes, etc. In this sense, the average life expectancy is one of the most inclusive indicators. Regarding economic threats (such as crime against property), they are already reflected via residential property prices. Besides that, it is known and empirically validated that average life expectancy is interconnected with figures of gross domestic product per capita, incomes, equality, education, and many other important characteristics (Bloom, and Canning 2017; Hummer, and Hernandez 2013). Various studies claim that development of urban settlements resulted in a higher life expectancy. For instance, such a tendency could be observed in the United States of America at the beginning of the 1990s and in Armenia in the mid-2000s (Singh, and Siahpush 2014). At the same time, the average life expectancy for rural populations is not lower than for urban populations in England, where rural settlements are usually characterized with better sustainability conditions (Kyle, and Wells 2010). This is another reason why average life expectancy should be considered a good indicator of regional development.

For certain, there are many general indicators to reflect the degree of regional development, such as migration, for example. However, such general indicators are unsuitable, as they may be significantly affected by state policy (for example, immigration limitations), require unified methodology and monitoring by administrative authorities. Hence, the above mentioned three main indicators are to be considered as a basis for evaluating development and its regional disparity (Table 6).

Table 6. The considered indicators of regional development and its disparity and their compliance with the suggested standard of methods of evaluation

Component of the standard	Average market price per 1 square meter of residential properties	Average net monthly salary	Life expectancy
Inclusive	Reflects availability of almost all the prioritized goods and services.	Reflects opportunities for generating legal incomes.	Reflects conditions contributing to the stability of conversion of incomes into goods and services
Accurate	From the side of affordability, it is obviously not positive to have high prices for residential properties. On the other hand, higher prices mean more infrastructure and opportunities. Residential property prices should be in accordance with incomes of the population. To reflect this, the intended method of evaluation should identify parity between property prices	In some cases, high salaries may be unattractive for investors, but this peculiarity refers to the initial stages of development of a region. In long terms the increase of investments results in the increase of salaries. Therefore, higher values of average salary are positive in almost all cases. To neutralize the influence of differences and changes of taxes and fees, net	The higher life expectancy, obviously the better.

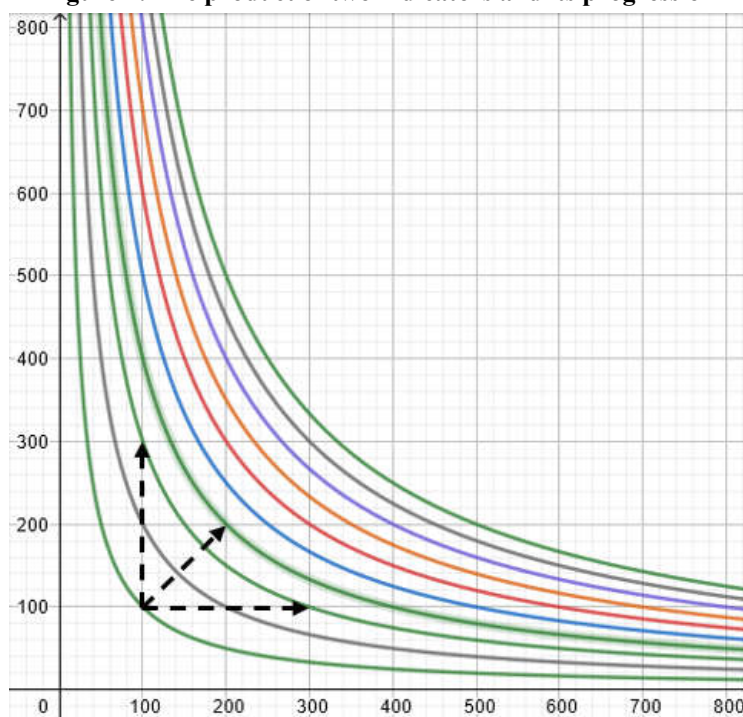
Component of the standard	Average market price per 1 square meter of residential properties	Average net monthly salary	Life expectancy
Quantitative	and salaries as a more positive situation. Monetary units are used. It is better to use the United States dollar (USD) for comparisons and progress evaluation. Besides that, USD is factually used in the Armenian real estate market as the main unit. The indicator comes from the market, therefore it is not directly influenced by any single person.	values are more suitable to be used. Monetary units are used. It is better to use USD for comparisons and progress evaluation. Besides that, USD is incomparably more stable than Armenian dram. The indicator comes from the market, therefore it is not directly influenced by any single person.	Years or months are used as units. To increase the visibility of changes, it is more suitable to use months for the measurements. The indicator is completely insensitive to personal influences of subjective nature.
Available	Most of the data is regularly published by the Statistical Committee of Armenia and statistical services of other countries, as well as international organizations. However, data for not all the regions is being processed, though microdata is available.	Data is regularly published by the Statistical Committee of Armenia and statistical services of other countries, as well as international organizations.	Data is regularly published by the Statistical Committee of Armenia and statistical services of other countries, as well as international organizations.
Understandable	The indicator is understandable for policy makers and the public.	The indicator is understandable for policy makers and the public.	The indicator is understandable for policy makers and the public.
Sensitive	The direction of influence of decisions by state or local authorities is mostly predictable.	The direction of influence of decisions by state or local authorities is mostly predictable.	It is hard to predict the influence of decisions by state or local authorities, as it is always indirect. However, by studying factors of life expectancy, it becomes possible to predict the direction and approximate extent of influence.

Source: Created by authors

2.3. The proposed method of measuring regional development disparity

As the considered three indicators basically match with the requirements of the suggested standard of methods of evaluation of regional disparity, they may be used as the key components of the method.

Regarding the issue of parity between property prices and salaries, the simplest solution is application of product or geometric mean. In this case an increase of any indicator with, for instance, 200 USD will indicate a smaller progression than in case of 100 USD increase for each indicator. This can be easily observed graphically (Figure 4).

Figure 4: The product of two indicators and its progression

Source: Created by authors with GeoGebra Calculator Suite

Approaching to the third indicator with the same although not that much obvious logic (Figure 5), the formula (1) is to be used to measure regional development:

$$D = (P \times S \times L)^{1/3} \quad (1)$$

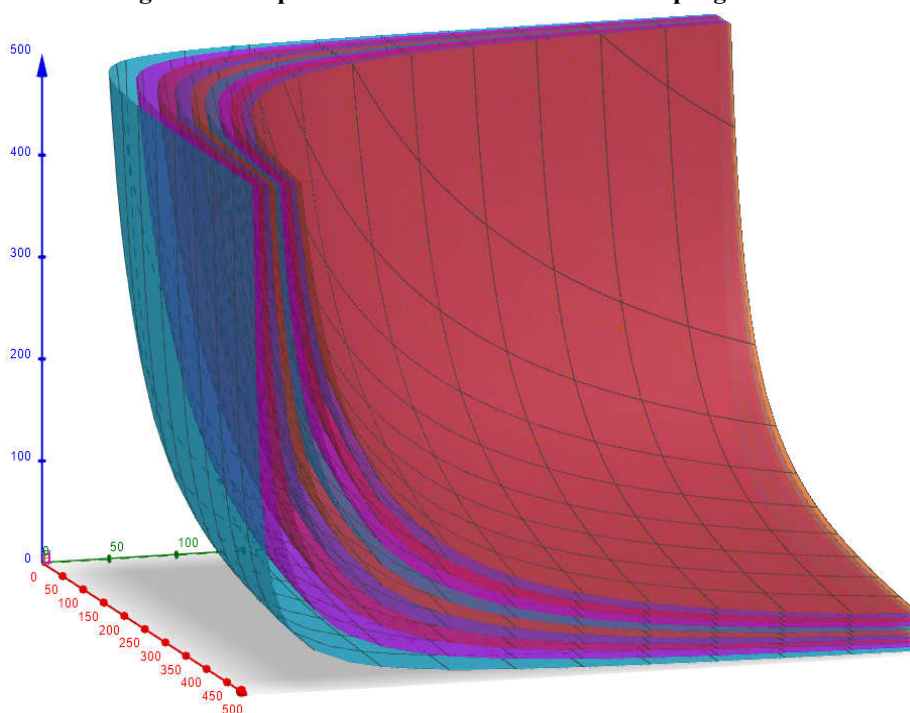
where

D is the score of development of a region,

P is the average market price per 1 square meter of residential properties in USD,

S is the average net monthly salary in USD,

L is the life expectancy in months.

Figure 5: The product of three indicators and its progression

Source: Created by authors with GeoGebra 3D Calculator

The application of geometric mean is more suitable than product, as it makes the meaning of D more understandable, while almost not changing the logic of calculations. For example, if D equals 900, then the situation in the region is equivalent to the one when the average market price per 1 square meter of residential properties is 900 USD, the average net monthly salary is 900 USD, and the life expectancy is 900 months or 75 years.

To test D as an indicator of development, calculations are made and shown in Table 7 for many countries, for which comparable data is available (Nubmeo, n.d.d, n.d.a; Worldometer, n.d.).

Table 7. D in different countries (2020)

Country		D	Country		D
1.	Hong Kong	3908,73	48.	Latvia	1051,16
2.	Switzerland	3765,1	49.	Panama	1033,67
3.	Luxembourg	3371,28	50.	Costa Rica	1006,64
4.	Singapore	3212,08	51.	Malaysia	1005,23
5.	France	2603,16	52.	Argentina	987,55
6.	South Korea	2579,12	53.	Romania	942,92
7.	Israel	2576,57	54.	Russia	933,46
8.	Norway	2491,2	55.	Montenegro	915,68
9.	Denmark	2443,11	56.	Serbia	883,88
10.	Japan	2425,22	57.	Bulgaria	866,94
11.	Australia	2414,73	58.	South Africa	864,54
12.	Germany	2340,32	59.	Bosnia and Herzegovina	857,43
13.	Finland	2316,16	60.	Iran	815,45
14.	Netherlands	2241,99	61.	Vietnam	790,36
15.	United Kingdom	2240,81	62.	Jordan	786,68
16.	Sweden	2217,28	63.	Peru	784,64
17.	New Zealand	2207,5	64.	Philippines	777,16
18.	Ireland	2206,55	65.	Belarus	765,85
19.	Iceland	2173,89	66.	Guatemala	760,46
20.	Qatar	2128,28	67.	Ecuador	750,2
21.	Austria	2097,55	68.	Bolivia	726,28
22.	United States	2051,19	69.	Mexico	716,81
23.	Canada	2033,76	70.	Indonesia	701,98
24.	Taiwan	1934,46	71.	Morocco	699,49
25.	Belgium	1896,06	72.	North Macedonia	693,28
26.	United Arab Emirates	1778,59	73.	Iraq	690,88
27.	China	1722,49	74.	Brazil	688,71
28.	Italy	1636,05	75.	Colombia	681,57
29.	Malta	1596,66	76.	Armenia	681,27
30.	Spain	1572,65	77.	India	680,76
31.	Czech Republic	1553,47	78.	Albania	677,22
32.	Slovenia	1520,15	79.	Kazakhstan	653,19
33.	Estonia	1372,72	80.	Ukraine	628,97
34.	Slovakia	1300,36	81.	Turkey	614,12
35.	Portugal	1293,15	82.	Georgia	608,6
36.	Cyprus	1233,67	83.	Algeria	583,25
37.	Croatia	1231,32	84.	Moldova	581,09
38.	Puerto Rico	1220,2	85.	Azerbaijan	572,66
39.	Poland	1192,56	86.	Tunisia	557,07
40.	Hungary	1163,52	87.	Dominican Republic	548,04
41.	Lithuania	1143,29	88.	Bangladesh	547,11
42.	Greece	1130,27	89.	Nepal	537,67
43.	Lebanon	1108,3	90.	Venezuela	516,8
44.	Saudi Arabia	1073,05	91.	Uzbekistan	466,39
45.	Chile	1060,26	92.	Egypt	460,85
46.	Thailand	1059,25	93.	Pakistan	428,82
47.	Uruguay	1058,61	94.	Syria	380,64

Source: Calculated by authors with Apache OpenOffice Calc

The ranking of countries by D provides a picture very similar to many other rankings by various indicators of development. Thus, D provides a well-directed reflection of development of regions.

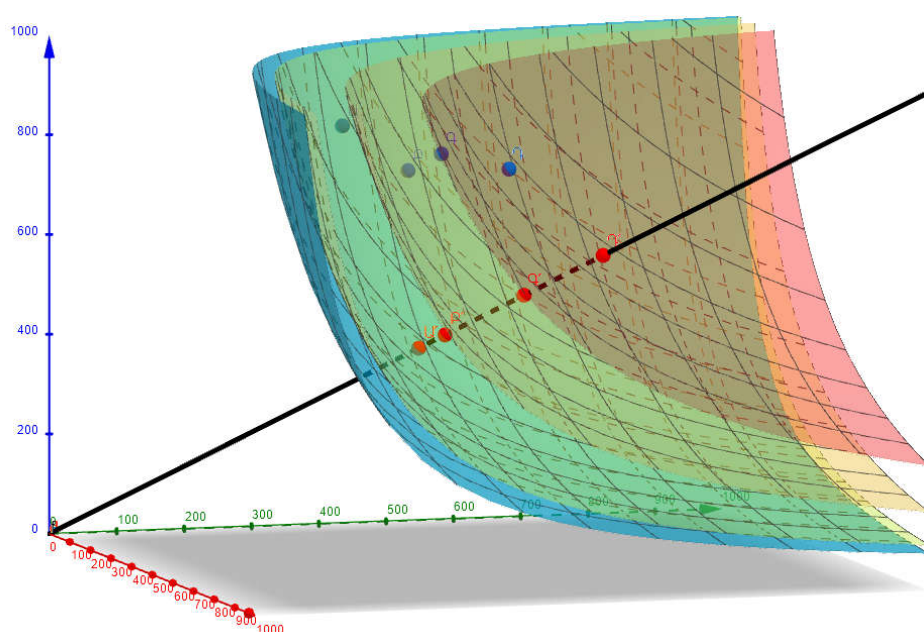
A suppositive example may be considered to understand the transformation of D into an indicator for measuring regional development disparity (Table 8).

Table 8. Suppositive example for measuring regional development disparity through D

Region	P	S	L	D
Region 1	245	360	840	420
Region 2	270	450	750	450
Region 3	432	450	810	540
Region 4	630	490	810	630

Source: Created by authors

It may seem that the simplest solution is application of standard deviation for values of D (StDev(D)), which equals 94.87 points. However, if D increases in all the regions, for example, by 40 points (thus becoming 460, 490, 580, and 670 accordingly), then the standard deviation for D will remain 94.87. This means that some progress has occurred in every region, but it has not been captured by the indicator. That is why the application of diagonal standard deviation (StDev(Dgn)) is more reasonable (Figure 6).

Figure 6: Measuring regional development disparity through diagonal standard deviation for D values

Source: Created by authors with GeoGebra 3D Calculator

The red spots in Figure 6 are diagonal or parity equivalents of blue spots, which represent D values for regions. For example, at the parity equivalent spot for Region 1 the values of P, S, and L are all equal to 420, as well as the value of D.

Diagonal standard deviation reflects distribution of parity equivalent spots on the diagonal. Evidently, wider distribution means deeper regional disparity.

Values of parity equivalents on the diagonal (Dgn) are calculated with the formula (2):

$$Dgn = D^{1/3} \times 3^{1/2} \quad (2)$$

As Dgn measures the distance of parity equivalents from the zero-point, diagonal standard deviation captures proportionate increase of D values in regions (Table 9).

Table 9. Measuring regional development disparity through diagonal standard deviation for D values

Region	D	Dgn	D'	Dgn'	D (+/-)	Dgn (+/-)
Region 1	420	12.97	460	13.37	+40	+0.40
Region 2	450	13.27	490	13.66	+40	+0.38
Region 3	540	14.10	580	14.44	+40	+0.34
Region 4	630	14.85	670	15.16	+40	+0.31
StDev(D)	94.87	-	94.87	-	0	-
StDev(Dgn)	-	0.848	-	0.807	-	-0.041

Source: Calculated by authors with Apache OpenOffice Calc

Therefore, the StDev(Dgn) indicator or diagonal standard deviation of D values reflects regional disparity more accurately. Nevertheless, the StDev(D) indicator or standard deviation of D values is more understandable. For example, if it equals 94.87, then the gap between regions with below average level of development and country average may be described with 95 USD cheaper residential properties, 95 USD lower salaries, and 8 years shorter life expectancy. As such interpretation is more understandable, it is worth using both StDev(D) and StDev(Dgn) indicators while evaluating regional development disparity.

3. Calculations and results

Calculations of the D, StDev(D) and StDev(Dgn) indicators have been made for Armenia and Serbia. The rationale behind that is the existence of several key similarities of economic, social, and cultural nature. Historically, both nations were on the frontline of cultural clashes through centuries. Armenia and Serbia had been heavily involved in World War I and passed through Ottoman Empire, socialism, and relatively recent wars. It is crucial that both countries are landlocked. All those factors have significantly influenced the perception of local governance and role of communities, as well as the mindset toward socioeconomic processes in general (Hayrapetyan, Asatryants, and Mnatsakanyan 2017).

By processing data published by the Statistical Committee of the Republic of Armenia (n.d.b, n.d.a, 2018a) and the Statistical Office of the Republic of Serbia (2014, 2015, 2016, 2017, 2018, 2019, 2020, n.d.), as well as by the Cadastre Committee of Armenia (n.d.) and Republic Geodetic Authority of Serbia (n.d., 2021), and by using currency exchange rate archives, a database was created and calculations were made for different levels, in particular, regions and towns of Armenia, and provinces, municipalities and towns of Serbia (the Nomenclature of Territorial Units for Statistics (NUTS) 1 and NUTS 2 levels were also observed, but not given importance due to the small number of units).

D was estimated for all the mentioned levels for a start. The results were primarily used for measuring disparity, but also for being compared with common perception of development level of particular regions to validate the methodology of D once more. Some results are presented in Tables 10, 11, and 12.

Table 10. D in Armenian regions in 2014-2019

Region	2014	2015	2016	2017	2018	2019	P (2019)	S (2019)	L (2019)
Yerevan	592	593	601	598	623	644	761	382	920
Syunik	410	407	408	418	442	461	212	506	918
Armavir	371	374	382	365	348	369	214	256	915
Kotayk	359	358	362	351	344	351	182	260	917
Ararat	311	312	320	312	305	342	137	318	914
Vayotz Dzor	348	349	352	344	335	339	177	240	915
Tavush	334	337	352	344	329	336	185	224	916
Shirak	348	350	358	343	327	335	196	210	917
Aragatsotn	313	313	311	310	306	316	161	215	914
Lori	332	335	338	333	306	308	136	236	917
Gegharkunik	302	307	310	301	285	290	123	217	914
Armenia	507	508	509	505	519	539	494	346	918

Source: Calculated by authors with Apache OpenOffice Calc

Table 11. D in Armenian towns in 2019

Top 10 towns	D	Bottom 10 towns	D
Yerevan	644	Artik	298
Tsaghkadzor	538	Vardenis	294
Goris	528	Tashir	293
Kapan	484	Alaverdi	290
Meghri	473	Maralik	286
Kajaran	472	Dastakert	279
Abovyan	452	Tchambarak	278
Ejmiatsin	450	Akhtala	263
Sisian	448	Shamlugh	262
Masis	438	Tumanyan	231

Source: Calculated by authors with Apache OpenOffice Calc

Table 12. D in Serbian provinces (oblast), towns and municipalities in 2019

Province	D	Town	D	Municipality	D
Top 10					
Beogradska oblast	1005	Grad Beograd	1005	Savski venac	1275
Grad Beograd					
Južnobačka oblast	839	Grad Novi Sad	879	Stari grad	1213
Šumadijska oblast	715	Kragujevac	746	Vračar	1197
Nišavska oblast	712	Grad Niš	728	Novi Beograd	1131
Zlatiborska oblast	688	Grad Požarevac	727	Zvezdara	1011
Južnobanatska oblast	677	Grad Užice	715	Voždovac	990
Braničevska oblast	675	Pančevo	704	Zemun	965
Severnobačka oblast	664	Vršac	691	Čukarica	926
Srednjobanatska oblast	662	Šabac	689	Palilula (Grad Beograd)	918
Kolubarska oblast	662	Novi Pazar	683	Novi Sad	880
Bottom 10					
Rasinska oblast	608	Grad Vranje	647	Kovačica	433
Pčinjska oblast	602	Kruševac	645	Plandište	430
Pomoravska oblast	600	Loznica	625	Ljubovija	427
Jablanička oblast	599	Jagodina	623	Mali Zvornik	423
Raška oblast	595	Sombor	616	Bela Crkva	421
Zapadnobačka oblast	575	Leskovac	610	Trstenik	420
Severnobanatska oblast	569	Zaječar	589	Aleksandrovac	419
Toplička oblast	561	Prokuplje	581	Brus	417
Zaječarska oblast	557	Kikinda	577	Čičevac	416
Borska oblast	537	Bor	565	Varvarin	406
Serbia	835				

Source: Calculated by authors with Apache OpenOffice Calc

Although estimations of D already give grounds for discourse, many hypotheses and conclusions, StDev(D) and StDev(Dgn) are still the main indicators of regional development disparity (Table 13).

Table 13. StDev(D) and StDev(Dgn) in Armenia and Serbia in 2014-2019

Level	2014	2015	2016	2017	2018	2019
StDev(D)						
Regions, Armenia	81,1	80,5	81,6	83,4	96,7	100,6
Towns, Armenia	82,3	82,4	84,1	81,6	77,1	80,5
NUTS 1 units, Serbia	140,6	132,6	140,7	153,5	162,7	184,1
NUTS 2 units, Serbia	133	123,9	130,6	141,4	149,7	167,2
Provinces, Serbia	85,3	77,2	80,6	85,7	90,4	97,4
Municipalities, Serbia	133,9	120,5	124,3	131,6	141,8	150,7
Towns, Serbia	81,9	74,2	77,6	81,4	83	89,5
StDev(Dgn)						
Regions, Armenia	0,815	0,805	0,81	0,835	0,967	0,986
Towns, Armenia	0,974	0,975	0,989	0,959	0,851	0,869
NUTS 1 units, Serbia	0,986	1,005	1,053	1,116	1,127	1,259
NUTS 2 units, Serbia	0,899	0,905	0,943	0,992	1	1,103
Provinces, Serbia	0,632	0,614	0,632	0,65	0,651	0,691
Municipalities, Serbia	1,04	1,01	1,03	1,057	1,06	1,101
Towns, Serbia	0,601	0,586	0,604	0,613	0,591	0,626

Source: Calculated by authors with Apache OpenOffice Calc

4. Discussion and conclusions

The described method of measuring regional development disparity and the corresponding estimations have been discussed by authors with representatives of the Armenian and Serbian scientific communities. It is worth making special mention of the discussion held at the Faculty of Economics of the University of Belgrade in May 2021. The discussion with the academic staff of the faculty contributed to refining and rationale of the methodological choices.

One of the primary reflections refers to D values, which are in line with common understanding of levels of development of regions. In general, this is an extra validation of the fact that D is a proper indicator for measuring development.

Through observing the structure of D in Armenian regions (Table 10), one can notice that a very broad range of S to P ratio exists in regions (from 0.5 to 2.4). It means that usually the

development is not properly planned. The incomes and infrastructures are not in accordance. This is a very crucial factor for authorities responsible for regional and local development planning and implementation: the development should be planned toward all its dimensions, ensuring equilibrium of economic, social, and environmental policies (Papadaskalopoulos, and Nikolopoulos 2018).

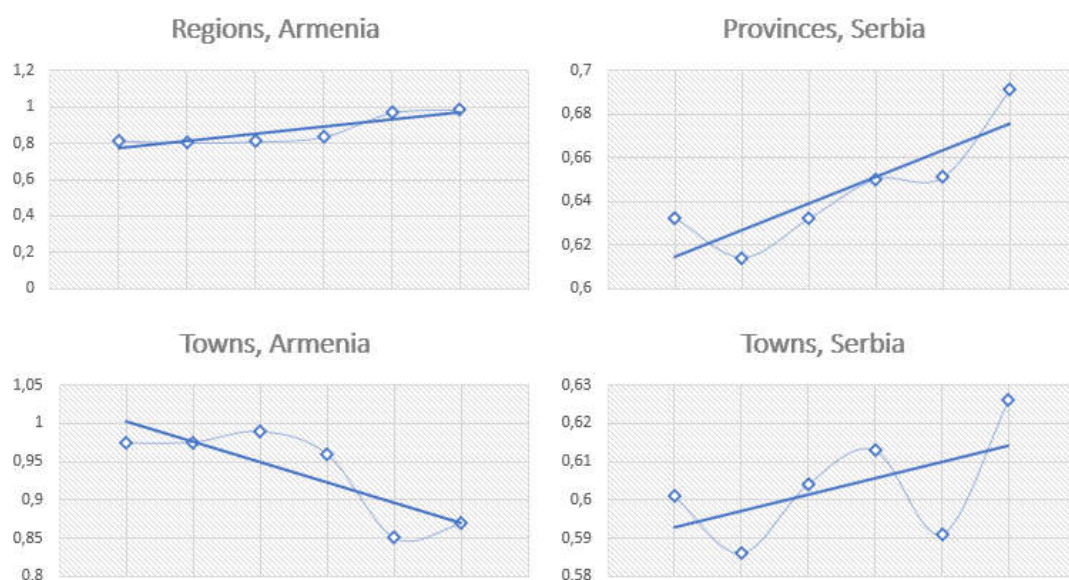
Both countries have gravity centers and black holes of development.

Development of towns, as gravity centers, determine development of regions in most of the cases. It cannot be said that existence of such gravity centers is either positive or negative, but the observed role of towns prompts considering at least two strategies: the strategy of betting on towns, with which the authorities should concentrate more on development of urban communities to promote services, industry, and construction; and the strategy of covering all the settlements, with which the authorities should try to prevent flow of population to urban areas and concentrate more on the weakest points on the whole map. Although the dilemma of these two strategies may seem obvious to arise at the very beginning of forming a policy for regional development, neither Armenia, nor Serbia has formulated a clear vision on the issue.

The capital cities of both countries have played the role of black holes of development for years. Migration, urbanization, real estate market growth, investments, services, better quality of life, incomes, labor market growth – it is an unbreakable vicious circle, which leads to draining of regions and deeper disparity. The outcomes of such processes are not always negative, and many successful agglomerations are formed (for example, in Germany, United States, or Japan), but in the cases of Armenia and Serbia, the social and economic conditions for population of regions are strict limitations for such success (Hayrapetyan, Asatryants, and Mnatsakanyan 2017). That is why the strategic planners of regional development should consider forming competitive advantages over the capital city. Such advantages may refer to taxation, special infrastructure for specific industries, excellent professional education for specific specializations, and many other features.

Another conclusion is that both countries do not register any meaningful trend in overcoming regional disparity. Without properly implemented policies for reducing disparity, StDev(Dgn) varies not much and not in a guided direction in Armenia and Serbia. However, the trendlines show clear difference of the two countries (Figure 7).

Figure 7: Trendlines of StDev(Dgn) values in 2014-2019



Source: Created by authors with Microsoft Excel

Both Armenia and Serbia have increasing StDev(Dgn) at the regional level, but the trends are different at the level of towns. It means that in the case of Armenia a rising issue is the disparity between urban and rural areas, while in the case of Serbia an issue of increasing disparity among urban areas also exists.

In the case of Serbia, it is very logical that the disparity on the level of municipalities is higher than on the level of provinces, and on the level of towns disparity is lower. Obviously,

rural areas are less developed, and it is reflected in Table 13. A similar situation may be observed in Armenia only since 2018. The disparity among towns in 2017 and previous years was higher than disparity among regions. The explanation is the effect of the black hole both on rural and urban areas. However, at some point the lack of affordability of living in the capital city affected the system: gravity centers became more attractive, and expansion of tourism played its role as well (Andrei et al. 2015).

Taking into consideration all the discussed factors and revealed gaps of regional development planning, the following recommendations are made:

- A complex of key performance indicators should be developed and implemented for state, regional and local authorities who are responsible for regional development and its parity.
- In particular, D should be used on the local level in both Armenia and Serbia, as local self-government bodies are mainly responsible for the development of communities. In case of consolidated communities and relatively large cities, D should be combined with standard deviation indicators to secure parity among settlements or districts.
- Both D and standard deviation indicators should be used as key performance indicators for authorities on state and regional levels, who are also responsible for balance of urban and rural lives.
- Concrete targets should be set. In Armenia, it could be D equal to 1000 in each region and each town. The goal for StDev(Dgn) could be set at 0.7 for regions and 0.6 for towns by 2025.
- In Serbia, although disparity is increasing at all the evaluated levels, development disparity among towns should be in focus of authorities. The goal for StDev(Dgn) could be set at 0.5 for towns by 2025 through achieving the current level of Belgrade in all Serbian towns (D equals 1005).
- To ensure proper implementation of the indicators, a training program should be designed for corresponding authorities. This program should include the toolkit of regional government and local self-government with all the tools discussed in connection with the main dimensions of development (P, S, and L). Any decision maker should understand probable consequences of a decision and be directly affected by its outcomes.
- To identify the most effective ways of ensuring development in specific regions, all local budgetary and regional statistics should be monitored in regard to indicators of development and disparity.

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Announcements, Conferences, News

19th EURegionsWeek 2021



Event Overview¹

The European Week of Regions and Cities (#EURegionsWeek), is a major annual Brussels-based event dedicated to regional policy. The event serves as a platform for discussing and showcasing the development of the EU cohesion policy, and for contributing decision-makers being more aware of the importance of regions and cities in the EU. The University Sessions of the event are organized by the European Commission, Directorate-General for Regional and Urban Policy (DG REGIO), and the European Committee of the Regions (CoR), advised by the Regional Studies Association European Foundation (RSA Europe, which is a major partner at the event), the cooperation of the European Regional Science Association (ERSA), and the Association of European Schools of Planning (AESOP).

This year's event, the 19th EURegionsWeek was held on 11-14 October 2021 with success and recorded the highest number of 17.600 participants. With its 591 partners, 30 stands, 1261 speakers and moderators, 142 video testimonials, the program of the 19th event highlighted how cohesion policy and funding helped communities to navigate the COVID-19 crisis in countless ways - and how these are crucial for promoting long-term growth once the pandemic eases. More than 4000 messages (exchanged on the user-friendly platform, encouraging interaction, messages) fed the discussion around the four themes of this edition: cohesion, green, digital, and Citizens' engagement.

The Opening session was the first high-level debate of the week, hosted as a TV show, and attracted 1.400 live followers via the streaming available on the event's platform and 2.000 views via social media channels. Several VIP panelists, including the President of the European Committee of the Regions, the European Commissioner, and the EP REGI Chair, joined the debate and focused on the transition from emergency to sustainable recovery. Many CoR members contributed as well, via live and remote interventions.

In a ceremony underscoring the importance of a free press in upholding EU values, two young journalists from the Youth4RegionsCompetition, one from Ireland and the second from Spain, were chosen as recipients of this year's Megalizzi-Niedzielski prize. The prize was jointly awarded by the Commissioner and Chair of the EP REGI Committee.

Finally, the Closing session harvested the results of this year's edition. During this session, 4 short videos summarizing the event were played and the 1323 responses of the EURegionsWeek 2021 #TheVoiceOfTheWeek online survey were unveiled. All recordings of sessions and high-level events are available in English, French, and German.

The #EURegionsWeek has also served as a platform for fostering the ongoing debate on democracy and citizen's engagement in the context of the Conference on the #FutureofEurope. The organizers invite all interested citizens to feed the debate, share ideas, and post comments to continue the Citizens' Dialogue.

More information about the review of the event is available at the URL: <https://europa.eu/regions-and-cities>.

¹ Event overview edited by Dimitrios Tsiotas, RSIJ

48th Annual Conference - Stirling 5-7 July 2022



Event Overview²

The British and Irish Section (BIS) of the Regional Science Association International (RSAI) announces the 48th Annual Conference, which will take place on 5-7 July 2022, in the form of an in-person event. The conference will take place in the same location as the 2020's conference, Stirling, Scotland, due to the cancelation of the previous conference that the public health concern of the coronavirus (COVID-19) pandemic caused. Suggested themes for the conference are listed below, though quality papers in all areas of regional science are welcome.

- Spatial analysis of productivity and labor markets
- Higher education and the impact of universities on regional economies
- Migration, refugees, and integration
- Spatial analysis of voting behavior and political outcomes
- Regional science in business (retail and geo-demographics)
- Transportation networks and their regional economic impact
- Regional disparities in health and well-being outcomes
- Spatial analysis of marine economies and renewable energy
- Scottish devolution, the UK, and Brexit
- Urban futures (and sustainable cities)
- Inequalities in subjective wellbeing
- Social welfare assistance and reform

The deadline for submission of abstracts is the 31st of January 2022. Submission of abstracts of approximately 300 words is welcomed online at <http://www.rsai-bis.org/online-abstract-submission.html>. Authors will be notified of the committee's decision in February 2022. The authors should also indicate if they wish the paper to be considered for the early career-best paper and/or best presentation awards.

The traditional early-career colloquium will take place in an online format before the conference. This provides a great opportunity for Ph.D. students and early career researchers (within 3 years of their Ph.D.) to present and discuss their work with experienced academics in their field. The organizers welcome students at any stage of their Ph.D., and particularly first-year Ph.D. students are strongly encouraged to apply and may present research plans or work in progress. Attendance at the colloquium is free for accepted presenters and existing RSAI-BIS members. Early career presenters included in the program, and who are not currently members, will also receive free membership of RSAI-BIS for 2021/22, thanks to a generous donation from one of the RSAI-BIS members. The free membership entitles them to discounted rates at RSAI-BIS, ERSA, and RSAI events, as well as free access to RSAI publications. A panel of judges will award prizes for the best paper and the best presentation. Prize winners will receive a certificate and will be entitled to attend the 2022 annual RSAI-BIS conference (in Stirling, Scotland), for free. The prize covers fees, accommodation, and economy-class travel costs. Shortlisted candidates will also receive a certificate and their first drink at the 2022 annual conference.

More details on the themes of the conference, and important dates, can be found on the conference webpage <https://www.rsai-bis.org>.

² Event overview edited by Dimitrios Tsiotas, RSII

Academic Profiles



Anastasia Stratigea, Dipl. Eng., Ph.D., is currently Professor in Spatial Planning and Policy at the Dept. of Geography and Regional Planning, School of Rural, Surveying and Geoinformatics Engineering, National Technical University of Athens (NTUA). She holds a Diploma in Rural and Surveying Engineering from the Aristotle University of Thessaloniki (1984); and a PhD from the National Technical University of Athens, Dept. of Geography and Regional Planning (1996). She has participated in a number of National and EU Projects. She is also member of several scientific national and international associations and networks [NECTAR, COST A22, EFONET, EU-MED, SMART-MED, Smart Grid – Smart Cities Network, etc.]. Scientific responsible and Coordinator of the Greek Regional Action Center – Gr-RAC (<http://iygu.ntua.gr/en>) (2015-16). Chair of the Commission for the Mediterranean Basin (COMB) of the International Geographical Union (IGU) (2020-today). Reviewer in international journals and conferences, member of scientific committees of international/national conferences. She has published her work in book chapters, international journals and conference proceedings.

The main research interests of Prof. **Anastasia Stratigea** focus on: Sustainable Development, Urban and Regional Planning and Policy, Spatial Planning, Participatory Planning – Methods and Models, ICTs and e-Planning, e-Participation, Smart Cities and Communities, Foresight Methodologies, Evaluation in Spatial Planning – Methods and Models, Participatory Evaluation, ICTs and Urban/ Regional Development, ICTs and Rural Development, Tourism and Urban/Regional Development, Culture and Urban/Regional Development, Cultural Planning. More information can be found on

<https://www.researchgate.net/profile/Anastasia-Stratigea>.

Her research work has been published in books and high impact journals and is widely accepted by the scientific community. Her most recent publications include, but are not limited to, the following:

- Koutsis, D. and **Stratigea, A.** (2021), Sustainable and Resilient Management of Underwater Cultural Heritage (UCH) in Remote Mediterranean Islands: A Methodological Framework, *Heritage*, 4, pp. 3469–3496.
- Lampropoulos, V., Panagiotopoulou, M. and **Stratigea, A.** (2021), Assessing the Performance of Current Strategic Policy Directions towards Unfolding the Potential of the Culture- Tourism Nexus in the Greek Territory, *Heritage*, 4, pp. 3157–3185.
- Marava, N., Alexopoulos, A. and **Stratigea, A.** (2020), Barriers to Empowering and Engaging Youth in Sustainable Urban Development Endeavours – Experience Gained from Korydallos Municipality – Greece, In O. Ronen and R. Purian (Eds.), Smart, Sustainable and Fair Cities, Special Issue, *Geography Research Forum*, 40 (1), pp. 89-107 (<https://grf.bgu.ac.il/index.php/GRF>).
- **Stratigea, A.** and D. Kavroudakis (Eds.) (2019), *Mediterranean Cities and Island Communities: Smart, Sustainable, Inclusive and Resilient*, Springer Nature Switzerland, ISBN 978-3-319-99443-7.
- **Stratigea, A.** and Murgante, B. (2019) (Ed.), Potential of Participatory Urban Planning and Governance, *International Journal of Electronic Governance* (IJEG), Special Issue, Vol. 11 No. 1, <https://www.inderscience.com/info/inarticletoc.php?jcode=ijeg&year=2019&vol=11&issue=1>.
- **Stratigea, A.** and Argyropoulos, V. (2019) (Eds), *Linking Land and Underwater Cultural Heritage Management to Technology in Smart Cities and Communities*, Special Issue, *Heritage*,

https://www.mdpi.com/journal/heritage/special_issues/smart_cities_communities.

- **Stratigea, A.**, Kyriakides, E. and Nicolaides, Ch. (2017), *Smart Cities in the Mediterranean: Coping with Sustainability Objectives in Small and Medium-sized Cities and Island Communities*, Springer, ISBN 987-3-319-54557-8.
- Katsoni, V. and **Stratigea, A.** (2016) (Eds.), *Tourism and Culture in the Age of Innovation*, Springer, ISBN 978-3-319-27527-7, ISBN 978-3-319-27528-4 (eBook), DOI 10.1007/978-3-319-27528-4_23.
- **Stratigea, A.**, Papadopoulou, Ch.-A. and Panagiotopoulou, M. (2015), Tools and Technologies for Planning the Development of Smart Cities: A Participatory Methodological Framework, *Journal of Urban Technology*, Routledge, <http://dx.doi.org/10.1080/10630732.2015.1018725>, DOI: 10.1080/10630732.2015. 1018725, pp. 43-62.

Academic Profile by:
by Dimitrios Tsiotas, Ph.D., RSI J



Prof. Angeliki N. Menegaki, Ph.D., is an Associate Professor of applied economics in the environment, energy, and tourism at the Agricultural University of Athens - EU CONEXUS. She teaches in the new department of Regional and Economic Development and the former of Management, Economics, and Communication of Tourist and Cultural Units, in the Campus of Amfissa. At the same time, she is the coordinator in the module of Tourism Economics (DIT33), in the Hellenic Open University, and the coordinator in the post-graduate module of Organization and Management- The environment of risk (ERM501), in Cyprus Open University. Currently, she is the coordinator of the sector of Environmental Education in the EU-CONEXUS joint venture of the Agricultural University of Athens with other major European Universities. Therein, she coordinates and teaches modules in various minor program courses such as sustainable tourism, entrepreneurship, and climate change, and its effects on maritime development.

Prof. Angeliki Menegaki has earned her Ph.D. in Economics (2006) from the University of Stirling (Scotland), her M.A. in Economics and Finance from the University of Leeds (UK), and holds two B.Sc. titles from Greek Universities, one in Economics (1998), from the University of Crete, and a second in Turkish Language and Literature (2011), from the Department of Languages, Literature, and Culture of Black Sea countries in the Democritus University of Thrace. Besides Turkish, she also has received recognized diplomas and certifications in English, German, French, Italian, and Spanish.

Up to date, she has authored more than 60 peer-reviewed papers in international scientific journals (equipped with an impact factor), while her publications enjoy more than 1600 citations and an *h*-index of 20 in Scopus. For the interested reader, her Scopus author ID is 16053108400, and her ResearchGate account is available at the URL: <https://www.researchgate.net/profile/Angeliki-Menegaki>.

Prof. Angeliki Menegaki has done a lot of research on energy economics and energy science and authored two books in energy economics and econometrics. The first book is an edited volume entitled *The economics and econometrics of the energy-growth nexus* (published in 2018), and the second one is a monograph entitled *A guide to the econometrics of energy-growth nexus* (published in 2020). Furthermore, in collaboration with Prof. G. M. Agiomirgianakis, she has supervised the translation from English and she co-authored chapters in books about tourism economics and scientific methodology in tourism. For more information, the reader can refer to the titles *The economics of tourism destinations* (by Norbert Vanhove), *The economics of recreation, leisure and tourism* (by John Tribe), and *Research methodology for tourism* (by R. Durbarry) and *An Introduction to Mathematical Analysis* (by Haussler et al.). Currently, she is the Guest editor (with Prof. Aviral K. Tiwari) in a Special Issue about *Renewable Energy Novel Research Methods* in the *Renewable Energy* (journal).

In 2020, she was ranked 480th amongst the top 649 Greek most influential scientists of all scientific fields, based on the ranking received by Prof. J. P. A. Ioannidis (doi.org/10.1371/journal.pbio.3000918) of Stanford University. She was also placed (according to the same list) in the top 2% of global most influential scientists in the field of energy, based mostly on the number of publications, citations received, number of authors in each paper, and the age of the author. The description of the ranking is provided in the following publications:

[<https://data.mendeley.com/datasets/btchxktzyw/2>]

and

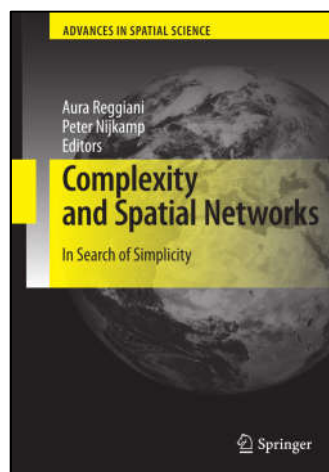
[<https://journals.plos.org/plosbiology/article?id=10.1371%2Fjournal.pbio.3000918&fbclid=IwAR1R-mBeOhm28F1zNyEXGPqMswkpcGsZitnvuB480lrYh33QjzDdGXADtVQ>]

Prof. Angeliki Menegaki has also held various managerial positions within and out of the academic sector. She has served as Head of the Department of Tourism Management, Economics and Marketing of Tourism and Cultural Units, in the Technical Institute (ATEI) of Central Greece. She has also served as Deputy Head in the Department of Regional and Economic Development and the General Department, in the Agricultural University of Athens. She is also elected member of the Integration Council of the Agricultural University of Athens which supervises the completion of the academic programs of the former Applied Sciences Universities (TEIs). In the past, she has worked in banks and the Greek public sector. Prof. Angeliki Menegaki has attended many international conferences, has given lectures and seminars in various universities, and has acted as an evaluator in research programs. She is also a member of the research team in SmartBic research program on Smart Agriculture and Cyclical Bio-economy conducted by the Agricultural University of Athens and the Region of Central Greece.

Last, but by no means least, Prof. Angeliki Menegaki is the mother of two children (aged 18 and 15) and the guardian of three dogs.

Academic Profile by:
NAME, RSI J

Book Reviews



Complexity and Spatial Networks In Search of Simplicity, Edited by Aura Reggiani and Peter Nijkamp, published by Springer

The book *Complexity and Spatial Networks In Search of Simplicity* (p.283) belong to the series Advances in Spatial Science and is a collective volume edited by Prof. **Aura Reggiani** and Prof. **Peter Nijkamp**, both distinguished scholars in spatial economics.

Complex systems analysis has become a fascinating topic in modern research on non-linear dynamics, not only in the physical sciences but also in the life sciences and the social sciences. Geographical space is one of the playgrounds for complex dynamics, as is witnessed by population movements, transport flows, retail developments, urban expansion, lowland flooding, and so forth. Within this context, from a methodological point of view, complex systems necessitate a unifying framework of analysis embracing the meaning and use of interdisciplinary concepts such as self-organization, criticality, redundancy, resilience, and sustainability. At the same time, the universality and austerity of the laws of network centrality and connectivity, such as the entropy and power laws, raise the demand for better exploration.

The book is composed of contributions from reputable scholars from all over the world and brings together a series of original and innovative contributions in the area of complex spatial dynamics and networks. This book suggests the outgrowth of a workshop organized by IPL (Institute Para Limes), the new Institute for frontier research on complex phenomena of a trans-disciplinary nature, based in the Netherlands (for details, see www.paralimes.org). The book is organized into three (A, B, C) Parts, plus an introduction and epilogue (Part D). The first part, entitled *Complexity, Evolution, and Simplicity in Space*, includes 5 papers dealing with complexity in urban modeling, city size distribution, complexity in transport costs and urban shapes, the linkage between algorithmic complexity and spatial simplicity, and polyplexity in social and policy sciences. The second part, entitled *Evolutionary Networks in a Socio-Economic Context*, includes 6 papers dealing with complexity, evolution, and learning, proximity in socioeconomic network applications. The third part, entitled *Empirical Aspects of Network Complexity in the Space-Economy*, includes 6 papers dealing with complexity, simplicity, and adaptivity in transportation systems, urban network dynamics, spatial autocorrelation and interaction, and commuting networks.

The 19 chapters of this book share a common goal in highlighting the linkages between *spatial economic analysis* and *network analysis* and addressing directions towards synthesizing these two scientific and research fields into a single disciplinary framework. This is mainly done through empirical applications and simulations building on transportation and social networks of spatial interaction background. The book *Complexity and Spatial Networks In Search of Simplicity* succeeds to serve this goal, as it is eloquently summarized in the Epilogue (Chapter 19) of this book.

The structure of the book sufficiently provides to the reader a clear and complete picture of the fundamentals describing the linkage between complexity and spatial networks. This successful approach, in conjunction with the ongoing demand of integrating

more aspects of network science in the educational process, highlights the necessity to convert this book into a textbook. Such a transition should build on the concepts of (a) *complexity*, as conceived by network science and statistical mechanics; (b) *spatiality* and *spatial interaction*, as conceived by spatial econometrics and analysis; (c) *network model*, as conceived by graph theory; (d) *evolution* and *dynamics*, as conceived by economics, econophysics, and statistical mechanics; and (e) *simplicity*, as conceived by optimization theory and operational research, as well as on the transportation networks' background, for the presentation of various examples and exercises (that excellently can be drafted from the available 19 chapters). In the scenario of becoming a textbook, the book ***Complexity and Spatial Networks In Search of Simplicity*** can serve various academic needs in spatial economics, geography, transportation, graph theory, and physics education.

Overall, in its current form, the book promotes the interdisciplinary way of thinking in spatial and transportation economics and is a must-to-have book for regional scientists, geographers, economists, engineers, and other scholars activating in spatial research.

Book Review by Dimitrios TSOTAS, Ph.D., RSI J

GUIDELINES

**for the Writers & a format model for the articles
submitted to be reviewed & published in the journal**

Regional Science Inquiry Journal

(EconLit, Scopus, RSA I) – www.rsijournal.eu

Guidelines for the Writers & a format model for the articles submitted to be reviewed & published in the journal

The Title of the paper must be centered, and the font must be Times New Roman, size 12, in Uppercase, in Bold

For the writers' personal information use the Times New Roman font, size 11, in bold, and centered. Use lowercase for the first name and uppercase for the last name. The line below the name includes the professional title and workplace; use the Times New Roman font, size 10, centered. In the third line write only the contact e-mail address in Times New Roman 10, centered.

Name LAST NAME

Professional Title, Workplace

E-mail Address

Name LAST NAME

Professional Title, Workplace

E-mail Address

Abstract

The abstract consists of a single paragraph, no longer than 250 words. The font must be Times New Roman, size 11. The text must be justified. The title "Abstract" must be aligned left, in Times New Roman, size 11, in bold. A space of one line must be left between the title and the text of the abstract. The abstract must contain sufficient information, be factual, and include the basic data of the paper.

Keywords: Use 3 to 5 keywords, separated by commas

JEL classification: We kindly request that you classify your paper according to the JEL system, which is used to classify articles, dissertations, books, book reviews, and a variety of other applications. The use of the JEL classification is necessary so that your paper be properly indexed in databases such as EconLit. Select the codes that represent your article and separate them by commas. You can find information on the JEL system here: <https://www.acaweb.org/jel/guide/jel.php>

1. Introduction

All articles must begin with an introduction, a section which demarcates the theoretical background and the goals of the paper.

The present document provides the necessary information and formatting guidelines for you to write your article. We recommend that you copy this file to your computer and insert your own text in it, keeping the format that has already been set. All the different parts of the article (title, main text, headers, titles, etc.) have already been set, as in the present document-model. The main text must be written in regular Times New Roman font, size 11, justified, with a 0.5 cm indent for the first line of each paragraph.

We recommend that you save this document to your computer as a Word document model. Therefore, it will be easy for you to have your article in the correct format and ready to be submitted. **The only form in which the file will be accepted is MS Word 2003.** If you have a later version of Microsoft Office / Word, you can edit it as follows:

- Once you have finished formatting your text, create a pdf file, and then save your file as a Word "97-2003" (.doc) file.

- Compare the two files – the pdf one and the Word “97-2003” (.doc) one.
- If you do not note any significant differences between the two, then – and only then – you can submit your article to us, **sending both the pdf and the Word “97-2003” (.doc) files** to our e-mail address.

If you use a word processor other than Microsoft Word, we recommend that you follow the same procedure as above, creating a pdf file and using the appropriate add-on in order to save your document in MS Word “97-2003” (.doc) form. Once you compare the two files (and find no significant differences), send us both.

2. General Guidelines on Paper Formatting

2.1. Body

The body of the text consists of different sections which describe the content of the article (for example: Method, Findings, Analysis, Discussion, etc.). You can use up to three levels of sections – sub-sections. For the Body of the text, use the default format style in Word, selecting the Times New Roman font, size 11, justified, with a 0.5 cm indent for the first line of each paragraph (this is further detailed in the section “Paragraphs”).

2.2. References

The references included in the paper must be cited at the end of the text. All references used in the body of the paper must be listed alphabetically (this is further detailed in the section “References”).

2.3. Appendices

The section “Appendices” follows the section “References”.

3. Page formatting

3.1. Page size

The page size must be A4 (21 x 29,7 cm), and its orientation must be “portrait”. This stands for all the pages of the paper. “Landscape” orientation is inadmissible.

3.2. Margins

Top margin: 2,54cm

Bottom margin: 1,5cm

Left and right margins: 3,17cm

Gutter margin: 0cm

3.3. Headers and Footers

Go to “Format” → “Page”, and select a 1,25cm margin for the header and a 1,25cm margin for the footer. Do not write inside the headers and footers, and do not insert page numbers.

3.4. Footnotes

The use of footnotes or endnotes is expressly prohibited. In case further explanation is deemed necessary, you must integrate it in the body of the paper.

3.5. Abbreviations and Acronyms

Abbreviations and acronyms must be defined in the abstract, as well as the first time each one is used in the body of the text.

3.6. Section headers

We recommend that you use up to three sections – sub-sections. Select a simple numbering for the sections – sub-sections according to the present model.

3.7. First level header format

For the headers of the main sections use the Times New Roman font, size 11, in bold and underlined, and leave a size 12 spacing before the paragraph and a size 6 spacing after the paragraph. The header must be aligned left. Use a capital letter only for the first letter of the header.

3.8. Second level header format

For second level headers, follow this model. Use the Times New Roman font, size 11, in bold, and leave a size 12 spacing before the paragraph and a size 3 spacing after the paragraph. Select a 0.5 cm indent. The header must be aligned left. Use a capital letter only for the first letter of the header.

3.8.1. Third level header

For third level headers, follow this model. Use the Times New Roman font, size 11, in bold and italics, and leave a size 6 spacing before the paragraph and a size 0 spacing after the paragraph. The header must be aligned left, with a left indent of 1 cm. Use a capital letter only for the first letter of the header.

4. Paragraphs

In every paragraph, use the Times New Roman font, size 11, with single line spacing. We recommend you modify the default (normal) format style in Word and use that in your text. For all paragraphs, the spacings before and after the paragraph must be size 0, and the line spacing single. Use a 0,5cm indent only for the first line of each paragraph. Leave no spacings nor lines between paragraphs.

4.1. Lists

In case you need to present data in the form of a list, use the following format:

- Bullet indent: 1,14cm
- Text:
 - Following tab at: 1,5 cm
 - Indent at: 1,5cm

Use the same format (the above values) if you use numbering for your list.

1. Example of numbered list 1
2. Example of numbered list 1

5. Figures, images, and tables

5.1. Figures and images

Insert your figures and images directly after the part where they are mentioned in the body of text. They must be centered, numbered, and have a short descriptive title.

Figures put together “as they are”, using Office tools, are absolutely inadmissible. The figures used must have been exclusively inserted as images in Word, in gif, jpg, or png form (with an analysis of at least 200dpi), and in line with the text. The width of an image must not exceed 14,5cm so that it does not exceed the margins set above.

The images, figures, and tables must be inserted “as they are” in the text, in line with it. **Figures and images which have been inserted in a text box are absolutely inadmissible.**

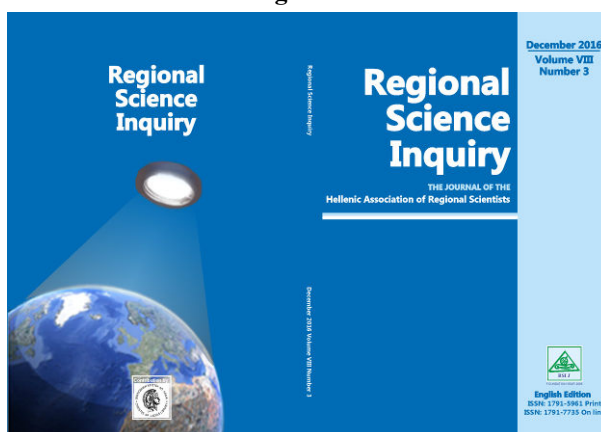
5.1.1. Reference inside the text

Avoid phrases such as “the table above” or the “figure below” when citing figures and images. Use instead “in Table 1”, “in Figure 2”, etc.

5.1.2. Examples

A model of how to format figures/images follows. For the title, use the Times New Roman font, size 10, in bold. Write the title above the figure, and set a size 6 spacing before the title and a size 0 spacing after it. The line spacing of the title must be 1.5 line. Both the image and its title must be centered.

Image 1: Title



Source: cite the source

Directly below the figure you must cite the source from which you took the image, or any note regarding the figure, written in Times New Roman, size 10. Write it below the figure, leaving a size 0 spacing before and after it, use a line spacing of 1.5 line, and make it centered.

5.2. Tables

For the title, use the Times New Roman font, size 10, in bold. Write the title above the table, and set a size 6 spacing before the title and a size 0 spacing after it. The line spacing of the title must be 1.5 line. Both the table and its title must be centered. The width of the table must not exceed 14,5cm so that it does not exceed the page margins set.

Table 1. Example of how a table must be formatted

Age	Frequency	Percentage %
Under 40	44	32.1
40 - 49	68	49.6
Over 50	25	18.2
Total	137	100.0

Source: cite the source

If the table needs to continue on the next page, select in the “Table properties” that the first line be repeated as a header in every page, as in the above example of Table 1. **Tables (or figures or images) which are included in pages with a “Landscape” orientation are absolutely inadmissible.**

Every table must have horizontal lines 1 pt. wide at the top and bottom, as shown in the example. The use of vertical lines and color fill at the background of the cells is strictly prohibited.

Directly below the table you must cite the source or any note regarding the table, written in Times New Roman, size 10. Write it below the table, leaving a size 0 spacing before and a size 6 spacing after it, and make it centered.

6. Mathematical formulas

There is a variety of tools in order to insert and process mathematical formulas, such as the “Mathematics”, found in the most recent editions of Word, “Math Type”, “Fast Math Formula

Editor”, “MathCast Equation Editor”, “Math Editor”. Since it is impossible for us to provide you with compatibility with all these tools in all their editions, **we can only admit your paper if it contains mathematical formulas solely in the form of images.**

Keep a continuous numbering for the mathematical formulas and center them in the page, as shown in the following example:

$$y = ax^2 + bx + c \quad (1)$$

The same stands for formulas or particular mathematical symbols you may have integrated in your text. For instance, if you want to use the term ax^2 in your text, you must insert it as an imaged, in line with the text. The images containing the mathematical formulas must be legible (at least 300dpi).

In the exceptional case of a text which may contain a great number of mathematical formulas, the writer may send it to us in TeX form if they so wish.

7. References

We recommend that you use the Chicago Manual of Style Author-Date system, as it is recommended by the AEA (American Economic Association) for the journals included in the EconLit database, and it is the dominant style of bibliography in the field of Economics. For more information you can go to the following links:

- <https://www.aeaweb.org/journals/policies/sample-references>
- http://www.chicagomanualofstyle.org/tools_citationguide.html
- <http://libguides.williams.edu/citing/chicago-author-date#s-lg-box-12037253>

7.1. Online references (internet citations)

Check your links again before sending your file, to confirm that they are active.

Avoid long internet links. Where possible, also cite the title of the website operator-owner. Return the font color to black, and remove the hyperlink. Links such as the following are impractical and distasteful, therefore should be avoided.

Example of an inadmissible hyperlink

<https://el.wikipedia.org/wiki/%CE%9F%CE%B9%CE%BA%CE%BF%CE%BD%CE%BF%CE%BC%CE%B9%CE%BA%CE%AC>

7.2. References Formatting

For your list of references, use the Times New Roman font, size 10, with single line spacing. The paragraph format must include a size 0 spacing before the paragraph and a size 0 spacing after it, aligned left. Use a 0,5 cm indent only for the first line of each paragraph. Leave no spacings or lines between paragraphs.

7.3. Example of how References must be formatted

- Bureau of Labor Statistics. 2000–2010. “Current Employment Statistics: Colorado, Total Nonfarm, Seasonally adjusted - SMS08000000000000001.” United States Department of Labor.
<http://data.bls.gov/cgi-bin/surveymost?sm+08> (accessed February 9, 2011).
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<http://www.aeaweb.org/articles.php?doi=10.1257/aer.100.3.763> (accessed August 22, 2012).
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- Heidhues, Paul, and Botond Köszegi. 2005. “The Impact of Consumer Loss Aversion on Pricing.” Centre for Economic Policy Research Discussion Paper 4849.
- Zitzewitz, Eric. 2006. “How Widespread Was Late Trading in Mutual Funds?”
<http://facultygsb.stanford.edu/zitzewitz>.