Regional Science Inquiry

Regional Science Inquiry

Regional Science Inquiry

THE JOURNAL OF THE
Hellenic Association of Regional Scientists

Regional Science Inquiry

December 2023 Volume XV Number 2

Contribution by:
ΒΙΒΛΙΟΘΗΚΗ ΧΡΙΣΤΟΥ ΑΠ. ΛΑΔΙΑ
1961
CHRISTOS AP. LADIAS LIBRARY

RSI J

<u>Electronic and hard copy editions are offered free of charge</u>

Contents

*The articles published in RSI Journal are in
accordance with the approving dates by the anonymous reviewers.*

Regional Science Inquiry, Vol. XV, (2), 2023
Editorial Note

In the second semester of 2023, the Regional Science Inquiry Journal (RSIJ), the scientific journal published under the aegis of the Hellenic Association of Regional Scientists, launched the second issue (2) of its fifteenth volume (Vol. XV) since the first day it was published. Being an international, open-access, and peer-reviewed journal, RSIJ publishes research on various topics related to the broad and multidisciplinary field of Regional Science. The journal aims to freely promote the academic dialogue in Regional Science worldwide and to serve scientific research under solid quality standards in empirical, methodological, and theoretical contribution. RSIJ provides a platform for scholars, researchers, policymakers, and practitioners to share their research and insights into regional development and its various dimensions.

Since 2018, the RSIJ has published 187 papers, on a wide range of topics (such as Regional Economics and Development; Spatial Analysis and Econometrics; Economic Geography and Transportation Economics; Urban Planning and Development; Tourism Economics and Development; Urban and Regional Sustainability; Regional Analysis and Policy; etc.). Serving its broad multidisciplinary scope, RSIJ provides publication opportunities to researchers from various disciplines and an open-access platform for communicating regional science research and making it accessible to a wider audience. Also, RSIJ supports a reasonably timely review process, promoting the academic dialogue by making scientific research accessible to the researchers' community in time. The journal is indexed in various scientific databases (such as Scopus, RePEc, EconLit, Scimago, etc.) and its contribution to scientific research is accredited by scientific associations (such as Regional Science Association International, Hellenic Association of Regional Scientists). Further, the RSIJ has the merit to include in its editorial board reputable scholars from worldwide, who ensure that the published papers meet rigorous academic standards. Moreover, the RSIJ systemically provides a forum for ideas exchange, news, and information, by covering topics of broader academic interest, such as events (conferences, workshops, and seminars), academic profiles (providing insights into the work and accomplishments of leading scholars in the field), and book reviews (offering a valuable service by summarizing and evaluating important publications). This broad academic framework enhances the value of RSIJ as a resource for scholars and practitioners for readers interested in keeping up with the latest developments in Regional Science.

All these attributes and merits of RSIJ have been so far fertile and promising for the journal's future path. According to the Scopus Database, the RSIJ is equipped with a Cite Score of 2.0 for the year 2022, while the Cite Score tracker for the year 2023 computes upon 2.2, illustrating a growing trend. Also, according to the same database, the RSIJ has a scientific impact counting above the average of registered journals in the fields of Sociology and Political Science; Development; and Geography, Planning, and Development. Following this reputed heritage, the RSIJ continues working hard toward providing a reputable and respected publication, along with a valuable platform for high-quality research for anyone interested in regional science, regional development, and related fields. In this semester, the current issue (RSIJ, Vol. XV, (2), 2023) includes five papers, which were carefully selected from a large pool of submissions so that to comply with the high journal's standards. These papers deal with modern and interesting topics of Regional Science research, such as regional economic resilience; labor market behavior and economic growth; public land transportation, air transport, and regional development; and business and entrepreneurship and economic growth.

In brief, the first paper, titled "*REGIONAL EMPLOYEES PERCEPTIONS ON DECENT WORK AND ECONOMIC GROWTH: LABOUR MARKET OF ALBANIA AND KOSOVO*", authored by Filipos RUXHO, Christos Ap. LADIAS, Ali TAFARSHIKU, and Edib ABAZI study key perceptions of targeted employees towards decent work and economic growth in the labor market of Albania and Kosovo. Building on a primary research consisting of 350 respondents, the paper measures economic growth; basic living costs; equal treatment; safety and security at the workplace; along with integrity and well-being; and reveals that there are

alarming differences in perceptions of respondents in terms of decent work between two regional labor markets. The research concludes that the labor market in Albania suffers from the weak treatment of employees at the workplace, ensuring a safe and secure working environment and low promotion of the well-being and integrity of employees in the workplace. The results highlight economic growth and basic living costs as aspects of major concern for labor markets in both Albania and Kosovo, and the paper concludes with recommendations prioritizing decent work and cooperation between employee organizations and syndicates.

The second paper, titled "*INVESTIGATING THE INTERACTION BETWEEN THE TOPOLOGY OF BUS TRANSPORT NETWORKS AND REGIONAL DEVELOPMENT IN GREECE*", authored by Thomai TASOPOULOU, Dimitrios TSIOTAS, and Serafeim POLYZOS, studies the topological and geographical characteristics of the Greek Bus Transport Network (GBTN) of five regions of Greece about their socio-economic environment. The research shows that units with high topological characteristics of public road networks tend to have low participation of the primary sector in the country's GDP formation; regional units with networks of highly connected neighbors facilitate the development of the secondary sector and compete with the functionality of the tertiary sector; and public long-distance road networks with distant destinations are more likely to meet in less urbanized areas. Correlation analysis provided evidence that the spatial distribution of public interurban road networks is described by the characteristics of the network infrastructure as well as socio-economic characteristics. Finally, bus networks form a specific category of complex networks that grow and evolve in physically constrained spatial networks.

The third paper, titled "*MEASUREMENT APPROACHES OF REGIONAL ECONOMIC RESILIENCE: A LITERATURE REVIEW*", authored by George J. XANTHOS and Evangelos N. DULUFAKIS, reviews different methodological approaches to measuring regional economic resilience, and the authors observe a variation of approaches spanning from the use of descriptive, interpretative, or simple regression models, to sophisticated statically econometric models. The paper provides insights into regional and spatial economics about resilience measurement and estimation methods, focusing on economically derived disturbances or shocks, such as recessions, and the resistance capacity or ability of a regional economy to respond to these shocks. The review paper observes that the methodological context for measuring regional economic resilience is undefined as empirically developed using either resilience indices or statistically based econometric models to assess the resilience of a region.

The fourth paper, titled "*THE COMPLEX RELATIONSHIP BETWEEN AIR TRANSPORT INFRASTRUCTURE AND REGIONAL DEVELOPMENT. AN EMPIRICAL INQUIRY*", authored by Daniela-Luminița CONSTANTIN and Ana-Maria MARCU, investigates the complex relationship between air transport infrastructure and regional development proposing an empirical analysis for the case of Romania, which faces challenges in managing the unprecedented dynamism in the general European framework, the request for reducing regional disparities, the balanced geographical distribution of the airport network, and the country's geo-strategical position in the international competition. The paper applies an in-depth analysis combining the examination of strategic documents with the interpretation of statistical data and semi-structured interviews. The results illustrate diversity in regional development levels, accompanied by insights into the policy-making framework, with emphasis on the requirements to be met for proper responses to the need to reinforce the air transport sector and to integrate the national vision with the specific regional development aspects.

The fifth paper, titled "*AN EMPIRICAL STUDY ON FAMILY BUSINESS FINANCING*", authored by Brikena LEKA, Etleva BAJRAMI, and Gentiana SHARKU, studies family business in Albania, which started to recover after 1990 with the overthrow of the communist regime. The study builds on primary data research, on a sample of 327 questionnaires, which is addressed to micro and small family businesses. The analysis employs statistical and empirical methods to examine the main factors that determine the way family businesses are financed and finds that the owners with high levels of education are more prone to use

external sources of financing, while the "older" businesses will finance the greater part of their activity by their funds, and as the turnover of the previous year increases, a major part of the profit will be reinvested in the business for short-term and long-term investment.

All these interesting works are available on the next pages of the RSIJ intending to promote the academic dialogue in Regional Science. Overall, the Editor in Chief, Prof. Christos Ap. Ladias, the Editorial Board, and the signatory of this Editorial Note welcome the reader to the multidisciplinary journey of Regional Science Inquiry that the current issue promises on its following pages.

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

References

Constantin, D.-L., and Marcu, A.-M. (2023) "The complex relationship between air transport infrastructure and regional development. An empirical inquiry", Regional Science Inquiry, 15(2).

Leka, B., Bajrami, E., and Sharku, G., (2023) "An empirical study on family business financing", Regional Science Inquiry, 15(2).

RSIJ, (2023) "RSI Journal / The Journal is Indexed in", available at the URL: https://rsijournal.eu [accessed 16/11/2023].

Ruxho, Filipos, Ladias, Christos Ap., Tafarshiku, Ali, Abazi, Edib, (2023) "Regional employees perceptions on decent work and economic growth: labor market of Albania and Kosovo", Regional Science Inquiry, 15(2).

Scopus, (2023) "Source Details, Regional Science Inquiry", available at the URL: https://www.scopus.com/sourceid/2100228533 [accessed 16/11/2023].

Tasopoulou, T., Tsiotas, D., and Polyzos, S., (2023) "Investigating the interaction between the topology of bus transport networks and regional development in Greece", Regional Science Inquiry, 15(2).

Xanthos, G.J., and Dulufakis, E.N., (2023) "Measurement approaches of regional economic resilience: a literature review", Regional Science Inquiry, 15(2).

Articles

REGIONAL EMPLOYEES PERCEPTIONS ON DECENT WORK AND ECONOMIC GROWTH: LABOUR MARKET OF ALBANIA AND KOSOVO

Filipos RUXHO
Professor Ass. Dr., Department of Business and Management, Universum College, Kosovo.
filip.ruxho@universum-ks.org

Christos Ap. LADIAS
Professor, Regional Science Inquiry Journal
ladias@rsijournal.eu

Ali TAFARSHIKU
Deputy Minister, Ministry of Regional Development of Kosovo.
ali.tafarshiku@rks-gov.net

Edib ABAZI
Professor Ass. Dr., Department of Law, Social and Political Studies, Universum College, Kosovo.
edib.abazi@universum-ks.org
Corresponding Author

Abstract

This research paper is a continuum of our previous research that aimed to identify key perceptions of targeted employees towards decent work and economic growth in labour market of Albania and Kosovo. The key components of SDG 8 - economic growth, basic living costs, equal treatment, safety and security at workplace, and integrity and wellbeing are measured. The questionnaire is used for the study purposes of the research. The sample consists of 350 respondents. Findings reveal that there are alarming differences on perceptions of respondents in terms of decent work between two regional labour markets. The labour market in Albania suffers from weak treatment of employees at workplace; ensuring safe and secured working environment and low promotion of wellbeing and integrity of employees in workplace. The dimension of economic growth and basic living cost is of concern for both labour markets. Consequently, it is strongly recommended that both states address decent work in labour markets of Albania and Kosovo with priority. State instruments shall be enforced to closely cooperate with employee's organizations and syndicates and work on elimination of core barriers that disable employees to feel equally treated at workplace, or safe and secured at workplace or having their integrity and wellbeing protected so that quality of working environment improves and involvement and productivity of employees grows.

Keywords: abour market, economic growth, decent work
JEL classification: J30, J40, R10, R11, R23, O10

1. Introduction

The composition structure of this paper includes inputs from legal cooperation frameworks of Albania and Kosovo where different matters of importance in implementation of SDG 8 are being considered, including responsible institutional bodies and role of international partners. The Sustainable Development Goals (SDGs) deriving from the efforts of the United Nations are to be considered with priority in each government. The goal on economic growth and decent work is known as Sustainable Development Goal 8 (SDG 8). This specific goal is set up by the United Nations (UN) and it defines clearly 12 Targets and 17 Indicators to be implemented globally. Concurrently, the responsibility of collecting data from countries, track real metrics on progress of each country, and possibly support under developed countries in enhancing economic growth and promoting decent work is directed by the United Nations.

The government of Albania and the government of Kosova in cooperation with United Nations are parties in working together to implement all SDGs and increase prosperity and wellbeing of the society through the Sustainable Development Cooperation Frameworks (Republic of Albania, 2022; Kuvendi i Kosovës, 2018). Albania renewed its Cooperation Framework starting from January 1, 2022. Kosovo is not a member state of the United

Nations and subsequently is not a signatory to the 2030 Agenda for Sustainable Development. The United Nations Kosovo Team is the key supporter of the Government of Kosovo in sustainable development (The 2030 Agenda for Sustainable Development, 2015). Activities of the United Nations development system agencies in Kosovo are guided by the United Nations Sustainable Development Cooperation Framework (United Nations Kosovo Team, 2021).

Next part presents facts from various resources and literature review. The methodology of research is explained in details including data analysis and hypothesis test. At the end, conclusions are drawn and compose the closing part of this research.

2. Methodology

The questionnaire is adopted from the previous survey that was compiled by authors of this paper in Kosovo. The targeted population consists of respondents working either in private or public sector during the course of survey administration. Random sampling is used to collect data from 350 respondents during the month of May and June 2022 in different areas of Albania and Kosovo.

The structure of the survey is consisted of two parts. The questions within the first part of the questionnaire, intend to identify where are the respondents coming from (Place), what is their age (Age) and gender (Gender), and in which sector do they work (Public sector/Private sector) and compose the demographic information in terms of sample.

Chart 1: Conceptual framework
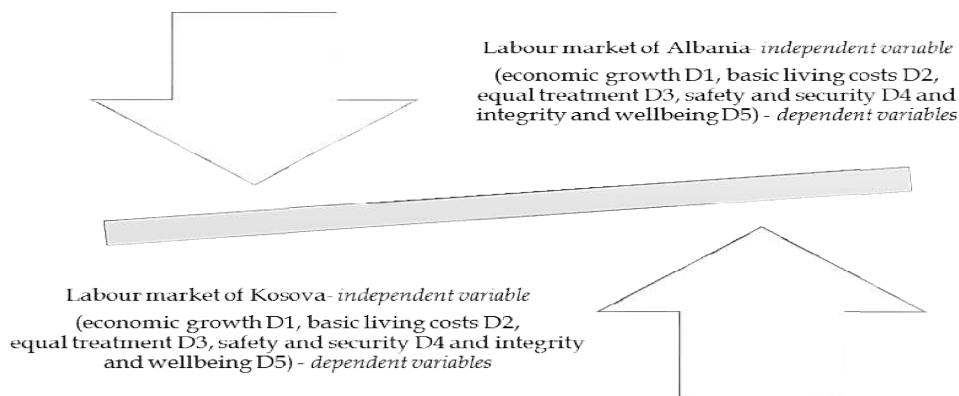
Since the aim of this research is to search if there is any difference on perceptions and believes between employees in Albania and in Kosovo in terms of decent work and economic growth, (see above Chart 1 Conceptual Framework) , the second part of the survey included statements that are grouped under scale called Differences consisted of 5 variables: D1: impact of economic growth, D2: sufficiency of monthly incomes; D3: equal treatment, D4: safe and security at workplace, and D4: wellbeing at workplace. The above-mentioned item is measured by statements using the Likert scale and are presented below: (D1) The economic growth in my country affected positively my incomes. (D 2) I earn enough monthly incomes to be able to cover basic living expenses. (D3) My organization treats all employees equally in all aspects. (D4) I feel safe and physically secured at my working place? (D5) My integrity and wellbeing is protected at my workplace.

3. Literature Review

The literature review of this paper is focused towards various resources such as statistical data, reports, regulations and laws, and research papers. Additionally, inputs from various reports and reliable statistical data on development indicators of countries are given within. The variety of research findings and recommendations are elaborated separately to address each of the variables in this survey research method.

3.1. Development Indicators

According to the SDG 8, the main indicator deals with the annual growth rate and aims to sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries through 2030. (SDG 8 Tracker, 2022). On the other hand, the United Nations Report highlights that:

"Roughly half the world's population still lives on the equivalent of about US$2 a day. And in too many places, having a job doesn't guarantee the ability to escape from poverty. This slow and uneven progress requires us to rethink and retool our economic and social policies aimed at eradicating poverty" (SDG 8 Tracker, 2022).

Chart 2: Annual Percentage growth per capita

Source: World Bank and OECD (2022)

For the purpose of this study, it deemed crucial to present data on growth rate per capita of both countries. Chart 2 shows comparison of the world's annual percentage growth per capita between Albania and Kosovo from 2016 to 2020.The data derive from annual percentage growth rate of GDP per capita based on the local currency, whereas aggregates are based on constant U.S. dollars, as per data of the Word Bank and OECD (2022). In 2020, the world's annual growth marked a decrease from -4.29%, whereas Kosovo marked a decrease of -5.41% compared to the Albania with -3.40%. In 2019, the world's annual growth was 1.52%, whereas Albania marked 2.55% and Kosovo 5.24%. In 2018, the world's annual growth was 2.14%, whereas Kosovo marked 3.06% and Albania 4.28%. In 2017, the world's annual growth was 2.22%, whereas Albania marked 3.90% and Kosovo 4.04%. In 2016, the world's annual growth was 1.64%, whereas Albania marked 3.48% and Kosovo 6.20%.

The Chart 3 presents the income of the average person growth in Albania from 1990 until 2020 and data from Kosovo started to be registered lately. Importantly to note is that data was collected from resources of the World Bank, and data for Kosovo is available not prior to 2007.

Chart 3: GDP based on PPP
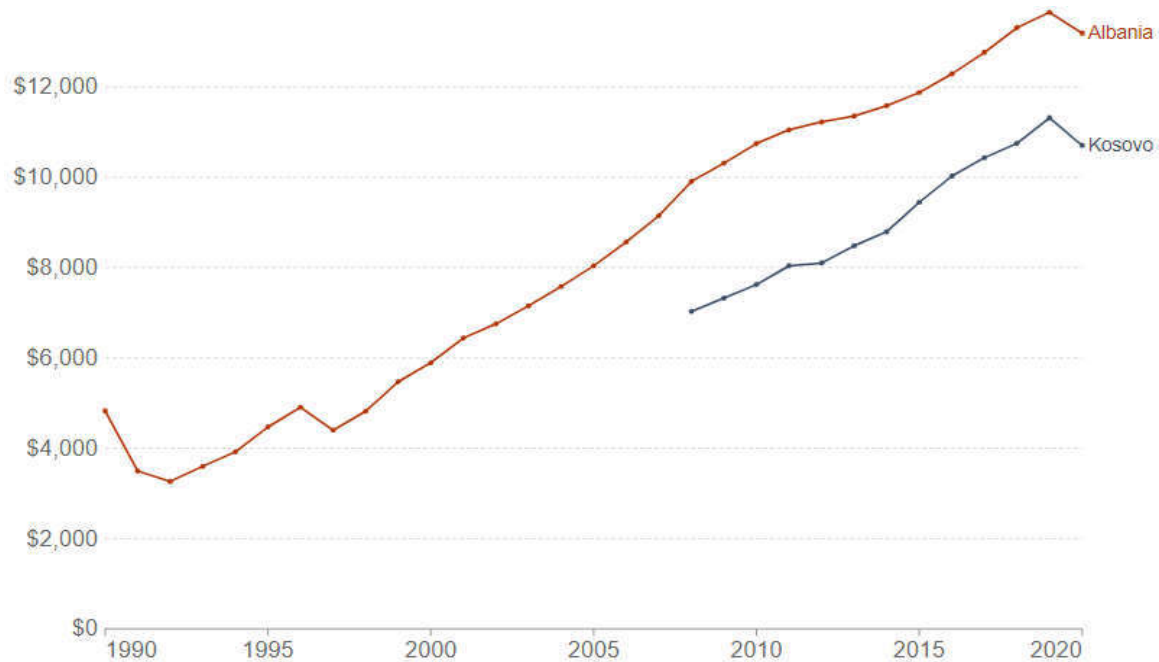
Source: World Development Indicators - World Bank (2022.05.26)

Albania has a longer period of data reporting to Word Bank and OECD, whereas Kosovo's data are newly reported due to its status. Incomes remain highly changing over a period of four decades in Albania and an increase is very evident during last two years. In 2019, Albania rated the highest GDP based on PPP of $13, 657, followed with $13, 317 in 2018 and, $13, 192 in 2020. During last five years, Albania's lowest rate was in 2016 with $12, 292 and $ 12, 771 in 2017.On the other hand , Kosovo rated the highest in 2019, similar to Albania during 2016-2020 period with $11, 318 followed by $10, 755 in 2008 and $10,707 in 2020.During 2016, Kosovo rated the lowest $10,031, followed by $10, 436 in 2017.

3.2. Economic growth

There are different views of scholars toward notion of economic growth. Considerations such as 'providing the world with remarkable improvements in per capita income' (Ahlstrom, 2010) or having 'the worlds ecosystems in a state of extreme distress where the planet will be unlivable in just a few decades' (Sweeney, 2012) are just few demonstrated examples of polarized views and concerns the researchers hold in this line. Bjørnskov & Foss (2016) share their view on entrepreneurial activity as a driving force of productivity towards economic growth by reconsidering the claim 'that the entrepreneurial activity has positive long-run economic consequences in terms of wealth, productivity, and growth'. In addition, Castles & Treasury (2014) balance the 'concept of 'growth' through expanding the options available to realize society's priorities'. In this direction, the first hypothesis of this research is as follows:

H_1: Difference exists between respondents of Albania and Kosovo and rate of satisfaction with economic growth and impact on monthly incomes.

3.3. Basic living expenses

The cost of living is best described as the amount of money needed to pay for the basic common expenses. The cost of living has experienced changes over periods of time and across countries. Research and studies in social and economic science show that from basic items such as food, clothing, housing, furnishings, operation, health, advancement, personal expenses and some other items that are marked as unclassified items or necessities from last century (Hoffer, 1929), the list has enriched with additional items as a requirement deriving from people's demand on standard of living. The inflation is on raise and consumers globally share their worries on its impact on their cost of living including affect on the standard of living. In this regard, for the purpose of this paper it is considered crucial to search about the

perception of employees in terms of economic growth and impact on being able to cover basic living expenses. Hence, it comprises one of the most meaningful variables within this research variable scheme and the second hypothesis is given as in the following:

H_2: Difference exists between respondents of Albania and Kosova and their monthly incomes sufficiency to cover basic living expenses.

3.4. Equal pay

The research addressing gender-based labor market discrimination (Foley & Cooper, 2021),inequality on pay based on occupation, age and persons with disability , gender differences in industries and roles in different countries, scarcity of skills as cause of rising inequality and many other dimensions have had attention of many academics and professionals for many decades (Belingheri et al, 2021; Blau and Kahn 2017; Kumar, 2016; Murphy and Topel, 2016; Marianne et al , 2015). According to UN Women (2015)'Twenty years ago 40 per cent of women were engaged in wage and salaried employment; today 48 per cent of women are being paid wages. Yet, globally, women still work at lower rates than men'. There has been some progress in this regard, but stilt there is a lot of work ahead to restore 'the status quo in the distribution of men and women across workplaces' (Bygren, 2010) and to define 'meaningful work at lower wages or less meaningful work at higher wages' (Maitland, 1989). To address the issue of equal treatment in the workplace it was vital to create a new hypothesis in this research and measure how employed people in two places perceive their treatment at their workplaces:

H_3: Differences exists between respondents of Albania and Kosovo and their equal treatment at workplace.

3.5. Safety, integrity protection and well-being at work-place

When addressing workplace, the most demanding requirement of all employees would be to have a safer, secured, healthier and productive working place. Aspects of different domains such as physical safety, security and health present the continuation of the findings from the research on workplace where instruments such as supportive organization, qualitative working environment for maximizing the level of perceived sense of security, or constructs such as information, training, occupational risks, cultural dimension in various sectors and at different countries helped establishment of the foundation for extending further the interest in the safe, secured and productive workplace (Kinzl et al, 2005; Raziq and Maulabakhsh, 2015; Irmie et al. 2015; Ip, 2009; Wall et al, 2021). The new segment of protection of labour rights and promotion of decent work has to consider web-based digital labour as well (Trajano, 2021).

Unfortunately, the issue of health, safety and security of employees in developing countries is not addressed adequately. Findings that when employees face physical injury or death at work-place by occasion receive media exposure in country (Uka, 2020), raises the need to deepen research in the country.

The difference between safety and security in the workplace is explained by Boustras (2020) in a way that 'for safety, there is a legal requirement to the owner/manager - in other words, responsibility is personalized. With security, this is not the case as the State authorities provide the backbone.' Hence, the safety culture in organizations becomes an important subject to be analyzed and evaluated (Halaj et al 2018b.), or will be required by law in all sectors (Vel'as et al, 2022). In this regard, the next hypothesis is as follows:

H4: Differences exists between respondents of Albania and Kosovo and their feelings on safety and security at workplace.

The legal infrastructure on providing extensive safety, security, integrity and well-being of employees in Albania and Kosovo is governed by codes, laws, administrative instructions, collective contracts, legal acts and employee's organizations such as labour syndicates. Albania strictly obeys to The Albanian Labour Code (No.7961), Law on Health and Safety in working premises (No.10237) and other related laws. The Ministry of Social Welfare and Youth is another institutional body to oversee the implementation of such laws through its

Labour Inspectorate Offices. In addition, the International Labour Organization helps continuously the government of Albania and Kosovo in ensuring the proper harmonization of laws as per EU requirements. It has helped in drafting the previous Occupational Health and Safety Strategy and Action Plan 2015-2020 fin Albania. The employment relationship and safety at work in Kosovo is governed by Law No.03/L –212 On Labour, and Law No. 04/L-161 on Safety and Health at Work. The Ministry of Labour and Social Welfare monitors its implementation through Labour Inspectorate.

The form decisions are made within an organization and who gets involved in that process has an impact on integrity and well-being of employees. Moreover, research is based on many proponents that organizations can apply. As the experimental research from Ghosh (2008) explains the 'ethical standard is a significant explanatory variable regarding the ethics of workplace decisions when corporate values reward integrity and good business practices, or when such values are not professed at all'. Another complementary explanation to this is that of research done by Wojtkowska et al (2021) concluding that 'Employees led by developers and executive managers sustained a high sense of work security and positive attitude to work, while those led by compromisers and deserter managers suffered from the highest drop of subjective security'. In sum, Moriarty (2010) suggests that 'possession of the participation right will vary from firm to firm'.

Sorensen & Sparer (2018) identified six components for protecting and promoting worker safety, health and wellbeing ' leadership commitment; participation; policies, programs and practices that foster supportive working conditions; comprehensive and collaborative strategies; adherence to federal and state regulations and ethical norms; and data-driven change'. The freedom of expression in the workplace is another component within the well-being of employees and Barry (2007) argues that it is excessively and unnecessarily limited in both law and management practice.

> H_5: Difference exists between respondents of Albania and Kosovo and their feelings on integrity and wellbeing at workplace.

4. Data analysis

This part covers Cronbach Alpha estimations of five items, numbers, descriptive statistics, and cross tabulation analysis and hypothesis test.

The statistical analysis of this survey are coded on SPSS in nine variables. The first step of analysis involved measuring of internal consistency to figure out the scale of reliability of data using Cronbach's alpha. Cronbach's alpha (α) is the most commonly used measure of internal consistency and generally the coefficient alpha (α) ranges from 0 to 1.00 (Holcomb & Cox, 2017). According to Collins (2007) 'Cronbach's alpha is a way of assessing reliability by comparing the amount of shared variance, or covariance, among the items making up an instrument to the amount of overall variance. The idea is that if the instrument is reliable, there should be a great deal of covariance among the items relative to the variance'. As seen in Table 1, in our case the Cronbach's alpha is 0.695 which indicates an acceptable reliability coefficient level of internal consistency (Hulin et al, 2001) between five items (D1, D2, D3, D4 and D5).

Table 1 Covariance of items

		D1	D2	D3	D4	D5
D1	Covariance	**.922**	.228	.233	.411	.141
D2	Covariance	.228	**.691**	.235	.341	.163
D3	Covariance	.233	.235	**.979**	.471	.377
D4	Covariance	.411	.341	.471	**1.153**	.321
D5	Covariance	.141	.163	.377	.321	**.932**

Source: Author's data

In the table 1 are presented five items that required Cronbach alpha test where N=5 is equal to the number of total items measured, N=5 is equal to the number of items, c̄ is the average inter-item covariance among the items and v̄ equals the average variance. Using the information from the table above, we can calculate each of these components via the following:

$$a = \frac{N\,\bar{c}}{\bar{v} + (N-1)\bar{c}}$$

$\bar{v}$ = (.922+.691+.979+1.153+.932)/5= 4.677/5=0.9354

$\bar{c}$ = (.228+.233+.235+.411+.341 +.471+.141+.163+.377+.321)/10=2.921/10=0.2921

$$a = \frac{5\,(0.2921)}{(0.9354) + (5-1)(0.2921)} = \frac{1.4605}{2.1038} = 0.6935$$

Descriptive statistics indicating number, mean and standard deviation of all variables are provided within Table 2. Outputs of means and SD are as follows: gender (M=1.5657, SD=.49637); institution (M=1.5257, SD=.50005), age (M=1.6356, SD=.69972); D1 economic growth (M=2.0943 SD=.96037), D2 basic living expenses (M=1.6543, SD=.83128), D3 equal treatment (M=1.7650, SD=.98950), D4 safety and security at workplace (M=2.3800, SD=1.07386), D5 integrity protection and wellbeing at workplace (M=2.2714, SD=.96532).

Table 2. Descriptive statistics of nine variables

Variables	N	Mean	Std. Deviation
Gender	350	1.5657	.49637
Institution	350	1.5257	.50005
Place of labour market	350	1.5000	.50072
Age	343	1.6356	.69972
Perceptions on economic growth	350	2.0943	.96037
Covering basic living expenses	350	1.6543	.83128
Equal treatment	349	1.7650	.98950
Safety and security at work-place	350	2.3800	1.07386
Integrity protection and well-being	350	2.2714	.96532

Source: Author's data

In this part is presented a summary of respondent's distribution based on gender, workplace and age and what are their perceptions on economic growth and its impact on incomes; perceptions on the amount of money earned and its sufficiency to cover basic living expenses; perceptions on equal treatment at their workplaces; perception on integrity and wellbeing in the workplace; perception on safety and physical security in the workplace.

The first part of the survey is consisted of three variables: gender, age, place of labour market and working sector. Hence the data from sample indicates that 43% are females and 57% are males. Respondents are purposely dived into two categories: respondents from Albania make up 50% of the sample, and 50% of the sample includes respondents from Kosovo. Respondents that work in public sector make up 47% of this sample, and 53% of respondents are working in private sector. The age of employed respondents is categorized in three groups: the first category includes respondent's that ranges from 25 to 34 years old (49%); the second category includes respondent's that range from 35 to 54 years old (38%); and the third category includes respondent's that range from 55 to 65 years old (13%). Respondents were asked about their perceptions on different work-related issues and well-being dimensions. The output of the first statement on respondent's association with economic growth in their country and increase on incomes reveal's that 31% of respondents consider probably not as their answer, 31% say definitely not, and very probably 20%, whereas definitely is an answer of 10% of the respondents in this sample. When analyzed between two countries, in Albania 24% declare 'definitely not', 24% 'probably not', 2% 'very probably', whereas in Kosovo 10% declare 'definitely', 18% 'very probably', 14% 'probably not' and 8% 'definitely not'.

The second statement on monthly earnings and their sufficiency to cover basic living expenses brings up a serious concern where 53% of respondents declared 'definitely not', 35% of respondents declare 'probably not', 8% 'very probably' 8% and 5% 'definitely'. In between countries, respondents from Albania declared 'definitely not' at a large range of 41%, 5 % of respondents declare 'probably not', 3% 'very probably' 8% and 1% 'definitely'. In contrast data of respondents from Kosovo, revels the following: 5% 'definitely', 5% 'very probably', 30% 'probably not', and 11% 'definitely not'.

The third statement on equal treatment within organization in all aspects reveals' that 52% of respondents feel discriminated in any given aspect at their workplace considering answering 'definitely not', 30% 'probably not', 6% 'very probably' and 11% 'definitely'. In Albania 36% declared 'definitely not' and 14 declared 'probably not'. The rest of the sample including respondents from Kosovo provide the following: 'definitely not' 16%, 'probably not' 17%, 'definitely 11% and 6% 'very probably'.

The forth statement on feeling safe and physically secured at workplace, ranges as follows: 27% of respondents marked 'definitely not' scale, 28% of respondents marked 'probably not' scale, 26% of respondent's market 'very probably 'scale and 19% of respondents marked 'definitely' scale. Within two groups, in Albania 24% declared 'definitely not', 22% 'probably not', 3%'very probably' and only 1% 'definitely'. In Kosovo, 24% declared 'very probably', 18% 'definitely', 6% 'probably not' and 3% 'definitely not'.

The fifth statement aims to identify how respondents perceive that their integrity and wellbeing is protected at their workplaces and the results indicate as follows: definitely not 22%, probably not 43%, very probably 20% and 'definitely' 15%. In Albania respondents ranged highest on 'probably not' (33%), 'definitely not' (9%), 'definitely' (5%) and (3%) 'very probably'. In Kosovo, 17% of respondents ranked with 'very probably', 13% with 'definitely not', 10% 'definitely' and 10%'probably not'.

4.1. Hypothesis test

Based on the subject studied, the test of hypothesis is conducted using bivariate Pearson Correlation coefficient, r, which measures the strength and direction of linear relationships between pairs of continuous variables. The Pearson Correlation evaluates whether there is statistical evidence for a linear relationship among the same pairs of variables in the population, represented by a population correlation coefficient, ρ ("rho"). The degree of coefficient values can range from +1 to -1, where +1 indicates a perfect positive relationship, -1 indicates a perfect negative relationship, and a 0 indicates no relationship exists. According to Ratner, B. (2009) correlation degrees can be interpreted as in the following: "the coefficient value is between $\pm$ 0.50 and $\pm$ 1, correlation is strong; when the value is between $\pm$ 0.30 and $\pm$ 0.49, correlation is moderate; when the value id below + .29, correlation is weak; when the value is zero, then there is no correlation".

Table 3 presents each correlation estimation for all five hypotheses, p values and number of respondents on which the below correlations are being estimated.

Table 3: Correlations Hypothesis Test

Hypotheses	Correlation Coefficient	Sig. (2-tailed)	Number of respondents	Test
H_1	.540**	.000	350	Accepted
H_2	.566**	.000	350	Accepted
H_3	.481**	.000	349	Accepted
H_4	.706**	.000	350	Accepted
H_5	.212**	.000	350	Accepted

Source: Author's data

The independent variable labour market (Albania 1 and Kosovo 2) and dependent variable satisfaction rate of respondents with the impact of economic growth on monthly incomes takes value of r = .540, N=350, p value is .000, p<.001which is less than 0.05. The above-mentioned variables were significantly and strongly and positively correlated. The null hypothesis that the correlation is 0 is rejected. It is accepted that there is a difference between respondents of Albania and Kosovo and their rate of satisfaction with economic growth and impact on monthly incomes.

In the second hypothesis, the independent variable labour market (Albania and Kosovo) and dependent variable sufficiency to cover basic living expenses r = .566, N=350, p value is .000, p<.001which is less than 0.05. Two variables were significantly, strongly and positively correlated. The null hypothesis that the correlation is 0 is rejected and it is accepted that there is a difference between respondents of Albania and Kosova and their monthly incomes sufficiency to cover basic living expenses.

The third hypothesis, consisted of independent variable labour market (Albania and Kosovo) and dependent variable equal treatment r = .481, N=349, p value is .000, p<.001which is less than 0.05. Two variables were significantly and moderately positively correlated. It is accepted that there is a difference between respondents of Albania and Kosova and their equal treatment at workplace.

The forth hypothesis, consisted of independent variable labour market (Albania and Kosovo) and dependent variable safety and security at workplace r = .706, N=350, p value is .000, p<.001which is less than 0.05. Two variables were significantly, strongly and positively correlated. It is accepted that there is a difference between respondents of Albania and Kosova and their perceptions on safety and security equal at workplace.

The fifth hypothesis, consisted of independent variable labour market (Albania and Kosovo) and dependent variable integrity and wellbeing r = .212, N=350, p value is .000, p<.001which is less than 0.05. Two variables were significantly and slightly positively correlated. The null hypothesis that the correlation is 0 is rejected and it is accepted that there is a difference between respondents of Albania and Kosovo and their feelings on integrity and wellbeing at workplace.

5. Conclusion

This research paper has evaluated the differences on perceptions of respondents on decent work and economic growth in labour market of Albania and Kosovo. The key components of SDG 8 - economic growth, basic living costs, equal treatment, safety and security at workplace, and integrity and wellbeing are used as dependent variables in this research within five above-mentioned hypothesis, whereas labour market is used as an independent variable. Hypothesis are testes using Pearson correlation coefficient and are all endorsed. The notable finding from this survey is that, all respondents from labour market of Albania declared that they are not being treated equally at their workplaces (50% from total sampling) compared to 33% respondents (from total sampling) in Kosovo. Importantly 48% of total respondents of this sample coming from labour market of Albania, consider that economic growth has had no impact on their monthly incomes compared to 22% of total sampling in Kosovo. In addition, in labour market of Albania, safety and security at workplace is of great concern and accounts for a larger portion (46% from total sampling), considerably larger than in Kosovo (9%, from total sampling), though they appear to highly contribute on differences between two countries. The next finding on differences is that of 27% of respondents from total sampling that come from labour market of Kosova , considering that their integrity and wellbeing is protected at the workplace, whereas in labour market of Albania is much lesser and counts for not more that 8%.

6. Recommendations

In this direction, it is strongly recommended that both states address decent work in their labour markets with priority. State instruments shall be enforced to closely cooperate with employee's organizations and syndicates and work on elimination of core barriers that disable employees to feel equally treated at workplace, or safe and secured at workplace or having their integrity and wellbeing protected. Hence provide "collaboration with specific institutions and social partners in providing technical assistance, that would help increase the quality of working environment and enhance involvement and productivity of employees.

7. References

Belingheri P, Chiarello F, Fronzetti Colladon A, Rovelli P. (2021) Twenty years of gender equality research: A scoping review based on a new semantic indicator. Plos One DOI: 10.1371/journal.pone.0256474

Ladias, Christos, Ap., & Stamatiou, E. (2006). The Macro Region As An Economic Entity And Of Regional Planning. Montenegrin Journal of Economics, 2(3), 127-138.

Hirobata Y., Miyata Y., Shibusawa H., (2011), Evaluating road network improvement: economic impacts on san-en region in japan, Regional Science Inquiry Journal, Vol. III (2), 2011, pp 61-75 61

Ladias, Christos, Ap., Hasanagas, N., & Papadopoulou, E. (2011). Conceptualizing 'macro-regions': Viewpoints and tools beyond NUTS classification. Studies in Agricultural Economics, 113(1316-2016-102776), 138-144.

Correia l., Alves M. (2017). Regional employment in Portugal: differences and cyclical synchronization, Regional Science Inquiry, Vol. IX, (2), pp. 159-175. https://www.rsijournal.eu/ARTICLES/December_2017/13.pdf

Curtini E., Valentini E. (2017). Regional strategies for dealing with structural change, Regional Science Inquiry, Vol IX (1), pp. 107-117. https://www.rsijournal.eu/ARTICLES/June_2017/8.pdf

Blau FD, Kahn LM. The gender wage gap: Extent, trends, and explanations. Journal of Economic Literature. 2017; 55(3):789–865 DOI: 10.1257/jel.20160995

Constantin, D. L., (2021) "Addressing spatial justice at lower territorial levels. some insights from thecentral and east European countries' perspective", Regional Science Inquiry, 13(2), pp.315-326.

Castles, I., & Treasury. (2014). Economic Growth: Is it Worth Having? In A. Podger & D. Trewin (Eds.), Measuring and Promoting Wellbeing: How Important is Economic Growth? (pp. 107–160). ANU Press. http://www.jstor.org/stable/j.ctt6wp80q.9

Duarte N., Diniz., (2020), Does business geographical acting areas impact on intrapreneurship and sustainability strategies, Regional Science Inquiry, Vol. XII, (1), pp.23-34

Bizzarri C., (2014), New urban space of migrants: Geographical and economics impacts, Regional Science Inquiry, Vol. VI,(1), pp.127-138

Papadaskalopoulos A., Nikolopoulos P. (2018). The role of social capital in regional development, Regional Science Inquiry, Vol X (1), pp. 125-140. https://www.rsijournal.eu/ARTICLES/June_2018/11.pdf

Foley, M., & Cooper, R. (2021). Workplace gender equality in the post-pandemic era: Where to next? Journal of Industrial Relations, 63(4), 463–476. https://doi.org/10.1177/00221856211035173

Hoffer, C. R. (1929). Research in the Standard of Living. Social Forces, 7(3), 399–402. DOI:10.2307/2569809

Holcomb, Z.C., & Cox, K.S. (2017). Interpreting Basic Statistics: A Workbook Based on Excerpts from Journal Articles (8th ed.). Routledge. https://doi.org/10.4324/9781315225647

ILO, (2021) Albania Decent Work Country Programme 2017 – 2021, Retrieved from https://www.ilo.org/wcmsp5/groups/public/---ed_mas/---program/documents/ genericdocument/wcms_562105.pdf

Polyzos, S., Tsiotas, D., (2020) "The contribution of transport infrastructures to the economic and regional development: a review of the conceptual framework", Theoretical and Empirical Researches in Urban Management, 15(1), pp.5-23.

Irimie,S., Munteanu,R., Ghicajanu, M., Marica,L. (2015) Aspects of the Safety and Health at the Workplace, Procedia Economics and Finance, 23, 152-160, Retrieved from DOI: 10.1016/S2212-5671(15)00390-1.

ILO 2014, Amendments to Law No. 10 237 on Occupational Safety and Health, Retrieved from https://www.ilo.org/dyn/natlex/docs/ELECTRONIC/102656/124224/F-429012013/ALB-102656.pdf

Feriyanto N., Sriyana J., (2016), Labor absorption under minimum wage policy in Indonesia, Regional Science Inquiry, Vol. VIII, (1), 2016, pp. 11-21 11 article_1_start_page_bookmark, https://www.rsijournal.eu/ARTICLES/June_2016/1.1.pdf

Murphy, K. M., & Topel, R. H. (2016). Human Capital Investment, Inequality, and Economic Growth. Journal of Labor Economics, 34(S2), S99–S127. DOI: /10.1086/683779

Batabyal, A.A., (2017), Output, growth and convergence in a creative region: An analysis of some measurements issues, Regional Science Inquiry, Vol. IX, (1), pp. 11-19, https://www.rsijournal.eu/ARTICLES/June_2017/1.pdf

Rai SM, Brown BD, Ruwanpura KN. (2019) SDG 8: Decent work and economic growth-A gendered analysis. World Development. 113:368–380 DOI;10.1016/j.worlddev.2018.09.006.

Amri K., (2018), The macroeconomic impact of regional minimum wages: a cross-province data evidence from Indonezia, Regional Science Inquiry, Vol. X, (3), 2018, pp. 163-176, file:///C:/Users/HP/Desktop/12.pdf

Linkaru C., Ciucă V., Pîrciog S., Atanasiu D., (2013), Finding underlying factors using the independent component analysis on labour market – application on unemployment rate in monthly variation, Regional Science Inquiry Journal, Vol. V, (1), 2013, pp. 43 -73,

Lincaru C., Pîrciog S., Atanasiu D., (2016), A model of a system of monitoring and alert system of the risk of unemployment – romanian case, Regional Science Inquiry, Vol. VIII, (3), pp. 125-145 125

Republic of Albania, 2022. United Nations Sustainable Development Cooperation Framework 2022-20026; Retrieved from https://albania.un.org/sites/default/files/2021-10/PRINT_Shtator_Eng_new_Updated_Albania%20CF%202022-2026%20OK_1.pdf

Rüdiger Hamm and Christine Goebel, (2010), Identifying regional cluster management potentials empirical results from three north rhinewestphalian regions, Regional Science Inquiry Journal, Vol. II (2), 2010, pp 83-94 83

Sorensen G, Sparer E, Williams JAR, Gundersen D, Boden LI, Dennerlein JT, Hashimoto D, Katz JN, McLellan DL, Okechukwu CA, Pronk NP, Revette A, Wagner GR. Measuring Best Practices for Workplace Safety, Health, and Well-Being: The Workplace Integrated Safety and Health Assessment. J Occup Environ Med. 2018 May;60(5):430-439. DOI: 10.1097/JOM.0000000000001286. PMID: 29389812; PMCID: PMC5943154.

Tsiotas, D., Polyzos, S., (2018) "The complexity in the study of spatial networks: an epistemologicalapproach", Networks and Spatial Economics, 18(1), pp.1–32.

Batabyal, A.A., and Nijkamp, P. 2018. The magnification of a lagging region's initial economic disadvantages on the balanced growth path. Unpublished Manuscript, Rochester Institute of Technology

Trajano, J. C. (2021). A Rights-Based Approach to Governing Online Freelance Labour: Towards Decent Work in Digital Labour Platforms. S. Rajaratnam School of International Studies. http://www.jstor.org/stable/resrep34088

UN Women (2015), Progress of the World's Women 2015-2016: Transforming economics, realizing rights, Chapter 4, p. 199. Retrieved from: UNW_progressreport.pdf (unwomen.org)

United Nations 2022, Sustainable Development Goal 8, Promote inclusive and sustainable economic growth, employment and decent work for all, Retrieved from https://sdg-tracker.org/economic-growth

United Nations (UN), (2015). Transforming our world: The 2030 Agenda for Sustainable Development. Retrieved from https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20ustainable%20Development%20web.pdf

United Nations Economic and Social Council (2020), Report of the Secretary-General on progress towards the Sustainable Development Goals; United Nations (2020), The Sustainable Development Goals Report 2020. Retrieved from https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf

United Nations Kosovo Team (2021) United Nations Sustainable Development Cooperation Framework 2021 – 2025, Retrieved from https://kosovoteam.un.org/sites/default/files/2022-02/UNKT-web%20version.pdf

Wall, E., Svensson, S., Berg Jansson, A.,(2021) Sense of security when new at work: a thematic analysis of interviews with young adult retail workers in Sweden, International Journal of Workplace Health Management, (14/6), 620-633. DOI: /10.1108/IJWHM-03-2021-0049

Wojtkowska, A., Tyburski, E., Skalacka, K., Gasiorowska, A. (2021) Perceived Decrease in Workplace Security Since the Beginning of the COVID-19 Pandemic: The Importance of Management Styles and Work-Related Attitudes. Front. Psychol. 12:635973. DOI: 10.3389/fpsyg.2021.635973

Dorninger C, Hornborg A, Abson DJ et al (2021) Global patterns of ecologically unequal exchange: implications for sustainability in the 21st century. Ecol Econ 179:106824. https://doi.org/10.1016/j.ecolecon.2020.106824

INVESTIGATING THE INTERACTION BETWEEN THE TOPOLOGY OF BUS TRANSPORT NETWORKS AND REGIONAL DEVELOPMENT IN GREECE

Thomai TASOPOULOU
Researcher, Department of Regional Development and Planning,
University of Thessaly, Volos, Greece
thtassopoulou@gmail.com

Dimitrios TSIOTAS
Assistant Professor, Department of Regional and Economic Development,
School of Applied Economics and Social Sciences, Agricultural University of Athens, Amfissa, Greece
tsiotas@aua.gr (Corresponding Author)

Serafeim POLYZOS
Professor, Department of Regional Development and Planning,
University of Thessaly, Volos, Greece
spolyzos@uth.gr

Abstract
Bus companies are transport operators that support the demand in local markets for transport and at the same time promote regional development. This paper studies the topological and geographical characteristics of the Greek Bus Transport Network (GBTN) of the Joint Reciepts Fund of Buses (KTELs) of five regions of Greece in relation to their socio-economic environment, aiming at studying the effectiveness of the GBTN in comparison to the inter-regional road transport network in Greece. For this purpose, we apply complex network and econometric analysis to delve into the interaction between the topology of bus transport networks and regional development, focusing on the case of Greece. The methodological approach promotes the analysis of complex spatial networks, as a modeling tool in spatial planning. Overall, this paper highlights and evaluates the contribution of the interurban network to the overall road network of the country and the support and promotion of the economic profile of local markets.
Keywords: public transport; regional and local economy; network science; spatial networks; network analysis.
JEL classification: R41, R42, R1

1. Introduction

The purpose of transport is to transcend space, which is shaped by a variety of human and physical constraints such as distance, time and administrative boundaries (Rodrigue et al., 2013). The main purpose of transportation systems is to move people, goods and information from source to destinations (Ducruet & Beauguitte, 2014). Transport networks in general and road networks in particular are the backbone of a city and directly affect its productivity and survival. The road network has been the main land transport network in Western world countries since the 1950s to the present day and exhibits complex topological properties (Tsiotas, 2021). It allows for extensive dispersion of travel in space and relatively easy accessibility to areas with complex geomorphological topography (Rodrigue et al., 2013; Tsiotas, 2021). In Greece, the road mode of land transport is the main mode of transport, given that the country's rail infrastructure lags far behind that of other European countries (Colak, 2015; Perovic and Golem, 2015; Constantin et al., 2021; Polyzos, 2019, 2023) and its main transport infrastructure is the road network (Tsiotas, 2017, 2021). This complements both sea and air and rail transport (Tsiotas and Polyzos, 2015a,b). Greece's road network consists of motorways, national and provincial roads. Two of the main roads in mainland Greece are the Patras - Athens - Thessaloniki - Evzoni (PATHE) axis and the Egnatia Odos, which crosses Greece from west to east, from the port of Igoumenitsa to the Turkish border. The Greek inter-regional road network is 35,860km long (Tsiotas, 2021) and connects a variety of mountainous, land and coastal areas.

An extremely important part of road transport is public transport, which is a collection of modes of transport available to the public regardless of ownership (White, 2002; Dionysopoulou et al., 2021). Historically, most public transport networks have evolved over time based on the past experience of planners, simple guidelines or requirements from local communities (Mumford, 2013). The evolution of a city's public transport system is closely related to the development of the city itself and is therefore influenced by many factors of historical, geographical and social origin (Gioti-Papadaki et al., 2017; Tsiotas et al., 2021). In sparsely populated areas, the aim is to meet basic transport needs, while in larger cities the aim is to reduce congestion and improve the environment (Goula et al., 2015; Polyzos, 2023). At the regional scale, the purpose is to create opportunities for education and increase the labor market. Several studies (Crane and Scweitzer, 2003; Titze et al., 2008; Van Acker et al., 2013; Zhang et al., 2017; Yu et al., 2019) have examined the association between public transport and the built environment, as well as socioeconomic characteristics. These studies quantitatively measured the impact of local built environment factors (density, diversity, design, transit distance, and destination accessibility) on public transportation. Most assumed that public transport travel choice is only influenced by local factors within the same spatial unit (e.g. traffic analysis zones) and most relied on empirical observations and surveys of the local spatial unit. However, the city is composed of a set of actions, interactions and transactions (Batty, 2013; Liu et al., 2015) and studies need to take into account dynamic spatial interactions in relation to space and time (Nasri and Zhang, 2014).

The analysis of public transport networks using Network Science allows the use of a common platform in which we can understand and decipher the intrinsic network characteristics encoded in the topological properties (Tsiotas and Polyzos, 2018). In graph theory, a network is typically represented as a graph consisting of a set of nodes interconnected by a set of edges. This field of study continues to attract enormous research interest in the last two decades (Barabasi, 2016). Although many complex real-world systems have been analyzed using graph theory, little attention has been paid to the field of public intercity road networks which is an active research area. Intercity bus services are an integral part of the overall public transport system that responds to the demand for long-distance travel. It plays a vital role in connecting large cities with each other and small towns and rural settlements. Intercity buses help communities achieve sustainability goals (Polyzos, 2019; Polyzos and Tsiotas, 2020, 2023).

In Greece, there are sixty-two operators providing public intercity passenger transport services using buses under the name of Common Bus Collection Funds (KTEL) with their headquarters and operating area in their regional unit. The definition of bus and coach undertakings also refers to the boarding stations of these buses and coaches. Bus and coach operators serve the whole country, with approximately 180 million passengers per year. The public long-distance road transport network serves the permanent travel needs of the public, with scheduled services to which everyone has access for a fixed fare. In the context of this complexity, in this paper, we conduct a case study on the public long-distance road bus network (GBTN) of five regions of Greece (Eastern Macedonia and Thrace, Central Macedonia, Western Macedonia, Thessaly and Epirus), using 24 bus stations (analysis zones). During our analysis, various network parameters are introduced to explore the impact of topology on transport and its connection to the socio-economic context of the network. The various local and global properties are evaluated as part of the topological analysis and provide a common platform for understanding and deciphering the intrinsic network characteristics that are partially encoded in their topological properties. In addition, a comparison is made between the topology of two networks, the public interurban road transport network (GBTN) and the interregional road transport network in Greece (GRN) as studied by Tsiotas (2020), expressing a spatial infrastructure network.

2. LITERATURE REVIEW

2.1. Transport, Transport Networks and Spatial Development

Human mobility serves the intrinsic need for mobility and continuously affects the social and economic development of societies at national, regional and local levels (Polyzos, 2011; Rodrigue et al., 2013; Polyzos and Tsiotas, 2020, 2023). The existence and efficient operation

of a transport system and the corresponding infrastructure is an essential prerequisite for development both at national, regional and local levels. According to Behrens and Thisse (2007), transport contributes over time to linking individual land uses and promotes the production process and the realisation of trade through the creation of trade flows (Polyzos and Tsiotas, 2020, 2023). Moreover, transport implies the development of economies at the local level, reducing inequalities between regional units and spatial asymmetry in general, while enlarging national economies and promoting international economic transactions (Alexiadis et al., 2011; Polyzos, 2011; Xanthos et al., 2011). The operation of transport networks contributes to regional development (Alexiadis, 2020; Polyzos and Tsiotas, 2020, 2023), as transport intensifies productive activities (contributing to the exploitation of the comparative advantages of regions), facilitates and develops interregional trade reducing travel costs and time (Shimamoto, 2019), expands the tourism sector contributing to the tourist development of remote areas (Caca et al., 2016), increases the degree of social cohesion (helping to address the phenomena of isolation and demographic weakening of regions), and improves the quality of life (contributing to the development of regional economies).

2.2. Public transport and regional development

Providing public transport requires significant organizational efforts, careful planning, financial contributions from the public and coordination between millions of passengers and staff members in large systems. The existence and operation of efficient transport networks and related infrastructure involves a key economic dimension that affects both the level of service to the public interest and the national economy and the level of encouragement of private initiative and enhancement of entrepreneurship (Polyzos and Tsiotas, 2020). Several studies have conducted extensive reviews of economic and policy issues related to public transport (Berechman, 1993; Gwilliam, 2008), others summarize previous developments in optimizing public transport capacity for social improvement (Jara-Diaz and Gschwender, 2003a,b), others review the pricing literature in a multimodal context (Jara-Diaz and Gschwender, 2005; Tirachini and Hensher, 2012; Jansson et al., 2015), while there are studies that review the optimization problems in public transport with a strong orientation towards operational research (Desaulniers and Hickman, 2007).

At EU level, the private car dominates over all other modes of transport (Eurostat, 2020). This fact, to the extent that it is linked to congestion on the arteries of the public transport network, not only has a significant impact on the environment (increased levels of air pollution) and on the quality of life of the populations of large urban centers (road accidents), but also has a negative impact on the mobility (in terms of time and cost) of goods and people transported to and from large urban centers, with consequences for their productivity and the overall efficient management of their time. In Greece, despite the fact that through privatizations and public-private partnerships (PPPs) the share of state control of transport, especially in the land transport sector, has been significantly reduced over the last decade, many transport hubs and transport service infrastructures are still owned by state operators. Investment in public transport affects the flow of money as well as job creation in the economy (Polyzos, 2019; 2023). Several researchers have found a close relationship between infrastructure investment and the economic development of a region (Tsiotas and Tselios, 2023). Transport infrastructure, among the different types of infrastructure, is considered one of the most important by policy makers, since transport costs are very important for the choice of location for businesses and thus the economic development of a region (Polyzos, 2019; Cao, 2021). Improved mobility, time and cost savings provided by investment lead to wider economic growth resulting from changes in business productivity, household disposable income and market access (Karras, 2010; Polyzos, 2019; 2023). There are public policy interests in both elements of economic impact (Polyzos, 2019; 2023; Tsiotas and Tselios, 2023).

2.3. Public Transport in Greece

The KTEL (Common Bus Collection Funds) constitute a separate operational structure in the Greek transport sector. They are public limited companies which are responsible for the

execution and operation of intercity and urban passenger transport services. The historical development of KTEL dates back to 1896, when the first French-built bus of only 14 seats appeared on the Athens - Thebes line. Each bus was an independent private enterprise and the owner, at his discretion, without the supervision of the state, could use it in any area and on any route. The fare was freely determined according to the number of passengers or any competition. In 1920-25, the first provisions regulating the circulation or movement of buses appear, such as Legislative Decree 24812 of September 1922, and Presidential Decree 715 of October 1925. In 1937-40, the fundamental provisions were adopted and the first joint urban and intercity bus directorates were established. Consequently, 1937 can be regarded as the starting point for public bus passenger transport. At that time, the joint directorates for urban and interurban buses were created, which was the first essential step in the organization of passenger transport. This process was halted by the Second World War. In the year 1939 the total number of intercity buses in the country was 1635 buses with 27,767 seats. After the end of the war, the reconstruction of bus transport began again and saw a rapid rise due to the fact that the railways had been destroyed and served few areas of the country, there were no airports and the car was essentially the only land-based means of transport. The KTELs were established by Law 2119/1952 "On bus transport by car", one for each island and for each prefecture (a total of 104 common funds were created, of which 59 were intercity and 45 urban). The intercity bus companies had a fleet of 3311 buses with 79,464 seats. By decision of the Ministry of Transport, in 1967-68, all the KTELs were merged into 8 KTELs (Joint Reciepts Fund of Buses). The 6 urban KTELs of Attica were merged into 1, the 45 intercity KTELs of the mainland and Crete were merged into 8 KTELs, and the remaining 53 maintained their independence. However, this system proved to be problematic and Legislative Decree 102/1973 'On the organization of buses, cars and public passenger transport services' reverted to the previous system. Under Law 1437/1984, a process of separation of the urban and interurban bus companies was initiated under Article 24. Law 1437/1987 "Regulation of issues of passenger cars for public use and other provisions" ensured their definitive separation into intercity and urban, while Law 2963/2001 "Organization and operation of public passenger transport by bus, technical inspection of vehicles and transport safety and other provisions" transformed them into joint-stock companies providing transport, commercial and tourist services.

Today, there are sixty-two KTEL operating in the form of limited companies with a fleet of around 4,199 buses. Although they are private companies (not directly subsidized by the State, as is the case with urban transport), they continue to be, in essence, public utilities, under the direct supervision of the State, which sets the fare (ticket prices) and offers the highest social good of public transport. In different countries, depending on the spatial structures, alternative transport services and regulations, there are huge differences in market shares. In fully deregulated countries such as the UK, the USA and Sweden, intercity buses operate without subsidies, while, in partially deregulated countries such as Norway and Spain, long-distance buses are operated with subsidies as a result of competitive tendering (Augustin et al., 2014). The supervisory bodies of the bus operators are the relevant Region and the Ministry of Infrastructure and Transport. Intercity bus stations owned by the State or other public sector bodies or public-private partnerships are part of the public intercity passenger road transport network.

The KTELs cover the basic road transport connections between local and municipal units and the administrative and economic centers of the urban areas of Greece. As far as the region of Attica, excluding the regional unit of islands, and the regional unit of Thessaloniki are concerned, the planning of the interurban road passenger transport network concerns only the interurban lines within their geographical boundaries, as well as the interurban line Athens - Thessaloniki. In addition, the bus services shall take into account the specific needs of pupils or trainees for travel to education centers and workers for travel to work. The contribution of KTEL to the regional economy is considered to be considerable, as it serves the mobility of many workers and connects remote areas of Greece with regional and national centers, serving to promote regional and local development in various ways, such as by improving accessibility for tourists. Moreover, the importance of KTEL as the main provider of long-distance transport services in Greece is evident from the fact that it covers areas where there are no alternative (ferry, rail or air) transport services at a national level (Tsiotas and Polyzos,

2015a,b; Alabanos and Theodoropoulos, 2017). In addition, several KTELs have set up tourism offices, organizing excursions to destinations inside and outside Greece, and operate routes between Greek urban centers and urban centers in neighboring countries. In order to carry out their transport work, the KTELs may undertake studies relevant to the organization and operation of their work and may carry out any transport project, subject to compliance with the relevant conditions of the regional unit, by setting up special transport companies to carry out this work. Given that the structure of the existing networks is characterized by a high degree of complexity, the study of bus networks in terms of complex network analysis is expected to be enlightening both in terms of economic geography and regional policy. A complex network is a network characterized by unusual topological properties (i.e. properties not found in simple networks or random graphs), but which occur in 'real world' networks (Barthelemy, 2011). The analysis of transport systems as complex networks can be an effective methodological tool for their investigation (Tsiotas and Polyzos, 2015a,b; Tsiotas, 2017, 2021). From a network science perspective, transport infrastructures correspond to networks and transport to the flows that take place within networks. The particular structure, form or function of transport networks may vary depending on current historical, economic and social conditions. It has been observed that the emergence and expansion of transport networks is a pole of attraction for economic and social activities in adjacent areas (Tsiotas and Polyzos, 2018). As a rule, therefore, the formation of areas (hubs) characterized by high accessibility implies an increase in the overall demand for the establishment of activities and, therefore, the creation of a comparative advantage in relation to other competing areas.

3. <u>METHODS AND DATA</u>

The methodological framework applied for the analysis of the public interurban road transport network (GBTN) consists of three distinct steps. The first is the graphical modeling of the GBTN (public long-distance road transport destinations and origins). In the second, important topology and geometry measures related to the structure and efficiency of the GBTN are calculated and compared with the corresponding measures of the inter-regional road transport network in Greece (GRN) as studied by Tsiotas (2021). The third step contains the empirical analysis which is carried out on a set of network and socio-economic variables for each regional unit, analyzing the results on the socio-economic performance of the GBTN topological structures both from a computational and empirical point of view. Initially, GBTN is modeled on a geo-referenced initial graph (Tsiotas, 2021), taking into account the spatial integration of 24 public long-distance road transport networks (KTEL) for the regions of Eastern Macedonia and Thrace, Central Macedonia, Western Macedonia, Thessaly and Epirus. The graph is represented in the space L, called the stop space (Kurant and Thiran, 2006; Von Ferber et al., 2009), where a bus stop is treated as a node and a pair of nodes are connected by an edge if there is at least one route serving the two stops consecutively. Multiple edges between nodes are not considered in order to display the actual physical connectivity of the network (Tsiotas and Polyzos, 2015a). In GBTN the L-space representation consists of bus stops and the presence or absence of connectivity between stops regardless of the number of routes between stops. Figure 1(a) shows the spatial locations of GBTN bus stops and the final network structure. Each sub-network node is connected to a central point (origin node), having point-to-point connectivity. The sub-network centers (KTELs) are shown in yellow and are indicated as bus starting points in the capital cities of the regional units (with the exception of the KTEL of Chalkidiki, where the starting point is defined as Thessaloniki). The digitization was carried out using QGIS, an open source geographic information system software that allows the creation, visualization, processing and analysis of geospatial data. Google Earth was used to visualize the spatial location of the bus stops and Gephi (Bastian, et al., 2009) for visualization and topological analysis. Also, Figure 1(b), illustrates the spatial locations of roadway intersections and the GRN structure (Tsiotas, 2021).

Fig.1. Spatial location of (a) GBTN bus stops (destinations and origins) (1486;1663) and (b) GRN road route intersections (stops) (4993;6847)
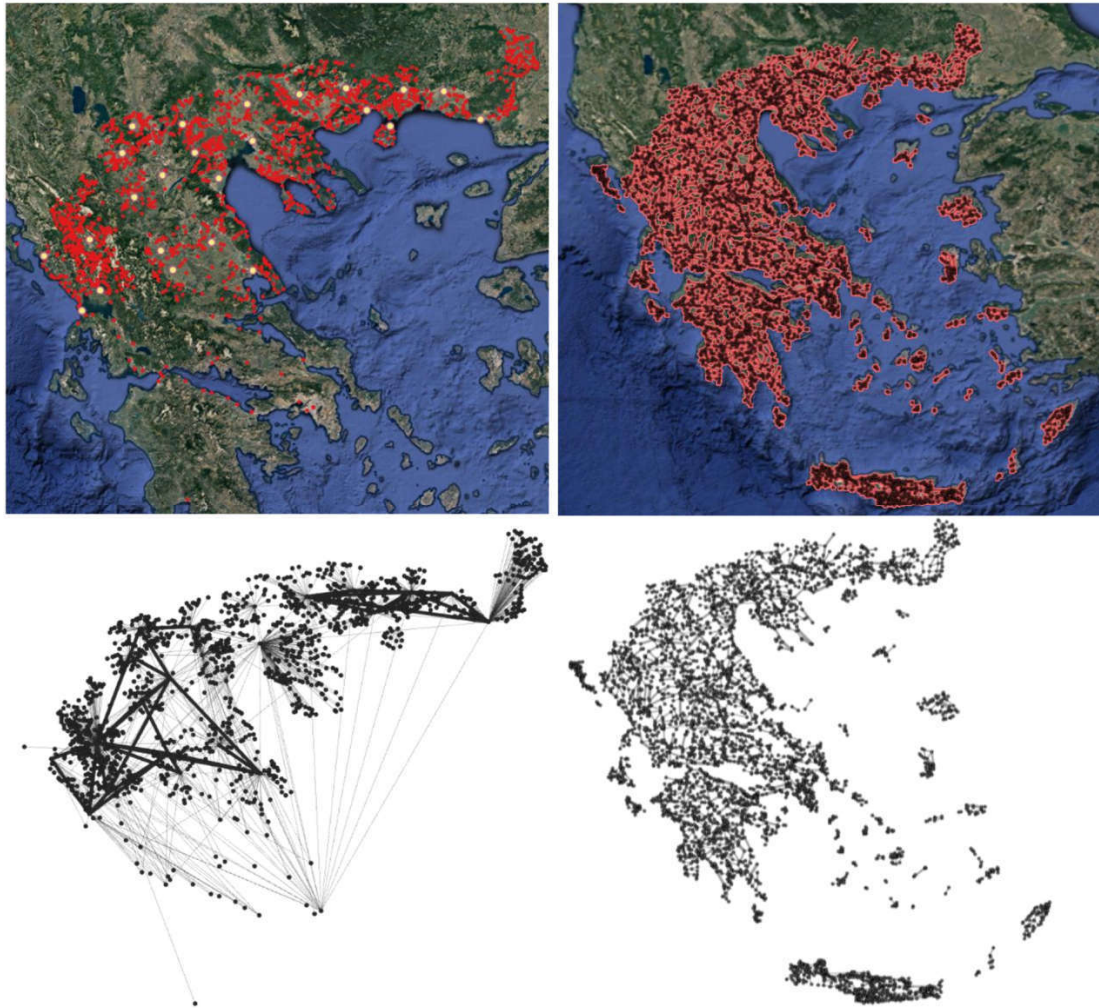
(Source: Own editing ; Tsiotas, 2021)

The bus network data for GBTN used in this study were obtained from the official websites of the twenty-four local bus transport organizations, and the institutional frameworks of the competent authorities (Directorate of Transport and Communications) and local authorities (see Annex). The information available for each long-distance line included the list of stops and the list of routes (sequence of stops) operated by the operators. A stop or station is a designated place available for picking up or dropping off passengers and a route (stop sequence) is a route followed to reach the destination from a source along intermediate stops. The key assumptions followed in the article to extract the datasets to extract meaningful information are summarized as follows:

• Destinations (places of arrival) are considered to be intermediate stops (settlements) and the final destination (settlement), even if they are round trips

• If the stop is outside a settlement (e.g. at a junction), the nearest settlement is taken as the stopping place

• Routes which are operated only when the school is in operation are considered as permanent routes (destinations)

• No separation of winter and summer routes (destinations)

In this framework, the GBTN was constructed as an undirected graph G(V,E), with spatial weights, consisting of n=1486 nodes (vertices) and m=1663 edges (links). The set of nodes V corresponds to the origins and destinations (place of arrival) of the GBTN, while the set of edges E, represents the road routes between origin and destination. The positions of the nodes are located at the exact geographical coordinates (longitude, latitude) of the GBTN buildings, while the edges are drawn as lines and not in their natural (to scale) form. The weights of the

edges represent the geographical distance (in km) and the time distance (in minutes) between two nodes. The geographical location of waypoints along road links between consecutive stops and the travel time of the whole route were not available from all operators of the routes, so an approximation had to be made for each route. The assumption made was to take as distances the minimum kilometric distance, within a radius of more than 10 km from the center of each sub-network (origin), and the minimum time distance between the origin stop and the destination stop, even if they do not correspond to the same road route. Because this assumption is constant in space and time across all sub-networks, its effect does not affect the results. The GBTN emerged non-connected network (Tsiotas & Polyzos, 2015a), having 25 subnets as components.

In the next stage of the empirical analysis of GBTN, a correlation analysis is applied to a set of road network infrastructure, spatial, economic, demographic and tourism variables. To apply the correlation analysis, the variables were reduced to the scale of a regional unit, as the network nodes do not have any additional exploitable physical or economic importance. The variables involved in the analysis were drawn from relevant literature (ELSTAT, 2011; Tsiotas and Polyzos, 2015a,b;. Tsiotas, 2017, 2021; Tsiotas et al., 2011, 2022) and are presented, by category, in Table 1.

Fig.2. Map of the GBTN Regional Entities' connecting components
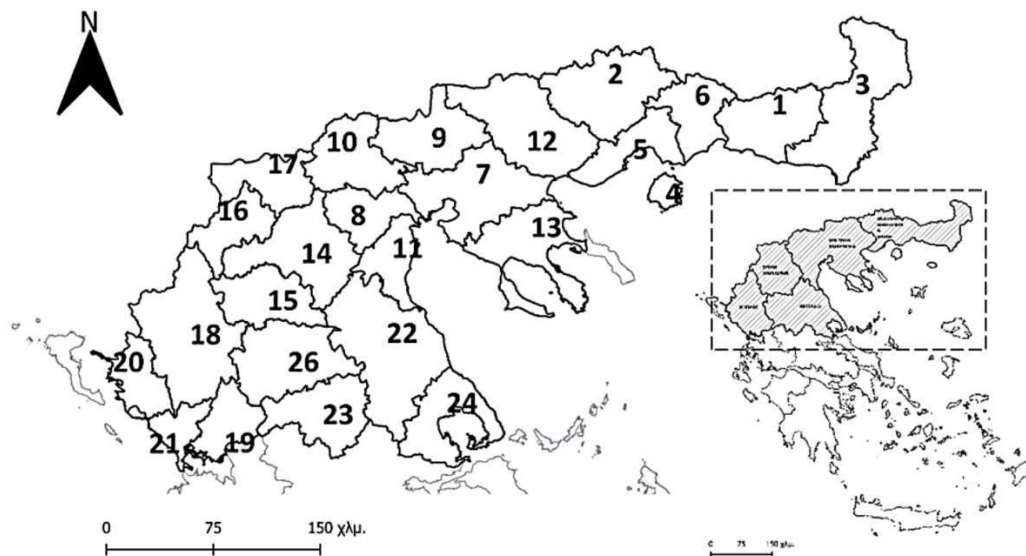
Source: Own editing

Table 1 Variables participating in the GBTN empirical analysis

Symbol	Description
Topological and spatial variables	
n	The number of GBTN nodes
m	The number of GBTN connections
$\langle K \rangle$	The average degree of GBTN nodes
$\langle k_{w(km)} \rangle$	The weighted average (kilometric proximity) degree of the GBTN nodes
$\langle k_{w(min)} \rangle$	The weighted average (time proximity) degree of the GBTN nodes
CC	The average centrality proximity of GBTN
CB	The average intermediate centrality of GBTN
C	The average concentration factor (probability of finding connected neighbours) of GBTN
$\langle d_{km} \rangle$	The average mileage of GBTN
$\langle d_{min} \rangle$	The average GBTN time distance
R_{km}	The GBTN mileage range
Network infrastructure variables	
RODENS	Road density, defined as the fraction of the total length of the country's roads to the total area of the country
RADENS	Railway network density, defined as the ratio of the total length of railways to the total area of the country
PRT	The number of ports
AIR	The number of airports
CENTR	Centrality, the average distance of the capital regional unit from all others in the network
FLT	The GBTN fleet, the sum of the fleets of the 25 subnets
DATH	The distance of each service point/background to Athens
DTHS	The distance of each service point/back-up point to Thessaloniki
Socio-economic variables	
POP	The permanent population
URBAN	The degree of urbanisation - ratio of the population of the capital of a regional unit to the total of the regional unit
EDU	The level of education
HUM	Human capital-qualitative characteristics of the population
FRC	The number of employees
A_SEC	The contribution to the national primary sector GDP of the regional study units
B_SEC	The contribution to the national secondary sector GDP of the regional study units
C_SEC	The contribution to the national tertiary sector GDP of the regional study units
TOUR	The contribution to the tourism sector of the study regions
FRM	The number of enterprises registered with the E.E.E.
PRVHC	Private motor vehicles in circulation
MTR	The motorcycles in circulation
PVHC	Public motor vehicles in circulation
BUS	The buses in circulation
TCKATH	The ticket price for Athens
TCKTHS	The ticket price for Thessaloniki
COST	The travel cost/kilometre
GDP	The Gross Domestic Product (GDP)

Source: Own elaboration

The correlation analysis is performed by calculating Pearson's correlation coefficient, which is a measure of linear involvement of two random variables. This coefficient is denoted by r_{xy} (Norusis, 2011) and takes values in the interval [-1,1]. The extreme values -1 and 1 correspond to the case when all points lie on a straight line with a negative or positive slope, respectively. The coefficient r_{xy} is a pure number thus allowing comparisons.

4.   RESULTS AND DISCUSSION

4.1. Topological Analysis

The topological analysis of GBTN was performed using basic theoretical topological measures (e.g., degree, concentration factor, centrality proximity), global measures (e.g., degree distribution, average path length) network and community detection. The results of computing the network measures compared to the corresponding measures of the inter-regional road network in Greece (GRN) calculated by Tsiotas (2021) are presented in the comparative Table 2.

Table 2 Comparative table of GBTN and GRN measures[a]

Metric/Measure	Symbol	Unit	GBTN	GRN[a]
Type of graph	#	#	Non-directed	Non-directed
network nodes	n	#[b]	1486	4993
Network edges	m	#	1663	6487
Connected components	a	#	2	156
Maximum degree	k_{max}	#	251	8
Minimum degree	k_{min}	#	1	1
Average degree	k	#	2.238	2.598
Average distance - weighted degree	$\langle k_{w(km)} \rangle$	km	140.657	14.108
Average time - distance weighted degree	$\langle kw_{(min)} \rangle$	min	122.203	N/A[d]
Average path length (weighted)	l	#	3.371	46.794
Network diameter (weighted)	D	km	4	993
graph density	P	net[c]	0.002	0.001
Average clustering coefficient	$\langle C \rangle$	net	0.686	0.07
Modularity - weighted	Q_w	net	0.774	0.946
No of communities	No_w	#	13	N/A
Modularity - distance weighted	$Q_{w(km)}$	net	0.621	N/A
No of communities - distance weighted	$No_{w(km)}$	#	10	N/A
Modularity - time - distance weighted	$Q_{w(min)}$	net	0.673	N/A
No of communities - time - distance weighted	$No_{w(min)}$	#	11	N/A

[a] Source: Tsiotas (2021); [b] Number of settlements; [c] Dimensionless number; [d] N/A: Not available

The GBTN study areas (Eastern Macedonia and Thrace, Central Macedonia, Western Macedonia, Thessaly and Epirus) cover almost half of the geographical area of the GRN since GBTN serves almost half of the regional units. The GBTN consists of 1486 nodes of which 24 are hubs and the rest are spokes. The GBTN is a network with 2 connecting components, no isolated nodes ($k_{GBTN min} \neq 0$) and no self-connections. The maximum value of the GBTN node degree is $k_{max(GBTN)} = 251$. In the case of GRN, it is $k_{max(GRN)} = 8$ and is almost half compared to the cases of urban systems (Buhl et al., 2006; Barthelemy, 2011), where $k_{max(GRN)}$ 20. The average value of the degree $\langle k \rangle_{GPRN} = 2.238$ is of the order of the lattice network structure size and represents the connections attributable to the 1462 regional destinations. Despite the specialization of GBTN in public long-distance road transport, the average value of the degree seems to be in line with the GRN case $\langle k \rangle = 2.598$, outlining that the bus operators have a rudimentary business profile.

The average distance-weighted degree of nodes is equal to $\langle k_{w(km)} \rangle = 140.657$km and expresses the total length of connections that a random node in the network has. The average time-distance-weighted degree of nodes (average time-distance-weighted degree) $\langle k_{w(km)} \rangle = 122.203$min shows a similar magnitude value. From the two weighted degrees, it can be seen that the average access speed of intercity buses is 69km/h. The maximum permissible speed limit of motor vehicles, inside residential areas, is set at 50km/h. Outside residential areas, for highways, expressways and other network, the maximum permissible

speed limit is set at 100km/h for buses, 80km/h for double-decker buses and 80km/h for school buses (amendment to Article 20, Government Gazette 57A/1999). As the bus services operate only long-distance routes, it can be concluded that more services are operated in inaccessible areas. The starting points of the bus services are on average 52 km from the furthest geographical boundaries of the regional districts to which they belong. Therefore, according to the weighted (in terms of distance in km), the routes of each bus service extend on average over three regional units. The measure of the weighted average degree and the average degree provide us with the information that, although the bus routes are outward-looking, they cover long distances in terms of kilometers and time, as almost two routes (connections) lead to the destinations, whenever the network cannot serve all the destinations.

The value of the average path length of the network expresses that the number of steps separating the most distant vertices of the network consists of 3,371 edges (connections). The low value of the GBTN average path length expresses a satisfactory level of directness and accessibility. The GRN consists of $\langle l \rangle$=46,794 edges. The values of $\langle l \rangle$ express the generalized cost of the movements occurring within the networks (Tsiotas and Polyzos, 2015a), which are affected by flatness constraints. Then, the diameter is the largest of all shortest paths and is an upper bound on the average path length. The spatial (kilometric) diameter of GBTN and GRN is equal to 4km and 993km, respectively, and expresses the kilometric distance between the two most distant nodes in the network. The density of the non-planar GBTN is equal to p=0,002, a value which is infinitesimally small and does not seem to be amenable to further interpretation given the planar nature of the network. Next, the average GBTN concentration factor quantifies the neighborhood relationship between nodes in a network. GBTN clustering is of the order of 69%, expressing high efficiency of regional relationships and good regional policy. The high value of the concentration (clustering) coefficient combined with the low value of the average path length demonstrates the efficiency and accessibility of GBTN. The corresponding value for the GRN network is equal to 0.07. Both values of $\langle C \rangle$ are much larger than the corresponding value of a random ER network, which is approximated by $\langle C \rangle_{ER} \sim 1/n = 2 \cdot 10^{-4}$ (Barthelemy, 2011), which suggests that GBTN and GRN are far from being described by the random pattern typology. Finally, the value of the modularity of GRN is equal to Q_{GBTN} =0.774 and expresses the ability to partition the network into communities. The communities obtained from the analysis are 13, a number that indicates a general competitive behavior but also a complementary behavior between neighboring (in geographical location) GRNs. The value of the modularity was also calculated with the edge weights, kilometer and time distance. The weighted modularity with kilometric proximity is 0.621, with ten communities and with temporal proximity is 0.673 with eleven communities.

In the next step, the key measures of topology and centrality (degree, interest, proximity, concentration) are presented in the topological maps in Figure 3. First, in the spatial distribution of degree (Figure 3a), the highest value appears in Ioannina, at the starting point of the Ioannina Bus Station (Ioannina Bus Station), making this hub. Ioannina, is the largest city in Epirus and the capital of the regional unit of Ioannina with a population of about 70,000 inhabitants (Polyzos, 2019). The regional unit is one of the largest regional units in Greece and occupies about half of the geographical region of Epirus, with an area of 4990 km2, is mainly mountainous and access is mainly by road with the Ioannina bus service. Of the 251 connections, only 32 are outside the boundaries of the regional unit, covering and ensuring access mainly to the villages of the regional unit. The direction of the Ioannina bus service is characterised by introversion and has a specific economic function and geographical limitation. The analysis also revealed the hub of Thessaloniki as the second most centralised (177 connections). In contrast to the case of Ioannina, the connectivity of Thessaloniki is mainly due to the operators of the other regional units in addition to the regional unit itself. First of all, in the regional unit of Thessaloniki, the planning of the interurban road passenger transport network concerns only the interurban lines within its geographical limits, as well as the Athens - Thessaloniki interurban line, a total of 50 connections. For the other regional units, however, Thessaloniki is a key road link and an economic pole as it concentrates the largest part of the country's population and economic activity after Athens (Polyzos, 2023). Approximately 33% of the national population lives in metropolitan Athens (with 3562538 people), 10% in metropolitan Thessaloniki (with 1054673 people), 6% in 6 medium-sized urban areas (250000 to 0.5 million inhabitants) and 8% in 6 small urban areas (50000 to

250000 inhabitants). The rest of the population (about 43%) inhabit in small municipalities with a population of about 50000 inhabitants or less (Polyzos, 2019, 2023). Finally, Thessaloniki is also the headquarters of the Halkidiki bus station with 102 connections.

Figure 3b and 3c depict the centrality distributions (intermittency and proximity centrality) of GBTN. The highest value on the map for proximity occurs on the island of Thassos, due to the insufficient connectivity of this island component, verifying the empirical research of Tsiotas (2021). Then, the highest value of intermediate centrality belongs to Thessaloniki. An interesting observation concerns the fact that the taxonomic hierarchy of nodes is maintained between the results of degree centrality and intermediacy centrality.

Fig.3. Spatial distribution of GBTN measures: (a) degree (b) intermediate centrality (c) centrality proximity (d) concentration factor

Source: Own ed.
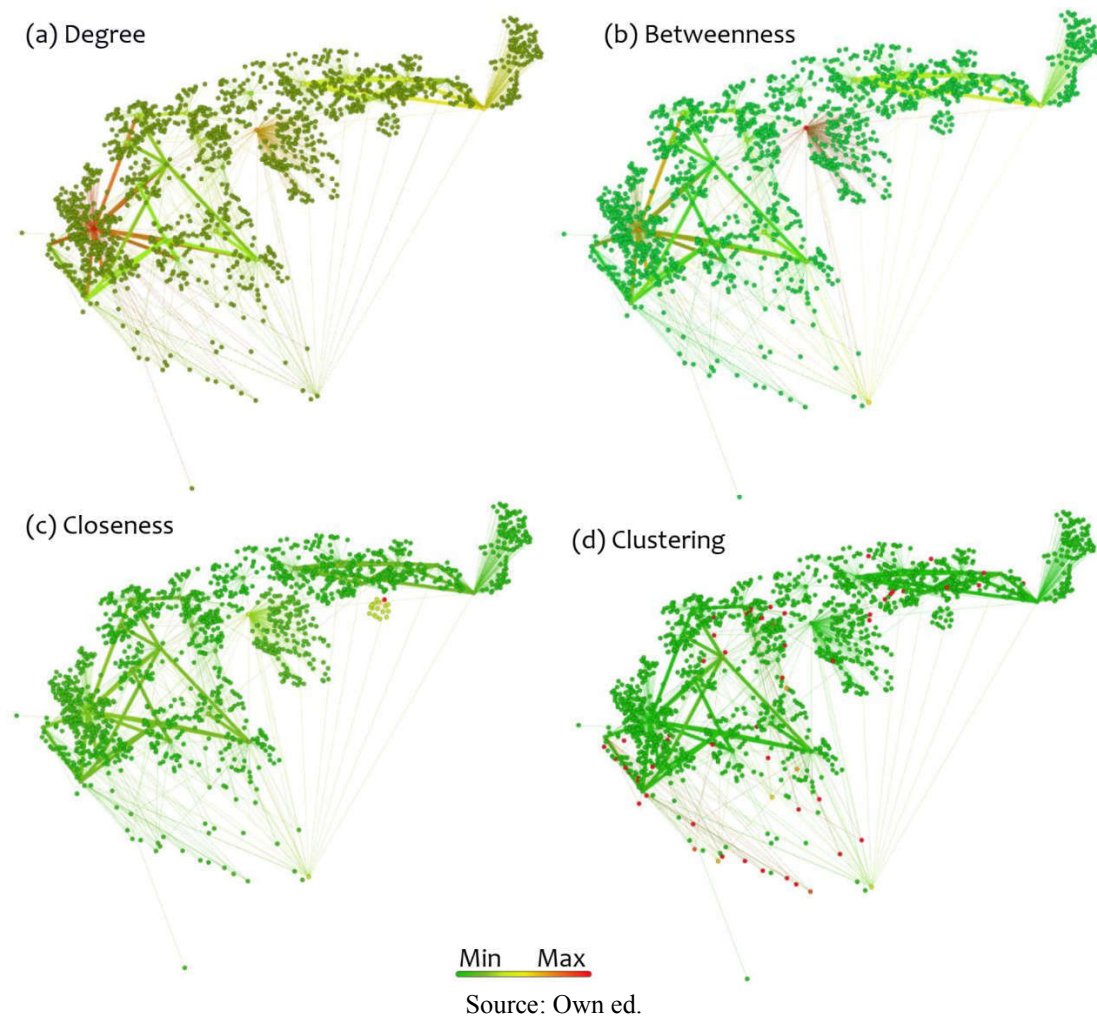
Hubs are by definition natural crossroads, so that the correlation between nodes with high degree centrality and those with high value of intermediate centrality is expected (Barthélemy, 2011). Thessaloniki is a modern city of Central Macedonia, the largest city in the geographical area of Macedonia (Polyzos, 2023) and a pole of attraction for commercial, economic, financial, economic, cultural, educational and social activities in the country and the region. The city's location in the wider Macedonia-Thrace region, the existence of an airport, the existence of its port as a natural gateway of this region to the sea make Thessaloniki an important strategic point on the one hand, and a commercial, transport and cultural crossroads on the other (Tsiotas and Polyzos, 2015b; Polyzos, 2023). Thessaloniki is also the most important railway hub in the country on the PATHEP (Patras - Athens - Thessaloniki - Idomeni/Promahon) axis, as it connects Greece with the rest of Europe and Turkey and is the main transport and freight hub in the wider Balkan region (Tsiotas, 2017). The intercity bus station in the city (hub) of Thessaloniki interferes with a large number of closer routes (paths) of the network as it is the terminal station for intercity buses throughout

the country. Therefore, due to the attraction of travel and consequently of organised transfers, Thessaloniki is an important transfer station. Finally, the spatial distribution of the clustering coefficient C (Figure 3d) appears to be very complex. High values of the coefficient indicate interconnected areas (existence of triangles), i.e. areas with many circular connections, where nodes have neighbours that are connected to each other. This situation may be related to the existence of areas with significant economic or related activity, since among the locations with high values there are areas within the study regions such as Asprovalta and Farsala, and outside the study regions such as Thebes, Lefkada and Chalkida.

Next, the spatial distribution of modularity values is captured in Figure 4 and appears consistent with theory (Barthelemy, 2011; Tsiotas, 2021). Relevant empirical research has generally highlighted that the sharing of spatial networks in communities is generally governed by geographical criteria, not providing particularly useful structural information, because the most important flows in the network are located between nodes belonging to the same or similar geographical areas (Guimera et al., 2005; Kaluza et al., 2010; Barthelemy, 2011). For example, in the study by Haznagy et al. (2015), the city centre was found to have few communities while the periphery has many communities. Moreover, a total of 46 communities with a strong modularity value of 0.91 were observed in an urban rail transit system in China (Zhang, et al., 2013). In a similar context, the spatial distribution of GBTN modularity values is also shown, which is partitioned into 13 color bands, highlighting a partial bipolar trend with relative geographical relevance. In contrast, the communities of mileage-weighted (Q_{km}) and time-weighted (Q_{min}) proximity-weighted modularity do not appear to be strictly determined by geographical criteria. The composition of communities involving modules located in different geographical areas, for both Q_{km} and Q_{min}, also highlight connections between disparate spatial modules.

We further proceed to study the degree distribution, which is insightful in revealing topological patterns in networks (Tsiotas, 2019). Intuitively, although we would expect that a certain number of stops in the network are served by a large number of routes, it is interesting to verify such a property mathematically. Figure 5 shows that both the degree and power (weighted degree) distributions follow a power-law distribution with a hierarchical structure, highlighting scale-free properties in GBTN with hyper-node operation. Compared to the normal distribution, this property expresses that a high percentage of nodes have connectivity less than the average value, while a low percentage of nodes have a degree greater than the average (hubs). The scale-free property in public transport networks expresses that hubs carry 80% of the load, having more connections, and 20% of the load is carried by the remaining nodes. Networks with such a structure are quite widespread in the transport sector mainly due to the fact that a transport operator needs to minimize its operational costs, even if this is not accompanied by minimizing the average travel time of commuters (Tsiotas and Polyzos, 2015b; Tsiotas, 2021). The emergence of the hub-and-spoke topology in public intercity road networks is a consequence of economic expectations, due to the creation of hub-and-spoke bus stations in areas with large urban concentrations (regional capitals), but also due to the efforts of bus operators to increase network efficiency (serving more destinations with the minimum total number of transfers) while reducing operating costs. Therefore, a profitability-oriented strategy emerges (Tsiotas and Polyzos, 2015b), an obvious strategy for any sound business organization operating in a free competition market (Tsiotas, 2022; Polyzos, 2023). Finally, from Figure 5(a), the price dispersion is adjusted to 66%. Although this is a normal but not high adjustment, it does not invalidate the network structure.

Fig.4. Spatial distribution of (a) weightless modularity, (b) modularity weighted by the information of kilometric proximity and (c) modularity weighted by the information of temporal proximity
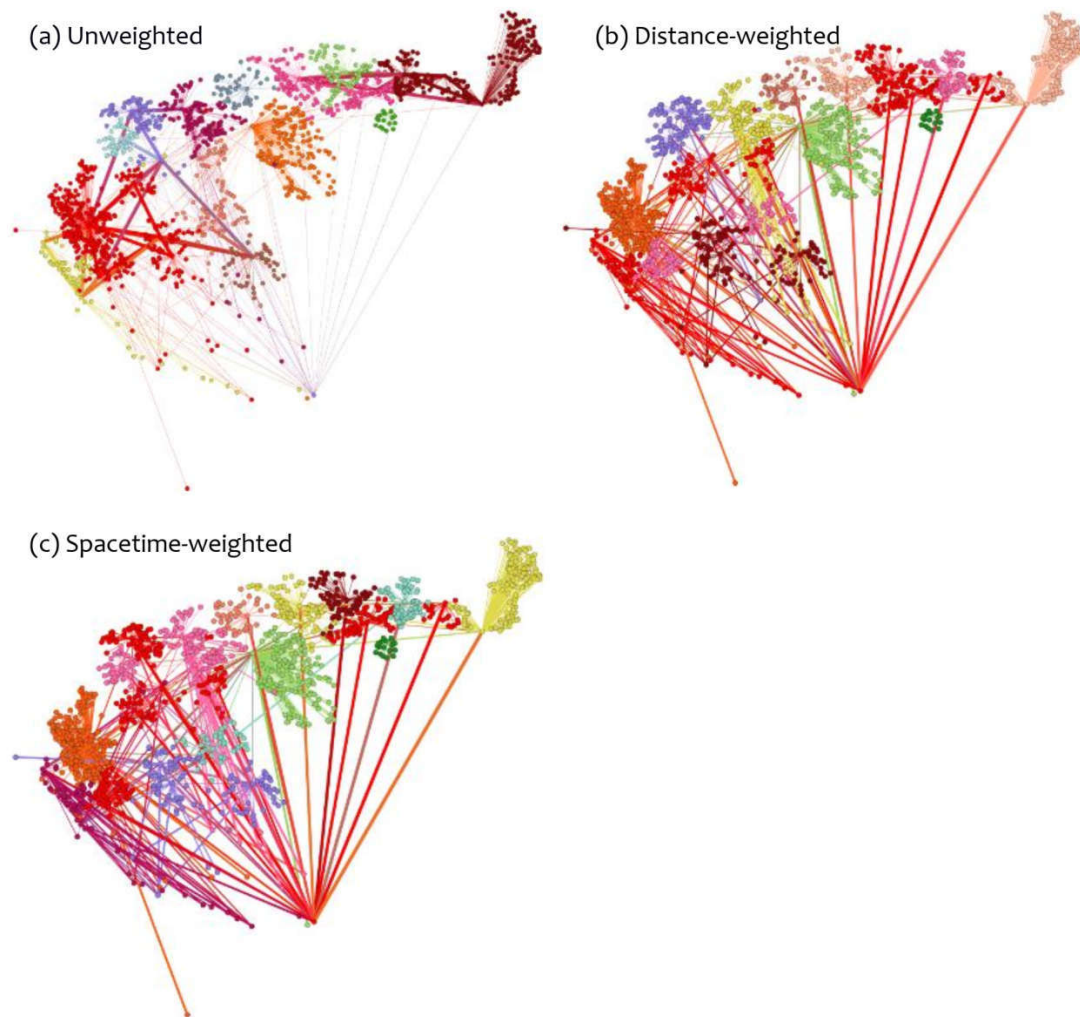
Source: Own elaboration

Overall, the topology analysis shows that GBTN is subject to spatial limitations, failing to serve all destinations in a more direct manner. At the same time, however, long-distance routes are characterized by extroversion, as they extend over long distances in terms of kilometers and time. The routes of each bus company cover on average three regional units. In terms of immediacy and accessibility, this finding characterizes the network as satisfactory, as three stops or transfers are interspersed between the most remote destinations on the network. The network serves 69% of the regional locations, further outlining the business profile of the Ioannina network, which is oriented towards local markets. This quite satisfactory percentage reflects relatively high efficiency of regional relations, good regional policy and support and promotion of the economic profile of local markets.

Fig.5. Spatial distribution of (a) weightless modularity, (b) modularity weighted with the information of kilometric proximity and (c) modularity weighted with the information of temporal proximity
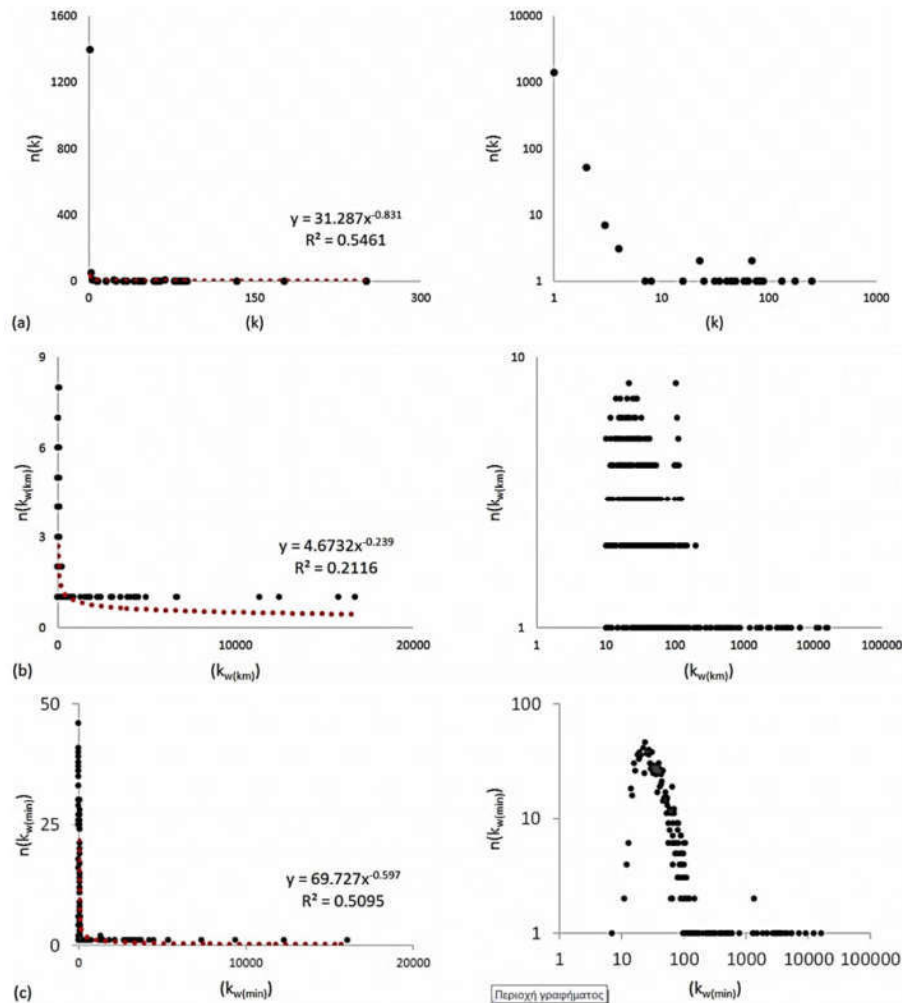
Source: Own elaboration

At the same time, a strategy oriented towards profitability is highlighted. The GBTN analysis provides topological information such as the existence of a hierarchical hub-and-spoke structure and the absence of scale in the network. This situation is due to the operation of hubs, which carry 80% of the switching load, having more connections, and 20% of the load is carried by the other nodes. Networks with such a structure are quite widespread in the transport sector mainly due to the fact that a carrier needs to minimize its operational costs, even if this is not accompanied by minimizing the average travel time of the commuters (Barthelemy, 2011; Rodrigue et al., 2013; Tsiotas, 2021). The emergence of this topology in public long-distance road networks is a consequence of economic expectations, due to the creation of hub bus stations in areas with large urban concentrations such as the capitals of regional districts (Polyzos, 2019; Tsiotas, 2022). Similarly, it is an outgrowth of the efforts of bus operators to increase the efficiency of the network (serving more destinations with the minimum total number of transfers) while reducing operating costs. It is an obvious strategy for any sound business organization operating in a free competition market (Tsiotas, 2022; Polyzos, 2023). Also, the results of the analysis express that GBTN shows strong heterogeneity in terms of traffic. The central hub areas from a geographical point of view (first three highest values in Thessaloniki, Ioannina and Athens), having only a few main roads with high traffic, are expected to be the beneficiaries of future transport infrastructure projects (Polyzos and Tsiotas, 2020; Tsiotas et al., 2021, 2022). The analysis also found that bus services operate more in hard-to-reach areas and that they serve more travel within the regional unit or with neighboring regional units, underlining the operational local character of bus services

4.2. Empirical Analysis

In the empirical analysis part, a correlation analysis is performed on the variables in Table 1 to identify relationships between network measures and GBTN socioeconomic variables. The results of the analysis for different levels of significance (5% and 1%) are presented in Table 3.

Table 3 Results of the GBTN correlation analysis

Metric	Stat.	FLT	POP	PRVHC	PVHC	BUS	MTR	GDP	DATH	TCKATH	DTHS	TCKTHS	COST	URBAN
n	r	.466*	.094	.142	.005	.090	.007	-.192	.234	.193	.139	.159	.101	-.183
	Sig.	.022	.596	.423	.978	.611	.969	.276	.282	.377	.538	.479	.654	.301
	N	24	34	34	34	34	34	34	23	23	22	22	22	34
m	r	.431*	-.020	-.015	-.009	-.005	-.048	-.056	.169	.145	.199	.217	.115	-.209
	Sig.	.036	.928	.946	.966	.980	.825	.796	.442	.509	.376	.331	.612	.328
	N	24	24	24	24	24	24	24	23	23	22	22	22	24
⟨k⟩	r	.001	.959**	.975**	.975**	.970**	.973**	.511**	-.216	-.229	.307	.322	.218	-.318
	Sig.	.997	.000	.000	.000	.000	.000	.002	.323	.293	.164	.144	.330	.063
	N	24	35	35	35	35	35	35	23	23	22	22	22	35
⟨CC⟩	r	.421*	.907**	.899**	.903**	.905**	.902**	.615**	-.096	-.118	.175	.182	.204	-.311
	Sig.	.040	.000	.000	.000	.000	.000	.000	.664	.593	.436	.417	.362	.069
	N	24	35	35	35	35	35	35	23	23	22	22	22	35
⟨CB⟩	r	.172	.968**	.989**	.992**	.986**	.985**	.532**	-.094	-.232	.148	.124	-.091	-.271
	Sig.	.421	.000	.000	.000	.000	.000	.001	.671	.287	.511	.584	.689	.116
	N	24	35	35	35	35	35	35	23	23	22	22	22	35
⟨C⟩	r	.026	.095	.083	.112	.090	.112	.262	-.139	-.023	.141	.177	.327	-.117
	Sig.	.905	.586	.636	.523	.606	.523	.128	.526	.916	.531	.432	.137	.502
	N	24	35	35	35	35	35	35	23	23	22	22	22	35
⟨dkm⟩	r	-.063	.003	.011	.015	.018	.015	.278	-.063	.040	.577**	.587**	.422	-.408*
	Sig.	.769	.989	.958	.943	.935	.945	.189	.775	.858	.005	.004	.050	.048
	N	24	24	24	24	24	24	24	23	23	22	22	22	24
⟨dmin⟩	r	-.014	-.008	.000	.007	.016	.018	.245	-.223	-.107	.665**	.668**	.457*	-.417*
	Sig.	.948	.971	.999	.975	.942	.934	.249	.307	.626	.001	.001	.032	.043
	N	24	24	24	24	24	24	24	23	23	22	22	22	24
Rkm	r	-.038	.005	.025	.016	-.021	.022	-.128	.986**	.934**	-.057	-.050	-.113	.221
	Sig.	.862	.982	.906	.940	.923	.919	.551	.000	.000	.800	.825	.616	.299
	N	24	24	24	24	24	24	24	23	23	22	22	22	24

Table 3 (continued) Results of the GBTN correlation analysis

Metric	Stat.	EDU	HUM	FRC	A_SEC	B_SEC	C_SEC	TOUR	FRM	RODENS	RADENS	PRT	AIR	CENTR
n	r	.103	.120	.091	.111	-.177	.146	.059	.095	-.212	-.030	-.223	.147	-.236
	Sig.	.561	.500	.609	.533	.318	.409	.739	.594	.229	.868	.204	.408	.179
	N	34	34	34	34	34	34	34	34	34	34	34	34	34
m	r	-.017	-.015	-.015	-.159	-.063	.164	-.032	-.016	.199	-.123	.092	.228	-.124
	Sig.	.939	.943	.944	.459	.770	.443	.881	.942	.352	.566	.669	.284	.563
	N	24	24	24	24	24	24	24	24	24	24	24	24	24
⟨k⟩	r	.963**	.901**	.964**	-.356*	-.056	.239	.945**	.958**	.817**	.863**	.700**	.205	.100
	Sig.	.000	.000	.000	.036	.749	.166	.000	.000	.000	.000	.000	.237	.566
	N	35	35	35	35	35	35	35	35	35	35	35	35	35
⟨CC⟩	r	.907**	.865**	.908**	-.439**	-.025	.246	.909**	.910**	.855**	.703**	.809**	.314	.065
	Sig.	.000	.000	.000	.008	.888	.155	.000	.000	.000	.000	.000	.067	.710
	N	35	35	35	35	35	35	35	35	35	35	35	35	35
⟨CB⟩	r	.975**	.885**	.975**	-.338*	-.045	.218	.954**	.967**	.861**	.879**	.744**	.193	.062
	Sig.	.000	.000	.000	.047	.799	.209	.000	.000	.000	.000	.000	.266	.722
	N	35	35	35	35	35	35	35	35	35	35	35	35	35
⟨C⟩	r	.091	.102	.096	-.371*	.471**	-.336*	.087	.093	.204	.088	.396*	.050	.111
	Sig.	.604	.558	.582	.028	.004	.049	.620	.594	.240	.616	.019	.774	.527
	N	35	35	35	35	35	35	35	35	35	35	35	35	35
⟨dkm⟩	r	.008	-.096	.011	-.112	-.123	.203	.044	.017	.225	-.357	.093	.244	.050
	Sig.	.970	.656	.958	.602	.568	.341	.837	.937	.291	.087	.664	.251	.818
	N	24	24	24	24	24	24	24	24	24	24	24	24	24
⟨dmin⟩	r	-.003	-.099	.001	-.142	-.180	.285	.038	.011	.249	-.491*	.145	.344	.193
	Sig.	.988	.645	.998	.507	.401	.178	.859	.960	.241	.015	.500	.100	.365
	N	24	24	24	24	24	24	24	24	24	24	24	24	24
Rkm	r	.002	.029	.002	-.017	.374	-.407*	-.058	-.030	-.148	.450*	-.351	-.037	-.746**
	Sig.	.993	.893	.993	.937	.072	.048	.787	.890	.491	.027	.093	.862	.000
	N	24	24	24	24	24	24	24	24	24	24	24	24	24

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

(Source: Own elaboration)

Firstly, there are correlations (significant at the 5% level) between the variables of number of nodes n and number of edges m with the variable of the fleet FLT of the public interurban road networks of the regional districts, namely r(n,FLT)=0.466 and r(m,FLT)=0.431. Given that the fleet is a structural and functional characteristic of the public transport operators, the above correlations indicate that the fleet is a determinant and determinant of the network size. Bus operators serving more settlements (nodes) have a larger fleet and undergo economies of scale (Polyzos, 2019, 2023). As the number of service locations increases, the fleet of operators increases. Also, the fleet is significantly correlated at the 5% level with the average GBTN proximity centrality, where r(⟨CC⟩,FLT)=0.421, highlighting that the network with the largest fleet extends farther and distances become shorter.

Then the majority of network variables, the average degree of nodes ⟨k⟩, the average centrality proximity ⟨CC⟩, the average intermediate centrality ⟨CB⟩, the average weighted (kilometric proximity) degree of nodes ⟨kw(km)⟩⟩ and the average weighted (temporal proximity) degree of nodes ⟨kw(min)⟩⟩ include (high or moderate) information about the network infrastructure, as shown by the positive correlations (significant at the 5% level) with RODENS country road network density, RADENS country rail network density and with the number of PRT ports. This observation suggests that network variables are related to structural aspects of the public long-distance road transport network, which highlights the interaction of network topology and geometry in spatial networks (Tsiotas and Polyzos, 2018). Also, regional units of public interurban road networks with high connectivity, accessibility and long distances tend to have ports and railway stations, highlighting the advantage of intermodality. An efficient public long-distance road network acts positively towards the regional unit's coastal (Tsiotas and Polyzos, 2015a) and rail (Tsiotas, 2017) activity. Intermodality is part of sustainable mobility (Polyzos, 2023) and aims to improve the efficiency and attractiveness of a trip made by combining more than one mode of transport avoiding the use of private cars (Rodrigue et al., 2013). Using and combining different modes of transport in a flexible way in a single trip is vital for a more efficient and sustainable intercity transport system. In central cities and towns, intermodal stations have a central role for the proper functioning of an efficient intermodal transport chain (Rodrigue et al., 2013; Polyzos, 2023). In this context, the lack of correlation with the airport number variable highlights that no significant intermodal cooperation occurs between the public long-distance road network and the air network and that the public long-distance road network has developed to serve more other types of transport. On the other hand, the correlation coefficient of the average concentration coefficient with the number of ports shows a low correlation value at the 1% significance level. The negative correlation, recorded between the average time distance and the RADENS country rail network density, suggests that the differences in travel time between modes of transport that is an important factor affecting the competitiveness of modes of transport. Finally, the positive correlation at a low 45% of the RADENS variable with the mileage range of the public intercity road network indicates that the complementarity between public intercity road transport and the rail network takes place to cover long distances.

Also, the network variables, the average degree of nodes ⟨k⟩, the average centrality proximity ⟨CC⟩, the average intermediate centrality ⟨CB⟩, the weighted average (kilometric proximity) degree of nodes ⟨kw(km)⟩⟩ and the weighted average (temporal proximity) are positively correlated (significantly at the 1% level) with the variables of permanent population POP, Gross Domestic Product (GDP) GDP and contribution to the tourism sector TOUR of the regional units. This result suggests that the network variables also include demographic and economic information economic information about the transport system they represent. The case with POP population is exceptionally high and reflects the tendency of cities with high population to also have high public interurban road connectivity, which is probably related to the more intensive land use and clustering effects that occur in such cities (Polyzos, 2023). The correlation with GDP reflects that an efficient intercity public transport network acts as an economic growth factor (to the extent that economic growth is reflected in a region's GBTN). The correlation with the TOUR variable suggests that regional sections of public road transport networks with high connectivity, proximity, centrality tend to carry a higher tourism load and in particular perhaps certain segments of tourism related to short distance (e.g. domestic tourism and "accommodation"), tour preferences (e.g. bus travel). The

same network variables are positively correlated (significant at the 1% level) with private motor vehicles in circulation PRVHC, public motor vehicles in circulation PVHC, buses in circulation BUS and motorcycles in circulation (MTR). From this result it can be concluded that the level of service of public interurban road transport has an impact on car and motorcycle ownership. In regional units with high connectivity, proximity, centrality of public interurban road network, which implies the existence of rapid development infrastructure, more private cars and motorcycles are in circulation

Connectivity ⟨k⟩ seems to be related to the education level of the EDU population at 96.3% (significant at the 1% level) describing that regional units with high connectivity of public transport networks tend to be distinguished by a higher education level of their population. Also, connectivity is related by the human capital-qualitative characteristics of the HUM population at 90.1% and by the number of FRC employees at 96.4%. By way of explanation, access to job opportunities is related to the likelihood that an individual will perform well in the labour market (Polyzos, 2019). This is true for developing countries because public transport plays a key role in mobility, especially for poor households. In this sense, public transport is one of the most important policies to enhance accessibility (Tsiotas and Tselios, 2023). The academic literature that has linked unemployment and accessibility refers to the lack of physical link between households and labour markets and its impact on the job search process and access to employment. In other words, spatial accessibility can therefore explain, at least in part, the probability of individual unemployment (Polyzos, 2023). Job seekers with higher or adequate levels of employment accessibility have more job opportunities available to them, which may also shorten the job search duration (Korsu and Wenglenski, 2010). Conversely, job seekers with low employment accessibility may face higher travel and job search costs. Also, the EDU, HUM and FRC variables are highly correlated with accessibility ⟨CC⟩, intermediate route structure ⟨CB⟩, mileage ⟨kw(km)⟩ and time ⟨kw(min)⟩ proximity by more than 85%.

The contribution to the national primary sector GDP of A_SEC regional units appears to be negatively correlated at less than 45% (significant at the 5% level) with connectivity ⟨k⟩, accessibility ⟨CC⟩, the structure of intermediate routes ⟨CB⟩, the status of neighbors' connectivity ⟨C⟩, the kilometric ⟨kw(km)⟩⟩ and temporal ⟨kw(min)⟩ proximity of public road networks of regional units. Regional units with high rates of topological characteristics of public road networks tend to show low participation of the primary sector in the country's GDP formation and more freely low agricultural production or activity. This result, as far as regional policy is concerned, verifies Polyzos et al. (2014), who have noted that the Greek state adopts disjointed strategies for rural and tourism development, preferring a spatial separation of their activities that potentially loosens competition and complexity and allows local economies that do not rely on tourism to grow. They also highlight that agro-industries prefer locations that ensure easy access to raw materials and efficient supply chains for marketing their products rather than centralized locations of large inland markets (Polyzos et al., 2015; Kokkinou et al., 2018).

Then, a negative correlation is observed in the contribution to national tertiary sector GDP of the study regional units with the status of neighborhood connectivity and with the range of kilometric distances having coefficients r(⟨C⟩,C_SEC)=-0.336 and r(Rkm ,C_SEC)=-0.407 significantly at the 5% level. On the other hand, the contribution to the national secondary sector B_SEC GDP of the study regional units is reflected at 47.1% (significant at the 1% level) in the state of neighbor connectivity. The notion of correlation of the above variables implies that regional modules with networks of high status of neighbor connectivity facilitate the development of the secondary sector and compete with the functionality of the tertiary sector. This interpretation verifies established theoretical approaches on the relationship between accessibility and industrial location (Polyzos, 2023). Moreover, a low correlation (significant at the 5% level) with a negative sign is observed between the degree of URBAN urbanization and the average kilometric ⟨dkm⟩⟩ and temporal ⟨dmin⟩ distance. The result expresses that regional units with public interurban road networks with long average kilometric and temporal distance tend to have low level of urbanization. Public long-distance road networks with long-distance destinations are more likely to be found in less urbanized regions.

Expected correlations, significant at the 5% level, are recorded between the network variables of mean kilometric distance ⟨dkm⟩, mean time distance ⟨dmin⟩, the average weighted (kilometric proximity) degree ⟨kw(km)⟩ and the average weighted (time proximity) degree ⟨kw(min)⟩ and the distance of each service point/back-up point for Thessaloniki DTHS and the ticket price for Thessaloniki TCKTHS. On the other hand, the corresponding variables for Athens DATH and TCKATH are highly correlated (at the 1% level) only with the mileage distance range Rkm. Also, the average time distance ⟨dmin⟩ is correlated with the travel cost/kilometer variable COST. In summary, the above correlations express that the public intercity road network with long travel mileage tends to determine higher travel ticket costs. This observation is verified by the legislative framework for determining the fare for public bus passenger transport, according to which kilometre factors are used to determine a uniform way of calculating the intercity bus fare. These coefficients may be uniform for the whole country or different for each region or regional unit or regional units or for categories of lines with similar operating characteristics. Finally, the negative correlation of the variable of the average distance of the capital of a regional unit from all others in the CENTR network with the kilometric distance range Rkm, underlines that the greater the extraversion of a regional unit's public long-distance road transport network, the more distant the capital of the regional unit will be from all others in the network.

Overall, the empirical analysis has shown that bus operators serving more settlements (hubs) have a larger fleet. As the number of service locations increases, the fleet of operators increases. The network with the largest fleet extends further and distances become shorter. It was also highlighted that there is no intermodal relationship between the public long-distance road network and the air network and that the public long-distance road network has developed to serve more other types of transport. On the other hand the differences in travel time between modes of transport that is an important factor affecting the competitiveness of transport modes. Finally, the complementarity between public long-distance road transport with the rail network is carried out to cover long distances. Next, correlation analysis provided evidence that the network variables include demographic and economic information economic information about the transportation system they represent. The network correlation with GDP expresses that an efficient intercity public transport network acts as an economic growth factor (to the extent that economic growth is reflected in a region's GBTN). Also, GBTN service locations emerged as important and popular in receiving passenger flows that provide easy access to tourist destinations. Finally, the empirical analysis showed that the level of service of public intercity road transport has an impact on car and motorcycle ownership.

5. CONCLUSION

Public transport is one of the most important policies for improving accessibility. By studying the public transport bus network of Northern Greece, this article has shown that Regional Units with high topological characteristics of public road networks tend to have low participation of the primary sector in the country's GDP formation and more freely low agricultural production or activity. Regional units with networks of highly connected neighbours facilitate the development of the secondary sector and compete with the functionality of the tertiary sector. In addition, it was observed that public long-distance road networks with distant destinations are more likely to meet in less urbanized areas. Furthermore, the more extroversion a regional unit's public long-distance road network has, the more distant the regional unit's capital city will be from all others in the network. A public long-distance road network with a long distance travelled tends to determine higher travel ticket costs. Our correlation analysis provided evidence that the spatial distribution of public interurban road networks is described by the characteristics of the network infrastructure as well as socio-economic characteristics. Finally, bus networks form a specific category of complex networks that grow and evolve in physically constrained spatial networks.

The current study takes into account a subset of the large-scale network. It would be interesting to carry out a comprehensive study involving all operators of the interurban road networks. Since transport plays an important role in the economic development of a city, the current study can be extended to incorporate other networks, such as rail passenger networks. A holistic approach to these networks will help us understand each level of complexity in

society. Overall, this article highlights the effectiveness of using complex network analysis in modeling spatial networks and in particular transport systems.

6.   <u>References</u>

Alabanos, N., Theodoropoulos, S., (2017) "Measurement of the Administrative Burden for the Establishment of Shipping Companies in Greece", Regional Science Inquiry, 9(2), pp.85-96.

Alexiadis, S, (2020) "Regional convergence: theory and empirics", Regional Science Inquiry, 12(1), pp.245-252

Alexiadis, S., Ladias, Christos Ap., (2011) "Optimal allocation of investment and regional disparities", Regional Science Inquiry Journal, 3(2), pp.45-59.

Augustin, K., Gerike, R., Josue Martinez, M., Ayala, C., (2014) "Analysis of intercity bus markets on long distances in an established and a young market: The example of the U.S. and Germany', Research in Transportation Economics, 48, pp.245-254.

Barabasi, A.-L., (2016) Network Science, Cambridge, England: Cambridge University Press.

Barthelemy, M., (2011) "Spatial networks", Physics Reports, 499(1), pp.1–101.

Bastian, M., Heymann, S., Jacomy, M., (2009) "Gephi: An open-source software for exploring and manipulating networks", Proceedings of the Third International ICWSM Conference, pp.361–362.

Batty, M., (2013) The New Science of Cities, MIT Press.

Behrens, K., Thisse, J., (2007) "Regional economics: A new economic geography perspective", Regional Science and Urban Economics, 37, pp.457-465.

Berechman, J., (1993) "Public Transit Economics and Deregulation Policy", Studies in Regional Science and Urban Economics, 23, New York, United States: Elsevier Science Publishers

Caca, E., Ladias, Christos Ap., & Polo, A. (2016) "The Development of Tourism in Albania and the Importance of Cultural Tourism" In Tourism and Culture in the Age of Innovation (pp.109-119). Springer, Cham.

Cao, Y. N., (2021) "Factors Affecting On Urban Location Choice Decisions of Enterprises", Regional Science Inquiry, 13(1), pp.217-224.

Colak, O. (2015). Convergence revisited: case of EU and Eastern Europe. Regional Science Inquiry, 7(1), pp.69-81.

Constantin, D. L., Nastaca, C. C., Geambasu, E., (2021) "Population Accessibility To Rail Services. Insights Through The Lens of Territorial Cohesion". Regional Science Inquiry, 13(1), pp.81-98.

Crane, R, Scweitzer, L., (2003) "Transport and sustainability: the role of the built environment", Built Environment, 29(3), pp.238–252.

Desaulniers, G., Hickman, M., (2007) "Public transit", In: Barnhart, C., Laporte, G. (Eds.), Handbook in Operations Research and Management Science, 14, pp.69–127. Transportation, chapter 2.

Dionysopoulou, P., Svarnias, G., Papailias, T., (2021) "Total Quality Management in Public Sector, Case Study: Customs Service", Regional Science Inquiry, 13(1), pp.153-168.

Ducruet, C., Beauguitte, L., (2014) "Spatial science and network science: review and outcome of a complex relationship", Networks and Spatial Economics, 14(3), pp.297-316.

Eurostat, (2020) "Car travel dominates EU inland journeys", 16 September, Accessed 20 January 2022, https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20200916-1.

Gioti-Papadaki, O., Ladias, Christos Ap., Alexiadis, S., (2017) "Examining the Evolution of Agriculture Productivity in the European Union", In Handbook of Research on Policies and Practices for Sustainable Economic Growth and Regional Development (pp.240-245). IGI Global.

Gobillon, L., Selod, H., (2014) Handbook of Regional Science, Spatial mismatch, poverty, and vulnerable populations, Germany: Springer Reference.

Gobillon, L., Selod, H., Zenou, Y., (2007) "The mechanisms of spatial mismatch", Urban Studies, 44, pp.2401–2427.

Goula, M., Ladias, Christos Ap., Gioti-Papadaki, O., Hasanagas, N., (2015) "The spatial dimension of environment-related attitudes: does urban or rural origin matter?", Regional Science Inquiry, 7(2), pp.115-129.

Gwilliam, K., (2008) "A review of issues in transit economics", Research in Transportation Economics, 23 (1), pp.4–22.

Haznagy, A., Fi, I., London, A., Nemeth, T., (2015) "Complex network analysis of public transportation networks: A comprehensive study", Conference on Models and Technologies for Intelligent Transportation Systems (MT-ITS), pp.371–378.

Jansson, J.O., Holmgren, J., Ljungberg, A., (2015) "Pricing public transport services", In: Handbook of Research Methods and Applications in Transport Economics and Policy. Springer, pp.101–122.

Jara-Diaz, S., Gschwender, A., (2003a) "Towards a general microeconomic model for the operation of public transport", Transport Reviews, 23(4), pp.453–469.

Jara-Diaz, S., Gschwender, A., (2005) "Making pricing work in public transport provision", In: Button, K.J., Hensher, D.A. (Eds.), Handbook of Transport Strategy, Policy and Institutions, Elsevier Ltd, Amsterdam, pp.447–459.

Jara-Diaz, S.R., Gschwender, A., (2003b) "From the single line model to the spatial structure of transit services: corridors or direct?", Journal of Transport Economics and Policy, 37 (2), pp.261–277.

Karras, G., (2010) "Regional economic growth and convergence, 1950-2007: Some empirical evidence", Regional Science Inquiry, 2(1), pp.11-24.

Kokkinou, A., Ladias, Christos Ap., Papanis, E., Dionysopoulou, P., (2018) "Innovation policy in European Union from a supply chain perspective", Regional Science Inquiry, 10(1), pp.141-147.

Korsu, E., Wenglenski, S., (2010) "Job accessibility, residential segregation and risk of longterm unemployment in the Paris region", Urban Studies, 47(11), pp.2279–2324.

Kurant, M., Thiran, P., (2006) "Extraction and analysis of traffic and topologies of transportation networks", Physical Review E, 74(3), pp.1–10.

Liu, X., Gong, L., Gong, Y., Liu, Y., (2015) "Revealing travel patterns and city structure with taxi trip data", Journal of Transport Geography, 43(C), pp.78–90.

Mumford, C., (2013) "New Heuristic and Evolutionary Operators for the Multi-Objective Urban Transit Routing Problem", In: IEEE Congress on Evolutionary Computation, pp.939–946.

Nasri, A., Zhang, L., (2014) "The analysis of transit-oriented development (TOD) in Washington, D.C, Baltimore metropolitan areas", Transporty Policy, 32, pp.172–179.

Norusis, M., (2011) SPSS 17.0 Advanced statistical procedures companion, New Jersey, United States: Prentice.

Papadimitriou, V., Polyzos, s., Tsiotas, D., (2023) "Project Evaluation using the Real Options Methodology", Regional Science Inquiry, 15 (1), pp.85-96.

Perovic L. M., Golem S., "Government Expenditures Composition and Growth in EU15: A Dynamic Heterogeneous Approach", Regional Science Inquiry, 11(1), pp.95-105.

Polyzos, S., (2019) Regional development, 2nd Edition. Athens: Kritiki [in Greek].

Polyzos, S., (2023) Urban development, 2nd Edition. Athens: Kritiki [in Greek].

Polyzos, S., Tsiotas, D., (2020) "The contribution of transport infrastructures to the economic and regional development: a review of the conceptual framework", Theoretical and Empirical Researches in Urban Management, 15(1), pp.5-23.

Polyzos, S., Tsiotas, D., (2023) "Interregional Transport Infrastructures and Regional Development: A Methodological Approach", Theoretical and Empirical Researches in Urban Management, 18(2), pp.5-31.

Polyzos, S., Tsiotas, D., Papagiannis, K., (2014) "Determining the changes in commuting after the Ionian Motorway's construction", MIBES Transactions, 8, pp.113–131.

Rodrigue, J. P., Comtois, C., Slack, B., (2013) The geography of transport systems, London, England: Routledge Publications.

Shimamoto, K., (2019) "Analysis on Travel Expenditure By Occupation For Japan Domestic Travel", Regional Science Inquiry, 11(3), pp.83-94.

Tirachini, A., Hensher, D.A., (2012) "Multimodal transport pricing: first best, second best and extensions to non-motorized transport", Transport Reviews, 32(2), pp.181–202.

Titze, S., Stronegger, W., Janschitz, S, Oja, P., (2008) "Association of built-environment, social-environment and personal factors with bicycling as a mode of transportation among Austrian city dwellers", Prev. Med, 47(3), pp.252–259.

Tsiotas, D., (2017) "Links Between Network Topology and Socioeconomic Framework of Railway Transport: Evidence From Greece", Journal of Engineering Science and Technology Review, 10(3), pp.175-187.

Tsiotas, D., (2019) "Detecting different topologies immanent in scale-free networks with the same degree distribution", Proceedings of the National Academy of Sciences, 116(14), pp.6701-6706.

Tsiotas, D., (2021) "Drawing indicators of economic performance from network topology: the case of the interregional road transportation in Greece", Research in Transportation Economics, 90: 101004 (10.1016/j.retrec.2020.101004).

Tsiotas, D., (2022) "A network-based algorithm for computing Keynesian income multipliers in multiregional systems", Regional Science Inquiry, 14(2), pp.25-46.

Tsiotas, D., Axelis, N., Polyzos, S., (2021) "A methodological framework for defining city dipoles in urban systems based on a functional attribute", Cities, 119 (10.1016/j.cities.2021.103387).

Tsiotas, D., Axelis, N., Polyzos, S., (2022) "Detecting city-dipoles in Greece based on intercity commuting", Regional Science Inquiry, 14(1), pp.11-30.

Tsiotas, D., Polyzos, S., (2015a) "Analyzing the Maritime Transportation System in Greece: a Complex Network Approach", Networks and Spatial Economics, 15(4), pp.981-1010.

Tsiotas, D., Polyzos, S., (2015b) "Decomposing multilayer transportation networks using complex network analysis: A case study for the Greek aviation network", Journal of Complex Networks, 3(4), pp.642-670.

Tsiotas, D., Polyzos, S., (2018) "The complexity in the study of spatial networks: an epistemological approach", Networks and Spatial Economics, 18(1), pp.1-32.

Tsiotas, D., Tselios, V., (2023) "Understanding peripherality in a multidimensional socioeconomic, accessibility, and institutional context: evidence from Greece", Regional Science Policy and Practice, 15(2), pp.1-34

Van Acker, V., Derudder, B, Witlox, F., (2013) "Why people use their cars while the built environment imposes cycling", Journal of Transport and Land Use, 6(1), pp.53–62.

Von Ferber, C., Holovatch, T., Holovatch, Yu., Palchykov, V., (2009) "Public transport networks: Empirical analysis and modeling", The Europian Physical Journal B, 68, pp.261–275.

White, T., (2002) Public Transport: Its Planning, Management and Operations, New York: New York Press.

Xanthos, G., Ladias, Christos Ap., Genitsaropoulos, C. (2012) "Regional Inequalities In Greece A Proposition For Their Depiction", Regional Science Inquiry, 4(2), pp.191-196.

Yu, L., Xie, B, Chan, E., (2019) 'How does the built environment influence public transit choice in urban villages in China?', Sustainability, 11, 148.

Zhang, H., Zhao, P., Gao, J, Yao, X.-M., (2013) 'The analysis of the properties of bus network topology in Beijing basing on complex networks', Mathematical Problems in Engineering

Zhang, Y., Thomas, T., Brussel, M, Van Maarseveen, M., (2017) 'Exploring the impact of built environment factors on the use of public bikes at bike stations: case study in Zhongshan, China', Journal of Transport Geography, 58 (3), pp.59–70.

Appendix

Internet resources used for GBTN modeling (access date: 31/12/2021)

Long-distance K.T.E.L.	Source :
Rhodope	http://www.ktelrodopis.gr
Drama	http://www.kteldramas.gr
	https://diavgeia.gov.gr/doc/4A8Ω7ΛΒ-1ΨΡ
	https://diavgeia.gov.gr/doc/45ΠΑ7ΛΒ-ΚΜ8
Evros	http://www.ktelevrou.gr
	https://diavgeia.gov.gr/doc/Ω34Β7ΛΒ-ΗΣ5
Kavala	http://www.ktelkavalas.gr
	https://diavgeia.gov.gr/doc/Ω69Ν7ΛΒ-ΞΞΜ
	https://diavgeia.gov.gr/doc/ΩΞΥΚ7ΛΒ-ΤΒΟ
	https://diavgeia.gov.gr/doc/ΩΠΗΞ7ΛΒ-ΦΧ6
Xanthi	http://www.ktelxanthis.gr
	https://diavgeia.gov.gr/doc/6Ρ2Ψ7ΛΒ-ΑΩΣ
Thessaloniki	http://www.ktelthes.gr
Imathia	http://ktel-imathias.gr/
Kilkis	http://www.ktelkilkis.gr
	https://diavgeia.gov.gr/doc/6ΟΑ17ΛΛ-ΒΝΛ
	https://diavgeia.gov.gr/doc/ΩΘΙ07ΛΛ-ΔΟ0
Pella	http://www.ktelpellas.gr/
Pieria	http://www.ktelpierias.gr
Serres	http://www.ktelserron.gr
Halkidiki	http://www.ktel-chalkidikis.gr
Kozani	http://www.ktelkozanis.gr

Grevena	http://www.ktelgrevenon.gr
Kastoria	http://www.ktel-kastorias.gr
	https://diavgeia.gov.gr/doc/72ΩΦ7ΛΨ-O5Z
Florina	http://www.ktelflorinas.gr
	https://diavgeia.gov.gr/doc/7NIZ7ΛΨ-EΞ7
Ioannina	http://www.ktelioannina.gr
Artas	http://www.ktelartas.gr
	https://diavgeia.gov.gr/doc/68ΨH7Λ9-ΨΦA
Thesprotia	http://www.ktel-thesprotias.gr
Preveza	http://www.ktelprevezas.gr
	https://diavgeia.gov.gr/doc/6PXX7Λ9-ΓΓΣ
	https://diavgeia.gov.gr/doc/ΨMΞM7Λ9-Ω79
Larissa	http://www.ktellarisas.gr
Karditsa	http://www.ktel-karditsas.gr
Magnesia	http://www.ktelvolou.gr
Trikala	http://www.ktel-trikala.gr

MEASUREMENT APPROACHES OF REGIONAL ECONOMIC RESILIENCE: A LITERATURE REVIEW

George J. XANTHOS
Hellenic Mediterranean University, Crete, Greece
xanthosg@hmu.gr
ORCID ID: 0009-0004-7250-3296

Evangelos N. DULUFAKIS
Hellenic Mediterranean University, Crete, Greece
ddk167@edu.hmu.gr
ORCID ID: 0009-0009-9258-5379
(corresponding)

Abstract

In this article, we review the different methodological approaches of measuring regional economic resilience conducting a literature review. Methodological approaches to measure resilience range from the use of descriptive, interpretative, or simple regression models to sophisticated statically econometric models.

Given these premises, the present research, provides insights of the regional and spatial economics in relation to resilience measurement and estimation methods and enriches the knowledge of the measurement methodological context and applications from diversified literature sources. Our research focuses on economically derived disturbances or shocks, such as recessions, and the resistance capacity or ability of a regional economy to respond to these shocks. The core results of this article are summed up in one main inference, that the methodological context for measuring regional economic resilience is undefined and basically empirically developed using either resilience indices or statistically based econometric models to assess the resilience of a region.

Keywords: regional economic resilience, conceptual approach, measurement context, economic disturbance, literature review

JEL classification: R11 Regional Economic Activity: Growth, Development, Environmental Issues, and Changes

1.   A brief literature review

In recent years, the concept of resilience has become a "popular" term in various multidisciplinary fields. In the case of economics, resilience is "interpreted" as the ability of an economy to return in equilibrium conditions, those that prevailed before the occurrence of the disturbance [Kallioras (2012), Adger (2000), Van Breda (2001), Janssen (2007), Swanstrom (2008) and Maru (2010)]. As regards to regional science, the resilience of a region is described as its ability to successfully recover from of a shock strike its economy that either "throw it off its growth path or have the potential to throw it off its growth path" [Martin (2011), Hill et al. (2008)]. According to another interpretation, regional resilience reflects the ability of a regional economy to anticipate, prepare, respond to, and ultimately recover from a disturbance or disruption [Foster (2007)].

A useful classification pertaining to the types of resilience, provides the notion of resilience in a 4 dimensional framework according to: a) the degree of sensitivity (or depth of reaction) of regional economy to a recessionary shock interpreted as resistance, b) the speed and degree of recovery of regional economy from a recessionary shock interpreted as recovery, c) the extent to which regional economy renews its growth path (resumption of pre-recession path or hysteretic shift to new growth trend) interpreted as renewal and d) the extent of re-orientation and adaptation of regional economy in response to recessionary shock interpreted as re-orientation [Martin (2012)]

The methodological approaches to measure resilience range from use of descriptive, interpretative, or simple regression models to sophisticated statically econometric models.

Some of them refer to the construction of simple indices [Martin (2012) or Augustine et al. (2013)] or of composite indices   [Psycharis et al (2012), Reggiani et al (2016)],

applications of statistical time series models [Fingleton et al. (2012)], panel data models [Angulo et al (2018)], causal structural models [Doran and Fingelton (2013), Fingleton and Palombi (2013)], Shift-share and an input-output analysis models [Giannakis & Bruggeman (2015)], or other methodological approaches for measuring the impact of a shock and the ability to recover, using measured indices [Lapuh (2016)]. Our focus in this paper is on economic shocks. Economic shocks originate globally to national or local level, are sudden, unexpected and 'out-of-the-ordinary' events (such as national recessions and financial crises) [Martin and Sunley (2015)].

Given these premises, the present article, provides insights of the regional and spatial economics literature in relation to resilience measurement and estimation methods applied and proposed so far, enrich the knowledge of the measurement methodological context and applications from several different sources, including other reviews or bibliometric analyses of resilience measurements. Our research focuses on economically derived disturbances or shocks (such as recessions) and the resistance capacity or ability of a regional economy to respond to these shocks.

The article is structured as follows: In section 2, different conceptual definitions and approaches of regional resilience encountered in the literature, enriched with several studies on measurement and estimation methods and applications are reported, emphasizing to the different methodologies applied at regional level of NutsII & NutsIII scale. In section 3 additional improvements and recommendations for future research are presented whether section 4 concludes the article summarizing the extracted results, highlighting the need for further studies and clarification on measurement methodological approaches' aspects of regional economic resilience.

2.   <u>Regional economic resilience: conceptual & measurement approaches</u>

The conceptual approach to the notion of resilience, as well the interpretation of its magnitude changes varies, depending on the science in the light of which it is examined and evaluated. The origin of the concept of resilience stems from the environmental, health and social sciences and describes the (biological) ability of an (eco)-system or an organism to adapt and thrive under adverse environmental conditions following a disturbance [Holling (1973), Holling & Gunderson (2002), Walker et al. (2004)]. A 'seminal' description of the concept of resilience, is described as the ability of a social-ecological system to absorb disturbance and re-organize while undergoing change to still retain essentially the same function, structure, identity, and feedback, that prevailing before the occurrence of disturbance [Walker et al (2004), Holling's (1973)].

In economics, resilience is "interpreted" as the ability of an economy to return in equilibrium conditions, for example those that prevailed before the manifestation of the disturbance [Kallioras (2012), Adger (2000), Van Breda (2001), Janssen (2007), Swanstorm (2008), Maru (2010)].

As regards regional science, the resilience of a region is described as its ability to successfully recover from a shock which either throw it off or had the power to throw it off its development path [Martin (2011), Hill et al. (2008)]. According to another interpretation, resilience reflects the region's ability to anticipate, prepare for, respond to, and ultimately recover from a disruption. Regional resilience is intertwined with the ability of a region to cope with external pressures, its ability to react positively to external changes, its adaptability, and the ability of regional structures to cooperate and implement the appropriate kinds of planning, action, and social learning [Davies (2011)]. More specifically, resilience represents the process of preparing a region to become (or to be) resistant to a disorder begins before the manifestation of the disorder itself [Foster (2007)].

Using a different approach, resilience interpretation is based on 3 main approaches [Martin (2011)]. The first interprets resilience using engineering/technical science terminology (engineering resilience) describing it as the ability of a system to return to the initial equilibrium point it was before the disturbance occurred.

According to the second approach, the resilience of a system is related to the level of adaptation after a disturbance, or more precisely to the level of equilibrium to which the system will return after a disturbance (multiple levels of equilibrium). In this case, the concept of "ecological" resilience is referred to, which was first presented by Holling (1973) and

concerns the different level of equilibrium that the system driven, after the enforcement of the disorder.

The third approach and interpretation resemble the evolutionary interpretation of resilience called "adaptive" resilience. According to this, it is related to region's ability to reorganize its operation, redefine its development goals and redefine its infrastructure to maintain an acceptable growth path in output, employment, and wealth over time, responding to the effects that any disturbance may cause whenever it occurs [Martin (2012)].

These different interpretations "impose" four interrelated aspects of regions' reactions against economic shocks [Simmie & Martin (2010), Kurikka (2022), Martin (2012)].The first aspect is that of resistance, which corresponds to the sensitivity of a regional economy to disturbances. The second aspect is that of the speed and extent of recovery from disruptions. The third aspect relates to the extent regional economy undergoes structural re-orientation in accordance to growth path. The fourth type concerns the degree of renewal or resumption of the growth path prior to the shock. Recent literature revisions, define resilience as the multidimensional capacity of regional and local economy to absorb shocks, adapt or transit to new sustainable development path [Martin and Sunley (2014), Diodato and Weterings (2015), Manca et al. (2017), Baycan and Pinto (2018), Martin (2012)].

As far as the methodological approaches to measure resilience is concerned, these range from descriptive, interpretative case studies to sophisticated statically econometric models. Several different methodological approaches to measuring the degree and "type" of regional resilience are found in the literature as described below [Martin and Sunley (2015)]:
- • Use of simple case studies incorporating descriptive statistical data and questionnaires among the main "players" shaping regional policies
- • Use of resilience indices - simple or composite - that measure relative resilience and recovery using time-specific variables.
- • Use of time series statistical models (impulse response models, errors correction models) through which the time required to absorb the effect of a disturbance is calculated, in other words the size of the effect of the disturbance that is gradually eliminated in the unit of time.
- • Random structural models that incorporate regional resilience into regional economic models predict the "imaginary" position that the system under consideration would have in the absence of the imposed disturbance.

Each of the above approaches has its own characteristics, advantages, and disadvantages and in a general perspective, researchers see no reason why these different approaches cannot be combined with each other. The concept of resilience in regional science is assessed based on a region's ability to maintain a successful growth path after a disturbance, regardless of whether "success" is evaluated in terms of a traditional index (for example: change in employment rate) or a more complex indicator (for example: change in Resilience Capacity Index - RCI). In any case, regional resilience is assessed by measuring the change in a state at the initial period (before the disturbance) and the change in the state at the final period (after the disturbance), or by assessing the initial and final state (of a variable or an indicator for example) of a region [Chapple and Lester (2010)].

These measurements may involve either the use of a simple statistical measurement index, or a more complex index, or the application of empirical measurements and data extraction applications through regional analysis techniques. An indicative example coresponds to the empirical assessment of regional resilience using a dataset of quarterly employment series for 12 UK regions for the period 1971–2010, applying a Seemingly Unrelated Regression (SUR) model to examine the relevance of UK (engineering) resilience and regional employment [Fingleton et al. (2012)]. A broader family of econometric models based on the Dixit–Stiglitz theory of imperfect competition has also been used [Doran & Fingleton (2013)]. Moreover, a dynamic spatial panel model to analyze the effects of disturbances in the regional economies caused by 2008 financial impact was also used [Fingleton et al. (2015)].

In international literature, the most widespread composite index is that of RCI Index (Resilience Capacity Index) [Foster (2011); Foster (2012)]. RCI is a composite index incorporating 12 equally weighted variables reflecting economic, socio-demographic, and social cohesion characteristics. Another attempt of constructing a composite index considers the following 4 components: 1) the macro-economic stability component, 2) the micro-

economic adequacy of the market component, 3) the good governance component and the 4) the social development component [Briguglio et al. (2006)]. In another research work, a Resilience Capacity Index (RCI) of 79 Slovakia regions was measured, in the context of 2007-2008 economic crisis, combined with the use of an index of regional vulnerability [Reggiani 's et al. (2016)]. A series of indicators to measure economic resilience and vulnerability of US counties relative to other counties were also implemented [Miller, Johnson, & Dabson (2016)]. Regional resilience to economic shocks as well, based on 6 groups of parameters consisting of 65 indicators determined using Pearson's correlation coefficient and Kendall's correlation coefficient Rank, the knowledge capacity index, the regional governance capacity index, the knowledge and innovation capacity index, the learning capacity index, and the infrastructure capacity index have been also presented [Bruneckiene et al (2018)]. Furthermore, a composite resilience index-using principal component analysis-based on five factors, such as public relations, human infrastructure in urban areas, labor market and performance of economic innovation in science and research resulting into the creation of CWIRR index (Composite Weighted Index of Regional Resilience for the r region) were constructed [Stanickova and Melecky (2018)]. Another researcher, analyzing the resilience of the European Union based on regional vulnerability, resilience, and recovery, used the resilience index and the recovery index. Using a spatial general equilibrium model, the researcher investigates the resilience of EU regions under three alternative recessionary shocks, each triggering different economic adjustments and mechanisms [Di Pietro et al. (2021)].

In Greek literature, dominates the construction of a composite index (CIRR index) which incorporates a range of ten economic, social, demographic, and structural variables [Psycharis et al. (2012)]. According to the researcher, GDP per capita is the most frequently used statistical indicator of growth. A composite index to assess the resilience of Greek regions including variables such as population changes, export value, savings, new constructions, were also created [Psycharis et al. (2014)]. In another attempt to evaluate spatial performance of the Greek regions, GDP per capita is used as an independent variable together with a series of structural variables such as trade index, the degree of public investment per region, the percentage of regional GDP produced in the protected sector of the economy, etc. [Petrakos and Psycharis (2016)]. A more complex growth and prosperity index consisting of 21 variables, including data related to welfare and quality of life such as declared income, sectoral GDP, urbanization, centrality index, etc. has been presented as well [Petrakos and Artelaris (2008)].

Apart from attempts to create composite indices, empirical research works measuring regional resilience have also been recorded in the literature. In this case, the change in "key" regional variables such as GDP, employment, and unemployment (percentages) measured and evaluated [Martin & Gardiner (2019); Kakderi & Tasopoulou (2017); Giannakis & Bruggerman (2015, 2017); Kitsos & Bishop (2018)]. In some cases, two different variables are used [Sensier et al. (2016)]. Often, empirical approaches examine the degree of correlation of measured resilience with specific factors (or determinants) affecting it. The logic of this approach follows the assumption that regional economies consist of economic factors that produce changes within the economy and determine the overall resilience of regional economies [Bristow & Healy (2014)]. The determinants that mainly affect regional resilience capacity and performance are categorized in 5 main groups such as Industrial Business Structure, Labor Market Conditions, Financial Arrangements, Governance Arrangements, and Agency and Decision-Making [Martin & Sunley (2015)]. Thus, quite often, researchers apply econometric models or statistical methods to assess and identify in detail the degree of correlation of the measured resilience with these determinants.

In some research works, resilience is assessed based on the calculation of variables' change in absolute values (between the periods of the disturbance year), for instance before and after the occurrence of the disturbance at a regional or/and at sectoral level [Martin (2012); Kitsos and Bishop (2018); Athanasopoulos (2022)]. A simple way of measuring a region's resilience to recession is the ratio of the decrease in employment or production to the corresponding decrease at national (country) level: that is, the respond of national economy is used as reference against which the relative resistance or resilience of the regions is measured

[Martin (2012)]. This researcher used data on employment changes to assess the resilience of UK regions over three UK crisis time periods: 1979-1982, 1990-1992 and 2008-2010.

Other researchers assess regional resilience by calculating the percentage change of statistical variables before and after the occurrence of a disturbance, either manually or by using descriptive methods such as the Shift Share Analysis method [Sensier et al. (2016); Angulo et al. (2018); Cainelli, Ganau, & Modica (2019); Giannakis & Bruggeman (2015; 2020)].

A combination of two econometric methods was used, the technique of the classical Shift Share Analysis method and the input-output method to evaluate employment's changes in 13 Greek regions in (2001-2006) and (2008-2013) period investigating the effects of 2007-2009 financial crisis [Giannakis & Bruggeman (2015)]. A simple regional resilience index was also used, upon the proposal of Lagravinese (2015), which calculates resilience based on the change of employment in European countries [Giannakis & Bruggeman (2017)]. As point of reference, it takes the average employment of the EU 28 countries and resilience is estimated from equation (1):

$$\beta_{res}^{EU} = \frac{\frac{E_t^R - E_{t-1}^R}{E_{t-1}^R} - \frac{E_t^{EU} - E_{t-1}^{EU}}{E_{t-1}^{EU}}}{|\frac{E_t^{EU} - E_{t-1}^{EU}}{E_{t-1}^{EU}}|} \qquad (1)$$

where E_t^R is employment at the regional level and E_t^{EU} employment in the 28 EU Member States, t -1 the initial period of the analysis and t the final period of the analysis (year after the disturbance). Additional analysis was also carried out at national level according to equation (2):

$$\beta_{res}^N = \frac{\frac{E_t^R - E_{t-1}^R}{E_{t-1}^R} - \frac{E_t^N - E_{t-1}^N}{E_{t-1}^N}}{|\frac{E_t^N - E_{t-1}^N}{E_{t-1}^N}|} \qquad (2)$$

where E_t^R is employment at national level. Another empirical approach to assessing regional resilience measures the changes of regional variables after the year of imposition of the disturbance, in other words after the occurrence of the disturbance (with or without the use of Shift Share Analysis Method or other techniques for measuring statistical variables' changes) to construct a simple resilience index using equation (3):

$$RSij = \frac{\Delta Ji - \Delta Jn}{|\Delta Jn|} \qquad (3)$$

where ΔJ_i is the change of regional variable J of region i in the time interval [t -1, t] referring to a time after the imposition of the disturbance and ΔJ_n corresponds to the change of variable J of region i in time interval [t -1, t] at national level [Lagravinese (2015); Martin, Sunley; Gardiner & Tyler (2016); Giannakis & Bruggeman (2017)].

Several empirical approaches separate resilience into two forms, resistance resilience and recovery resilience. Often in the literature the interpretation of these two terms is also found as "performance" resilience and "ability" resilience. "The concept of resilience can be divided into two forms, performance (resistance) and capacity (recovery)" [Sutton & Arku (2022)]. Similar terms have been given by other researchers describing regional resilience as resistance and recovery capacity after disruption.

Performance refers to the outcome of regions' response to perturbations (for example assessment of regions' resilience), while capacity refers to the underlying process of regions' adaptation to a perturbation (for example short-term and sudden perturbations) [Bristow & Healy (2014); Evenhuis (2017)]. Both forms of resilience are important, as the former shows whether areas are resilient, and the latter explains why they are resilient. While conceptually both forms of resilience have been recognized in the resilience literature, resilience capacity is rarely examined empirically, remaining a "black box" in need of further investigation [Hill et al. (2012)]. Most of the empirical research has focused on the performance of regional economies against disturbances, examining particularly whether regions were resilient or not,

exploring the general determinants of resilience [Brown & Greenbaum (2017), Courvisanos et al. (2016), Martin. (2012)].

Considering a general categorization of disturbances that take place and affect spatial economic resilience of an area or region, one can distinguish two main categories: a) disasters, that are usually of anthropogenic origin or coming from extreme weather conditions [Rose and Krausmann (2013)] and b) recessionary disturbances [Martin (2012)]; In a more detail interpretation of shocks, seven broad types are referred: economic, institutional, organizational, environmental, and technology [Holm & Østergaard, (2015)], man-made shocks, and epidemic shocks [Sutton, & Arku, (2022)]. Considering the spatial origin of shocks, these could be either regionally or globally, isolated or globally occurrences (Martin & Sunley, (2015)].

In literature, the construction of a simple resilience index is mainly based on the measurement of employment rates. Employment's changes better reflect social effects of disturbances and especially economically originated disturbances, such as the financial crisis of 2007-2009 [Giannakis & Bruggeman (2017)]. Apart from employment, other indicators of economic growth such as GDP or GDP per capita or GVA are also important in capturing the effects of disturbances on society. The use of employment as a statistical variable is applied to calculate regional resilience index according to equation (3) [Lagravinese (2015)]. The researcher studied the period 1970-2011 and the effects of the economic recession on the Italian regions. To investigate the relationship between resistance and recovery indices, they used the Dynamic Shift Share Analysis Method to analyze how sectoral specialization and regional factors affect employment changes.

Another empirical analysis of the relationship between regional innovation capacity and resilience to crises in the European region uses cluster analysis [Bristow & Healy, (2018)]. Another indicative research work investigates the relationship between regional resilience of European regions and the quality of governance during the period of the great economic crisis of 2008 [Ezcurra & Rios (2018)]. Using equation (3) they calculated the regional resilience index for 255 NUTSII regions in the EU of 27 Member States in the period 2008–2013 applying regional employment as the measured value of corresponding index. The calculation of simple Resilience (Resistance) and Recovery (Recovery) indices are evolved by using regional EU27 GDP, from 2008 to 2009 for the resistance index and to 2011 for the recovery index [Opera et al. (2020)]. To examine the effect of the various factors (affecting regional resilience) on the formation of the resistance and recovery indices, the researchers examined two multiple linear regression models in which dependent variables were Resistance and Recovery Indices and independent variables were several influencing parameters selected and determined by the researchers. These parameters were: income from agricultural production, industrial processing and services, public administration activities, entrepreneurship data and higher education data, gross capital formation, urban population concentrations.

Another methodological approach to calculate a simple index, uses the employment E_r in region r of the corresponding country c, at t =2008 and T=2009...2012. The survey sample was 209 NUTS II regions in 16 European countries [Cainelli et al (2019)]. Employment data were also used to measure regional resilience and economic diversification, income equality and the prevailing business environment to interpret economic resilience (or resistance) to various shocks [Augustine et al. (2013)]. Other researchers, use local knowledge networks to interpret regional resilience [Crespo, Suire, and Vicente (2013)]. At another research paper, assessment, and identification of the impact of the economic crisis of 2011–2013 in Greek urban areas through the deterioration of the labor market and welfare is presented [Palaskas et al. (2015)]. Different ways of measuring evaluation found in literature and the different methodological approaches that have been developed such as empirical examinations, case studies of econometric or statistical models are also presented [Martins & Sunley (2015)]. Additional issues of assessment of regional resilience which relate to issues such as whether resilience is measured in absolute terms or relative to the national average or if it is compared with the resilience of other regions to a sudden disturbance are also examined [Sensier et al. (2016)]. In another research, an attempt to econometrically test the performance and the determinants that influence NUTS III regions during the economic crisis of 2007-2009 is performed [Petrakos & Psycharis (2016)].

Various other research works on the measurement and assessment of regional resilience are recorded. Such as, is the study of regional economic resilience for 20 Italian NUTS 2 regions analyzing regional employment changes over the period 1992-2021 using a non-linear smooth transition regression model [Di Caro (2017)]. The investigation of 2002–2007 period (before the financial crisis) and how determinants affected regional resilience based on changes in employment over the period 2008–2013, in 268 NUTSII regions of EU-28 countries, performed using a multilevel linear regression model [Giannakis & Bruggeman (2017)]. The assessment of the resistance of Spanish regions to the economic crisis, has been investigated under three main concepts of resilience: "Adaptive", "Engineering" and "Ecological" [Angulo et al. (2018)]. "Adaptive" resilience is measured through the application of the Shift Share Analysis method to calculate employment change, while "Engineering" and "Ecological" resilience emphasize on the path of development and the overall level of employment, in a period before and after crisis. An examination and empirical investigation of the relationship between industrial affinity and economic resilience during the crisis period 2008-2012 on a sample of 209 NutsII EU regions in 16 countries has also been performed [Cainelli et al. (2019)]. A two-dimensional quantitative measurement using the observed differences between expected (counterfactual) and actual employment in a region after a shock at US county-level developed to quantify regional resilience [Ringwood et al. (2018)]. Researchers attempted to distinguish the response to the shock from a random variation in the disturbance. Another empirical investigation of economic resilience of NutsII regions, examines the correlation between regional and structural factors and the degree of their influence upon resilience [Giannakis & Bruggeman (2020)]. A more comprehensive analysis provides, again for European NutsII regions, the application of an OLS regression model to measure unemployment resilience for the period 2008–2016 using a set of explanatory variables such as human capital [Cappelli et al. (2020)]. In another measurement of regional resilience of seven Eastern European countries during 2008 crisis, the construction (using GDP variable) of a resistance and a recovery index is used as dependent variable on a regression analysis model [Oprea et al. (2020)]. Using the OLS method, the researchers investigate the effect of specific factors on the resilience index (in terms of resistance and recovery) such as: agriculture, constructions, services, public administration, entrepreneurship, higher education, natural capital, and the urban population. The importance of human capital on labor market resilience in a sample of seven Portuguese NutsII regions over the period 1995–2018 based on different regional business cycles (and therefore various disruptions) has also been investigated [Simoes et al. (2022)].

According to a recent research paper, a different methodological approach was used to evaluate and rank the economic resilience of 17 Spanish regions, by observing the evolution of the components of the profit rate from 1975 to 2011 [Navines et al. (2022)]. For this purpose, researchers measured and analyzed the differential evolution of the two components of the rate profits: (i) the productivity of capital and (ii) the share of gross operating surplus in national income. In this research paper, the profit rate component is used instead of the "classical" components of measuring regional resilience such as employment. In another research paper, the role of regional industrial embeddedness (the share of regional industrial activity located in a region) on regional resilience is studied [Kitsos et al. (2022)]. Resilience is captured as the difference between pre- and post-crisis employment during the 2008 EU recession and the NutsII regions of the United Kingdom. Using Martin and Sunley's (2014) equation, they measure the resilience resistance (*Res*) for each region r and period t from 2008 to 2011. Using the local input-output tables, researchers try to interpret the industrial integration in the local regional systems and, by using regression models, to look for their correlation to regional economic resilience between 2008 and 2011.

In another research paper, an attempt is made to analyze the economic resilience of 284 Chinese cities at county and district levels using the equation that have already been used by Faggians et al. (2018); Giannakis and Bruggeman (2020, 2021); Lagravinese (2015) [Wang & Li (2022)]. They calculate regional resilience based on national employment changes. Moreover, they applied logistic multiple regression to assess the determinants of regional economic resilience and the variation in resilience caused by interprovincial disparities. In a more contemporary approach to assess resilience, it is examined through the investigation of the changes in a system (ie, structural and functional) resulting from the reactions to the

disturbances of the economic factors that constitute it [Sutton & Arku (2022)]. The methodological approach of evaluation-investigating a system-argues that the overall resilience is determined by the economic factors that constitute the region and by examining the changes of the system due to various disturbances. By examining system changes, research can determine the type of resilience regions exhibit during various perturbations.

3. Proposed improvements

Pertaining to the measurement and estimation of regional economic resilience, the analysis' results revealed the domination of the simple indices in measuring and evaluating regional economic resilience combined with correlation analyses applications to identify interrelations between resilience indices and regional determinants. This approach must be modelized and standardized under a unified and globally accepted context of investigation towards the production of comparable, scientifically reliable, accepted, and replicable measurement results and data.

Another point of intervention is correlated to the two (2) forms of resilience capacity, the resistance resilience (performance) and the recovery resilience (capacity) of a region. The former shows whether regions are resilient, and the latter explains why they are resilient. Both forms of resilience have been conceptually recognized in the resilience literature, while resilience capacity or recovery is rarely examined empirically remaining the need of further investigation. Most of the empirical research has focused on the performance of regional economies against disturbances, examining particularly whether regions are resilient or not, and not why they are resilient.

Moreover, further investigation should be conducted upon regional determinants that mainly affect regional resilience capacity and performance towards the evolution of another unified and unbiased identification and measurement framework, which could be applied and performed at any regional level within Europe and globally.

Before these interventions are practiced, there is a prerequisite and unnegotiable condition as regards the concept and notion of regional economic resilience: a concrete conceptualized clarification and adaptation of a common accepted definition of the term "resilience" should be adopted, especially in regional and spatial economic science.

4. Conclusions

The concept of resilience in regional science is assessed based on a region's ability to maintain a successful growth path after a disturbance, regardless of whether "success" is evaluated in terms of a traditional index (for example: change in employment rate) or a more complex indicator (for example: change in Resilience Capacity Index - RCI). In any case and according to Chapple and Lester (2010), regional resilience is assessed by measuring the change in a state at the initial period (before the disturbance) and the change in the state at the final period (after the disturbance), or by assessing the initial and final state (of a variable or an indicator for example) of a region.

The methodological approach to measure resilience ranges from the use of descriptive or interpretative models, simple or multi regression analyses to sophisticated statically econometric models. According to the results of this paper, several different methodological approaches to measuring the degree and "type" of regional resilience are found in the literature. These measurements may involve either the use of a simple statistical measurement index, a more complex index, or the application of empirical measurements and data extraction applications through regional analysis techniques that assess the resilience of a region.

Composite indicators present several advantages, mainly the ability of their adaptation in different economic conditions, the easy and direct classification and comparison of the examined economies as well as the ease of drawing conclusions compared to the use of simple indicators. Nevertheless, the safest and most efficient way to exploit the results of measurements using composite indicators is to use them in combination with other data that consider social, technological, and business characteristics of the economies under examination. Explicit care is required in the process of compiling such an index, which requires a correct and clear knowledge of the conditions prevailing in the regional economy

under consideration, the current economic conditions and the parameters that may limit the reliability of the applied indicators.

Apart from attempts to create a composite index, empirical research works measuring regional resilience have also been recorded where in most cases, the change in key regional variables such as GDP, employment, and unemployment (percentages) are measured and evaluated. In some research works, resilience is assessed based on the calculation of variables' change in absolute values (between the periods of the disturbance year), for instance before and after the occurrence of the disturbance at a regional or even at sectoral level. Other researchers calculate the percentage change (%) of statistical variables before and after the occurrence of a disturbance at regional level, either manually or by using descriptive methods such as the Shift Share Analysis method or input-output method. Another empirical approach is related to the measurement of the changes of regional variables after the year of imposition of the disturbance, in other words after the occurrence of the disturbance measuring the two types of resilience named and distinguished in the literature as resistance resilience and recovery resilience. The former shows whether areas are resilient, and the latter explains why they are resilient. In several research works as well, measured changes of statistical variables, are used to construct a simple resilience index. The construction of a simple resilience index is mainly based on the measurement of employment rates. Apart from employment, other indicators of economic growth such as GDP or GDP per capita or GVA are also important in capturing the effects of disturbances on regional economies.

In most of the research, the use of a simple or composite index does not provide researchers with solid and adequate information upon region's resistance performance and behavior. This derives from the fact that regional economies are composite complex systems, which are composed of numerous heterogeneous components such as firms, workers, and institutions. Each of these components have various complex interrelations and interconnections between each other and with external influences, presenting each of them with different absorption and responses to adverse shock and various disturbances. Moreover, regional economic structures are considered dynamic operating entities, and this is where time and evolution are involved as well. In such economic systems, there are numerous possible factors (determinants) that determine their operation and performance against possible disturbances and distortions. Thus, quite often, researchers apply econometric models or statistical methods to assess and identify in detail the degree of correlation of the measured resilience with these determinants.

Finally, regional changes of specific variables are compared to the corresponding national changes and in some cases, counterfactual, or estimated values in the absence of the occurrence of a disturbance, are compared to the real values occurred due to the existence of the disturbance.

Concluding, the methodological context for measuring regional economic resilience at NutsII or/and NutsIII level is undefined and basically empirically developed using either resilience indices or statistically based econometric models to assess resilience of a region. This somehow happens because regional resilience has not yet been clearly defined conceptually, to conclude to a globally accepted concept and definition. Until then, fussiness and multi directional approaching methods will prevail in the field of regional and spatial economics.

5. **References**

Adger W. N. (2000), "Social and Ecological Resilience: Are they related?", Progress in Human Geography 24: 347-364 (accessed February 8, 2023).

Angulo, A. M., Mur, J., & Trívez, F. J. (2018). Measuring resilience to economic shocks: an application to Spain. The Annals of Regional Science, 60(2), 349-373 (accessed February 8, 2023).

Augustine, N., Wolman, H., Wial, H., & McMillen, M. (2013). Regional economic capacity, economic shocks and economic resilience. Washington, DC: MacArthur Foundation Research Network.

Briguglio L., Cordina G., Bugejia S. and Farrugia N. (2006), "Conceptualizing and measuring Economic Resilience", University of Malta Working Paper 13 (accessed March 2, 2023).

Briguglio, L. I. N. O., Cordina, G., Bugeja, S., & Farrugia, N. (2005). Conceptualizing and measuring economic resilience. Economics Department, University of Malta, Valletta (accessed March 6, 2023).

Briguglio, L., Cordina, G., Farrugia, N., & Vella, S. (2008). Profiling economic vulnerability and resilience in small states: conceptual underpinnings.

Briguglio, L., Cordina, G., Farrugia, N., & Vella, S. (2009). Economic vulnerability and resilience: concepts and measurements. Oxford development studies, 37(3), 229-247 (accessed June 12, 2023)..

Bristow, G., & Healy, A. (2014). Building resilient regions: Complex adaptive systems and the role of policy intervention. Raumforschung und Raumordnung| Spatial Research and Planning, 72(2), 93-102.

Bristow.G., Healy.A., (2018). Innovation and regional economic resilience: an exploratory analysis, Annals of Regional Science 60, pp. 265-284 (accessed July 4, 2022).

Brown, L., & Greenbaum, R. T. (2017). The role of industrial diversity in economic resilience: An empirical examination across 35 years. Urban Studies, 54(6), 1347-1366(accessed July 4, 2022).

Bruneckiene, J., Palekienė, O., Simanavičienė, Ž., & Rapsikevičius, J. (2018). Measuring regional resilience to economic shocks by index. Engineering economics, 29(4), 405-418.

Cainelli, G., Ganau, R., & Modica, M. (2019). Industrial relatedness and regional resilience in the European Union. Papers in Regional Science, 98(2), 755-778.

Cappelli, R., Montobbio, F., & Morrison, A. (2020). Unemployment resistance across EU regions: The role of technological and human capital. Journal of Evolutionary Economics. https:// doi. org/10. 1007/ s00191- 020- 00693-5 (accessed July 6, 2022).

Cellini R, Torrisi G (2014) Regional resilience in Italy: a very long-run analysis. Reg Stud 1–19.

Chapple, K., & Lester, T. W. (2010). The resilient regional labour market? The US case. Cambridge journal of regions, economy and society, 3(1), 85-104 (accessed July 7, 2022).

Courvisanos, J., Jain, A., & Mardaneh, K. (2016). Economic resilience of regions under crises: A study of the Australian economy. Regional Studies, 50(4), 629–643. https://doi.org/10.1080/00343404.2015.1034669 (accessed July 8, 2022).

Crespo, J., Suire, R., & Vicente, J. (2013). Lock-in or lock-out? How structural properties of knowledge networks affect regional resilience. Journal of Economic Geography, 14(1), 199–219

Cropanzano R (2009) Writing nonempirical articles for journal of management: General thoughts and suggestions. Journal of Management 35: 1304–1311.

Davies S (2011). Regional resilience in the 2010 downturn: Comparative evidence from European countries, Cambridge Journal of Regions, Economy and Society 4: 382 (accessed July 15, 2023).

Di Caro P (2013) Recessions, recoveries and regional resilience: evidence on Italy. University of Catania Working Paper (accessed July 15, 2023).

Di Caro, P. (2017). Testing and explaining economic resilience with an application to I talian regions. Papers in Regional Science, 96(1), 93-113 (accessed July 14, 2023).

Di Pietro, F. Lecca P. & Salotti S. (2021) Regional economic resilience in the European Union: a numerical general equilibrium analysis, Spatial Economic Analysis, 16:3, 287-312, DOI: 10.1080/17421772.2020.1846768.

Diodato, D., & Weterings, A. B. (2015). The resilience of regional labor markets to economic shocks: Exploring the role of interactions among firms and workers. Journal of economic geography, 15(4), 723-742.

Doran, J., & Fingleton, B. (2013, August). US metropolitan are resilience: insight from dynamic spatial panel estimation. In annual conference of regional Science association international, University of Cambridge.

Doran, J., & Fingleton, B. (2016). Employment resilience in Europe and the 2008 economic crisis: Insights from micro-level data. Regional Studies, 50(4), 644-656 (accessed August 5, 2023)

Faggian, A., Gemmiti, R., Jaquet, T., & Santini, I. (2018). Regional economic resilience: The experience of the Italian local labor systems. The Annals of Regional Science, 60, 393.

Fingleton B. and Palombi S. (2013) Spatial panel data estimation, counterfactual predictions, and local economic resilience among British towns in the Victorian era, Regional Scie nce and Urban Economics 43, 649–660. doi:10.1016/j.regsciurbeco.2013.04.005 (accessed August 6, 2023)

Fingleton, B., Garretsen, H., & Martin, R. (2012). Recessionary shocks and regional employment: evidence on the resilience of UK regions. Journal of regional science, 52(1), 109-133.

Fingleton, B., Garretsen, H., & Martin, R. (2015). Shocking aspects of monetary union: the vulnerability of regions in Euroland. Journal of Economic Geography, 15(5), 907-934.

Foster K. A. (2007α). A Case Study Approach to understanding Regional Resilience, IURD Working Paper 8

Foster, K. A. (2007). A case study approach to understanding regional resilience.

Foster, K. A. (2011). Resilience capacity index: Data, maps and findings from original quantitative research on the resilience capacity of 361 US metropolitan regions. URL: http://brr. berkeley. edu/rci.

Foster, K. A., & Barnes, W. R. (2012). Reframing regional governance for research and practice. Urban Affairs Review, 48(2), 272-283 (accessed September 4, 2021).

Gallopín, G. C. (2006). Linkages between vulnerability, resilience, and adaptive capacity. Global environmental change, 16(3), 293-303 (accessed September 4, 2021).

Garfield, E. (2004). Historiographic mapping of knowledge domains literature. Journal of Information Science, 30(2), pp. 119-.

Giannakis, E., & Bruggeman, A. (2015). Economic crisis and regional resilience: Evidence from Greece. Papers in Regional Science, 96(3), 451–476. https://doi.org/10.1111/pirs.12206.

Giannakis, E., & Bruggeman, A. (2017). Determinants of regional resilience to economic crisis: a European perspective. European Planning Studies, 25(8), 1394-1415 (accessed September 11, 2023).

Giannakis, E., & Bruggeman, A. (2020). Regional disparities in economic resilience in the European Union across the urban–rural divide. Regional Studies, 54(9), 1200-1213 (accessed September 11, 2023).

Gu, D., Dillard, M., Gerst, M., & Loerzel, J. (2023). Validating Commonly Used Indicators for Community Resilience Measurement. Natural Hazards Review, 24(2), 04023008.

Hadjimichalis, C. (2011). Uneven geographical development and socio-spatial justice and solidarity: European regions after the 2009 financial crisis. European Urban and Regional Studies, 18(3), 254-274.

Hassink, R. (2010). Regional resilience: a promising concept to explain differences in regional economic adaptability?. Cambridge journal of regions, economy and society, 3(1), 45-58.

Hill E., Wial H. and Wolman H. (2008). "Exploring Regional Economic Resilience", IURD Working Paper 4 (accessed September 14, 2023).

Hill, E., Clair, T. S., Wial, H., Wolman, H., Atkins, P., Blumenthal, P., ... & Friedhoff, A. (2012). Economic shocks and regional economic resilience. In Urban and regional policy and its effects: Building resilient regions (pp. 193-274). Brookings Institution Press (accessed September 15, 2023).

Holling, C. S. (1973). Resilience and stability of ecological systems. Annual review of ecology and systematics, 4(1), 1-23.

Holling, C. S., & Gunderson, L. H. (2002). Resilience and adaptive cycles. In: Panarchy: Understanding Transformations in Human and Natural Systems, 25-62 (accessed September 15, 2023).

Holm, J. R., & Østergaard, C. R. (2015). Regional employment growth, shocks and regional industrial resilience: A quantitative analysis of the Danish ICT sector. Regional Studies, 49(1), 95–112. https://doi.org/10.1080/00343404.2013.787159 (accessed September 16, 2023).

https://ec.europa.eu/eurostat/web/regions-and-cities/overview.

Hundt, C.; Holtermann, L. The role of national settings in the economic resilience of regions—Evidence from recessionary shocks in Europe from 1990 to 2014. Growth Chang. 2020, 51, 180–206.

Janssen M. A. (2007), "An Update on the Scholarly Network on Resilience, Vulnerability& Adaptation with the Human Dimension of the Global Environmental Change", Ecology and Society 12(2): 9.

Kakderi, C., & Tasopoulou, A. (2017). Regional economic resilience: The role of national and regional policies. European Planning Studies, 25(8), 1435-1453 (accessed October 5, 2023).

Kitsos, A., & Bishop, P. (2018). Economic resilience in Great Britain: the crisis impact and its determining factors for local authority districts. The Annals of Regional Science, 60(2), 329-347.

Kitsos, A., Grabner, S. M., & Incera, A. C. (2022). The role of embeddedness in regional economic resistance (accessed October 6, 2023).

Kunisch S, Menz M, Bartunek JM, et al. (2018) Feature topic at organizational research methods: How to conduct rigorous and impactful literature reviews? Organizational Research Methods 21: 519–523.

Kurikka, H. (2022). On regional resilience. Tampere University, Urban and Regional Studies Group Sente.

Lagravinese, R. (2015). Economic crisis and rising gaps North–South: evidence from the Italian regions. Cambridge Journal of Regions, Economy and Society, 8(2), 331-342 (accessed October 8, 2023).

Lapuh, L. (2016). Measuring the impact of the recession on Slovenian statistical regions and their ability to recover. Acta geographica Slovenica, 56(2), 247-266.

Markusen, A. (2003). Fuzzy concepts, scanty evidence, policy distance: the case for rigour and policy relevance in critical regional studies. Regional studies, 37(6-7), 701-717 (accessed November 19, 2022).

Martin, R. (2011). Regional economic resilience, hysteresis and recessionary shocks. Journal of economic geography, 12(1), 1-32 (accessed November 24, 2021).

Martin, R. (2012). Regional economic resilience, hysteresis and recessionary shocks. Journal of economic geography, 12(1), 1-32 (accessed November 24, 2021)

Martin, R., & Gardiner, B. (2019). The resilience of cities to economic shocks: A tale of four recessions (and the challenge of Brexit). Papers in Regional Science, 98(4), 1801-1832.

Martin, R., & Sunley, P. (2007). Complexity thinking and evolutionary economic geography. Journal of Economic Geography, 7(5), 573–601. https://doi.org/10.1093/jeg/lbm019 (accessed November 24, 2021)

Martin, R., & Sunley, P. (2015). On the notion of regional economic resilience: conceptualization and explanation. Journal of economic geography, 15(1), 1-42 (accessed November 24, 2021).

Martin, R., Sunley, P., Gardiner, B., & Tyler, P. (2016). How regions react to recessions: Resilience and the role of economic structure. Regional Studies, 50(4), 561-585 (accessed November 27, 2021).

Maru Y. T. (2010), "Resilient Regions: Clarity of Concepts and Challenges to Systemic Measurement", CSIRO Working Paper Series 4.

Miller, K. K., Johnson, A., & Dabson, B. (2016). Measuring resilience and vulnerability in US Counties. Institute of Public Policy Working Paper, 7 (accessed December 20, 2021).

Navinés, F., Pérez-Montiel, J., Manera, C. et al. Ranking the Spanish regions according to their resilience capacity during 1965–2011. Ann Reg Sci (2022). https://doi.org/10.1007/s00168-022-01171-5.

Oprea, F., Onofrei, M., Lupu, D., Vintila, G., & Paraschiv, G. (2020). The determinants of economic resilience. The case of Eastern European regions. Sustainability, 12(10), 4228.

Palaskas, T., Psycharis, Y., Rovolis, A., & Stoforos, C. (2015). The asymmetrical impact of the economic crisis on unemployment and welfare in Greek urban economies. Journal of Economic Geography, 15(5), 973-1007 (accessed December 11, 2022).

Pendall, R., Foster, K. A., & Cowell, M. (2010). Resilience and regions: building understanding of the metaphor. Cambridge Journal of Regions, Economy and Society, 3(1), 71-84.

Petrakos G. (2008). 'Regional growth and inequalities in the European Union', Paper presented at the International Conference "Transnational Europe: Promise, Paradox, Limits" Carleton University, Ottawa.

Petrakos, G., & Artelaris, P. (2008). Regional inequalities in Greece. H. Coccossis and Y. Psycharis (edit.), Regional Analysis and Policy: The Greek Experience. Physica-Verlag. A Springer Company (accessed December 20, 2022).

Petrakos, G., & Psycharis, Y. (2016). The spatial aspects of economic crisis in Greece. Cambridge Journal of Regions, Economy and Society, 9(1), 137-152 (accessed December 3, 2021).

Psycharis, Y., Kallioras, D. and Psatha, E. (2019). Political Resilience in Times of Economic Crisis and Local Government Reforms: the case of the Municipality of Volos, 2019, Hannover : Leibniz Universität Hannover, Institut für Umweltplanung, https://core.ac.uk/reader/237444710 (accessed January 20, 2022).

Psycharis, Y., Kallioras, D., & Pantazis, P. (2014). Economic crisis and regional resilience: detecting the 'geographical footprint 'of economic crisis in Greece. Regional Science Policy & Practice, 6(2), 121-141 (accessed January 9, 2022).

Psycharis, Yiannis, et al. (2012). The Spatial Footprint Of The Ongoing Economic Crisis (2009-…) In Greece: Assessing The Resilience And Development Of The Greek Regions (accessed January 20, 2022).

Reggiani, A., De Graaff, T. & Nijkamp, P. (2002). Resilience: An Evolutionary Approach to Spatial Economic Systems. Networks and Spatial Economics 2, 211–229. https://doi.org/10.1023/A:1015377515690.

Reggiani, A.; Bucci, P.; Russo, G.; Haas, A.; Nijkamp, P. Regional labour markets and job accessibility in City Network systems in Germany. J. Transp. Geogr. 2011, 19, 528–536 (accessed January 29, 2022).

Reggiani, Aura; Hudec, Oto; Siserova, Monika, (2016). Resilience capacity and vulnerability: The case of Slovakia, European Regional Science Association (ERSA), Louvain-la-Neuve.

Ringwood, L., Watson, P., & Lewin, P. (2019). A quantitative method for measuring regional economic resilience to the great recession. Growth and change, 50(1), 381-402 (accessed January 20, 2023).

Rose AZ, Krausmann E (2013) An economic framework for the development of a resilience index for business recovery. Int J Disaster Risk Reduction.

Sensier, M., Bristow, G., & Healy, A. (2016). Measuring regional economic resilience across Europe: Operationalizing a complex concept. Spatial Economic Analysis, 11(2), 128-151 (accessed April 22, 2023).

Simmie, J., & Martin, R. (2010). The economic resilience of regions: towards an evolutionary approach. Cambridge journal of regions, economy and society, 3(1), 27-43 (accessed May 20, 2023).

Simões, M., Andrade, J. S., & Duarte, A. (2022). Human Capital and Labour Market Resilience: A Regional Analysis for Portugal. Applied Spatial Analysis and Policy, 1-25 (accessed May 14, 2023).

Stanickova, Melecký, (2018) An Understanding of resilience in the context of regional development using composite index approach: the case of European Union NUTS-2 regions, Journal Region Studies, Regional Science, Vol. 5, No.1, pp. 231-254.

Sternberg RJ (1991) Editorial. Psychological Bulletin 109: 3–4 (accessed January 4, 2023).

Stilwell, F. J. B. (1969). Regional growth and structural adaption. Urban Studies, 6(2), 162-178. https://doi.org/10.1080/00420986920080241 .

Sutton, J., & Arku, G. (2022). Regional economic resilience: towards a system approach. Regional Studies, Regional Science, 9(1), 497-512 (accessed June 22, 2023).

Swanstrom T. (2008), "Regional Resilience: A Critical Examination of the Ecological Framework", IURD Working Paper Series 7.

Van Breda A. D., (2001), Resilience Theory: A Literature Review, Pretoria: South African Military Health Service (accessed September 4, 2023).

Van Eck, N. J. and Waltman, L. (2014). Visualizing bibliometric networks. In Y. Ding, R. Rousseau, and D. Wolfram (Eds.), Measuring Scholarly Impact. Cham, Switzerland: Springer.

Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, Adaptability and Transformability in Social–ecological Systems. Ecology and Society, 9(2). http://www.jstor.org/stable/26267673.

Wang, X., & Li, M. (2022). Determinants of Regional Economic Resilience to Economic Crisis: Evidence from Chinese Economies. Sustainability, 14(2), 809 (accessed September 11, 2023).

Wang, Z., & Wei, W. (2021). Regional economic resilience in China: Measurement and determinants. Regional studies, 55(7), 1228-1239 (accessed September 13, 2023).

Αθανασόπουλος, Δ. (2022). Περιφερειακή ανθεκτικότητα, περιφερειακές ανισότητες και περιφερειακή πολιτική (Doctoral dissertation, Πάντειο Πανεπιστήμιο Κοινωνικών και Πολιτικών Επιστημών. Σχολή Επιστημών Οικονομίας και Δημόσιας Διοίκησης. Τμήμα Οικονομικής και Περιφερειακής Ανάπτυξης).

Καλλιώρας Δ. (2012), The Notion of Resilience in Regional Science: Review and Decomposition. Region & Periphery, (2), 37–58. https://doi.org/10.12681/rp.18756 .

THE COMPLEX RELATIONSHIP BETWEEN AIR TRANSPORT INFRASTRUCTURE AND REGIONAL DEVELOPMENT. AN EMPIRICAL INQUIRY

Daniela- Luminița CONSTANTIN
Professor at the Department of Administration and Public Management, The Bucharest University of Economic Studies; Bucharest; Romania
danielaconstantin_2005@yahoo.com

Ana-Maria MARCU
MSc Student, Administration and Public Management, Faculty of Administration and Public Management, The Bucharest University of Economic Studies; Bucharest; Romania
marcuana19@stud.ase.ro

Abstract
Nowadays the development of the air transport infrastructure is acknowledged as an important driver of regional development, while the economic development processes impact the demand and volume of air transport as well. This paper investigates the complex relationship between air transport infrastructure and regional development proposing an empirical analysis for the case of Romania, whose relevance is supported by her unprecedented dynamism in the general European framework at the same time with the tendency of reducing regional disparities, the balanced geographical distribution of the airport network, and the country's geo-strategical position in the new international force field. By applying an in-depth analysis which combines the examination of strategic documents with the interpretation of statistical data and semi-structured interviews, relevant findings are provided with regard to the significance of air transport infrastructure in a context described by diversity of regional development levels, accompanied by insights into the policy-making framework, with emphasis on the requirements to be met for proper responses to the need to reinforce the air transport sector and to integrate the national vision with the specific regional development aspects.
Keywords: air transport infrastructure, regional disparities, place-based approaches, resilience, integration
JEL classification: R11, R19, R42, R58

1. Introduction

At present the contribution of transport infrastructure to regional development is largely acknowledged, evidence being provided on the positive correlation between them. In particular, the development air transport infrastructure is considered "a strategic transportation policy factor for regions" (Elburz et al., 2020, p. 128), taking into account the globalization and trade opeeness, on the one hand, and the capacity of aviation sector to enhance the international networks for business and tourism on the other hand (Elburz et al., 2020; Hong et al., 2011; ATAG, 2005). Considered one of the world's most important industries, the air transport impact envisages core economic domains such as welfare, jobs and wages, tourism, and broader aspects of economic growth, productivity and trade (Chapman, 2023), with important direct and indirect effects at local, regional, national and international scale (Tsiosas, 2022).

It enters into mutual relationships with GDP and employment – overall and structured by sector and by region, the intensity and direction of causality being still an intensely debated topic (e.g. Elburz et al., 2020; Kucukonal, Gulşah, 2017; Brueckner, 2003). Most studies have pointed out that the influence of air transport on the economic development of a region is higher compared to the effects that the economic development process can generate on the demand and volume of air transport. However, there are also researchers who consider that the two influences are almost of the same magnitude.

For example, Vijver et al. al (2016) analysed the causal relationship between air passenger transport and regional development using data from 2002 to 2011 for 112 European NUTS2

regions. They conducted their research by applying a Granger causality analysis and treating the service and manufacturing sectors separately. The aim of the research was to investigate the causal linkages between passenger air transport and regional development, expressed in terms of employment rates, while the established hypotheses concerned both the influence of air transport on employment and the extent to which the increase in employment can cause increases in the level of transport. The results indicated the presence of both directions of causality at the level of European urban regions, a fact that reveals the necessity but not the sufficiency of air passenger transport in generating regional growth. The higher level of employment observed in the service sector confirms its sensitivity to air passenger transport. The research also showed that, for most of the analysed regions, the effects of causality between passenger volume and total employment become visible after the passage of at least a period of one year. At the same time, the study revealed a stronger connection between air passenger transport and employment in the service sector, the following aspects being noted: the causal relationship starts from the number of passengers to employment, characteristic of the Central - European area, while the opposite causality was noticed in the case of six regions in Spain and the South of France. Bidirectional causality was also observed among 10 regions. Granger causality for the manufacturing sector was detected in 39 NUTS2 regions, particularly among those with high levels of employment, such as Piemonte and Lombardy in northern Italy. In summary, the results suggested that: causality patterns between air transport and employment were geographically heterogeneous or even absent; the influence of air transport on employment was more pronounced than the influence of employment on air transport, although the latter could also be noticed in the case of some regions; the causality between air transport and employment was stronger in the service sector compared to the manufacturing sector.

In another register, Hu et al. al (2015) used recent panel time series methodology to examine the dynamics and causal relationship between economic growth and domestic air passenger traffic. They analysed quarterly data of 29 provinces in China, for the 2006 – 2012 period. The choice of China was motivated by the fact that it has become the second largest air transport market in the world in terms of distances flown, both for passenger and freight transport. The results highlight the existence of a long-term equilibrium relationship between economic growth and domestic passenger traffic. Specifically, a 1% increase in air passenger traffic was found to lead to a 0.943% increase in real GDP. Between these two data series, a strong bidirectional and long-term Granger causality, but also a unidirectional short-term causality from domestic air passenger traffic to economic growth was identified.

Without providing information on the direction of influence manifested between the two processes, a Eurocontrol report (2022) justifies their interdependence by the very way of realizing future traffic forecasts and scenarios. Specifically, the three scenarios regarding the possible evolution of air traffic up to the horizons of 2050 highlight and reaffirm the close connection between air transport infrastructure and economic growth, considering the following situations: the optimistic scenario is based on a strong economic growth, the basic one envisages a moderate level of it, while the pessimistic scenario assumes the existence and manifestation of conditions specific to a slow economic growth. The underlying analysis for 1975-2020 (Figure 1) has shown that the economic growth remains the most important factor of influence for the growth in air travel, the corresponding cycles being strongly correlated, but with the elasticity coefficient in Europe decreasing over the years. The distortion induced by the COVID-19 crisis is also captured, at the same time with the mentioned expectation regarding the restauration of the relationship in the next years.

In order to ensure the long-term resilience of the aviation sector, Tisdall et al. (2021) point to the need to address "a pathway for future sudden moments of dislocation" and propose policies able to support aviation "in a way that engages all levels of industry rather be airline centric" (p. 273). In the same register Gherghina et al. (2023) propose institutional resilience-based approaches that take into consideration three organisational traits, namely "preparedness, agility and robustness" (p. 426).

Figure 1: Correlation between GDP level and air transport demand in Europe, 1975-2020
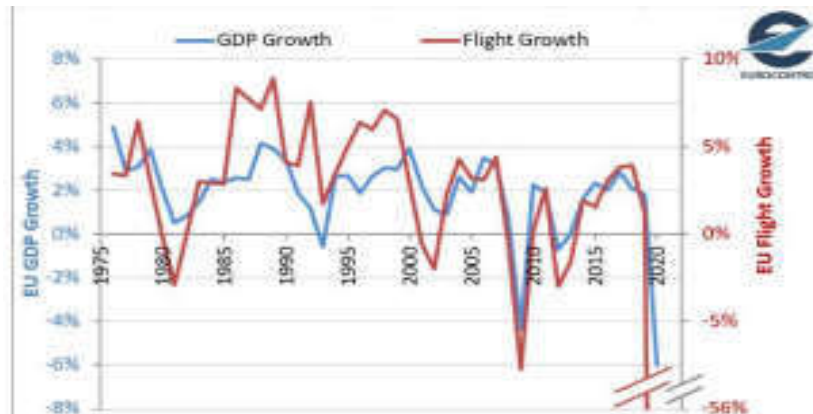
Source: Eurocontrol (2022), p.5

Beyond the above interpretations on intensity and direction of causality, there is a plethora of well-grounded studies which illustrate and bring about solid arguments for the contribution of air transport infrastructure to regional development.

According to Baltaci et. al (2015), for developing countries transport is a key sector, with an essential contribution to the development process. Transport infrastructure not only favors the air connectivity growth but also facilitates the economic, social and cultural relations between countries and regions (Bekisz and Kruszynski, 2021; Morphet and Bottini, 2013; Stilianos and Ladias, 2011). In addition, Cascetta et. al (2020) highlights that an improvement of the transport system can also stimulate local production, by facilitating the access of producers to more distant markets and creating more opportunities to attract foreign direct investments, which contribute significantly to economic growth. It can also create significant competitive advantages for the envisaged regions (Tu et al., 2022). On the other hand, a low degree of accessibility to transport routes may, however, limit the degree of accessibility to employment opportunities, health and education services or other facilities.

Going deeper, Aguirre et. al (2019) demonstrate that an airport with an efficient activity can significantly contribute to the economy of the area it serves while improving the quality of life in the region as well. These effects occur together with the increase in employment that can be generated both by the new jobs created by the airport activity itself and by attracting new companies in that area. The wide range of employment opportunities can vary, starting from those related to air transport, such as management activities necessary to coordinate airport activity, maintenance services, ground cargo handling, radio communications, air traffic control, catering services, fuel refining, etc. to the establishment of new travel agencies in the area.

Based on these overall considerations, this paper aims to deepen the exploration of the relationship between air transport infrastructure and regional development by proposing for the empirical analysis the case of Romania, which is relevant in the recent international context from two perspectives, namely: 1. the unprecedented dynamism of the country in the general European framework combined with the tendency of reducing the inter-regional inequalities; air transport has a very interesting place in this picture, considering the quite balanced geographical distribution of the airports, with a good representation of this mode of transportation even in the less developed regions of Romania; 2. Romania's geostrategic position in the new international force field, in a time of overlapping crises (sanitary, resulted from the COVID-19 pandemic, the emerging economic one, the Russian-Ukrainian war, with entailed immigrant crisis, etc.), in other words, a complex polycrisis.

Thus, new knowledge deriving from empirical analysis can be added with regard to the complex relationship between air transport (with the support offered by the corresponding infrastructure) and regional development, shedding more light on the effects that one can manifest on the other as well as on the new ways of action and measures able to enhance the economic development processes in a more resilient manner.

2. Data and Research Methodology

In order to respond the research objective formulated above, an in-depth analysis is proposed, combining the overall image offered by strategic documents (e.g. General Transport Master Plan prepared by the Ministry of Transport and Infrastructure) and the interpretation of the statistical data offered by Statistical Yearbook of Romania and Eurostat with semi-structured interviews with representatives of relevant stakeholders in the field (e.g. Bucharest Airports National Company, county councils, etc.). As a result, useful findings with regard to the airport network will be revealed, providing insights with direct implications for increasing the air transport contribution to regional development in Romania.

3. Results

3.1. 3 Quantitative data interpretation

According to the Ministry of Transport and Infrastructure, Romania has 27 airfields and 6 heliports. Depending on their role and potential to attract internal and external traffic, the airfields fall into the following categories: international hub, international strategic airport, international airport, secondary international (regional) airport, airfield (other than the previous ones) (MTI, 2021). Table 1 shows the distribution of the airfields by development region and category; in addition, Figure 2 depicts the territorial organization of Romania by development region (NUTS2) and county (NUTS3), while Figure 3 offers a geographical image of the airport network at national scale.

Table 1. The distribution of airfields by development region and category

Development Region	Airfields	Category
North-East	Iasi	Principal intn'l airport
	Bacau	Secondary intn'l airport
	Suceava	Secondary intn'l airport
South-East	Constanta	Strategic intn'l airport
	Tulcea	Secondary intn'l airport
	Galati	National airfield
	Tuzla	National airfield
South-Muntenia	Clinceni	National airfield
	Gradistea	National airfield
	Pitesti Geamana	National airfield
	Ploiesti Strejnic	National airfield
South-West Oltenia	Craiova	Secondary intn'l airport
West	Timisoara	Principal intn'l airport
	Arad	Principal intn'l airport
	Arad CBS	National airfield
	Caransebes	National airfield
	Deva	National airfield
North-West	Cluj-Napoca	Principal intn'l airport
	Baia Mare	Secondary intn'l airport
	Oradea	Secondary intn'l airport
	Satu Mare	Secondary intn'l airport
	Bistrita	National airfield
Centre	Sibiu	Principal intn'l airport
	Targu Mures	Principal intn'l airport
	Brasov	Secondary intn'l airport
	Orastie	National airfield
Bucharest-Ilfov	Bucharest-Otopeni	International hub
	Bucharest-Baneasa	Principal intn'l airport

Source: authors' processing based on MTI (2021), p.208

Figure 2: The territorial structure in Romania – NUTS2 and NUTS3

COUNTIES GROUPING, BY DEVELOPMENT REGION
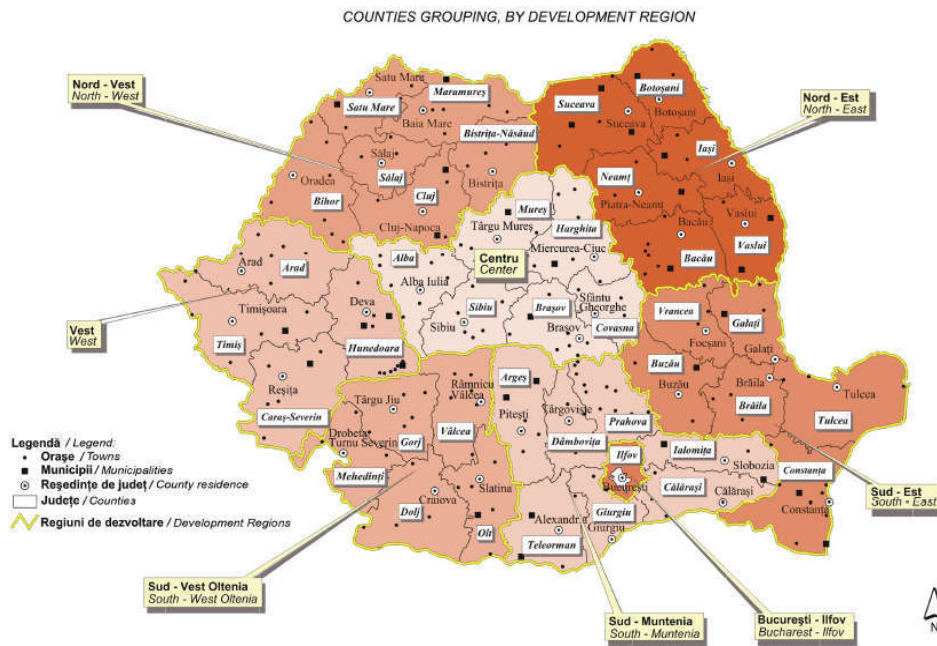
Source: National Institute of Statistics

Figure 3: The geographical location of the Romanian airfields
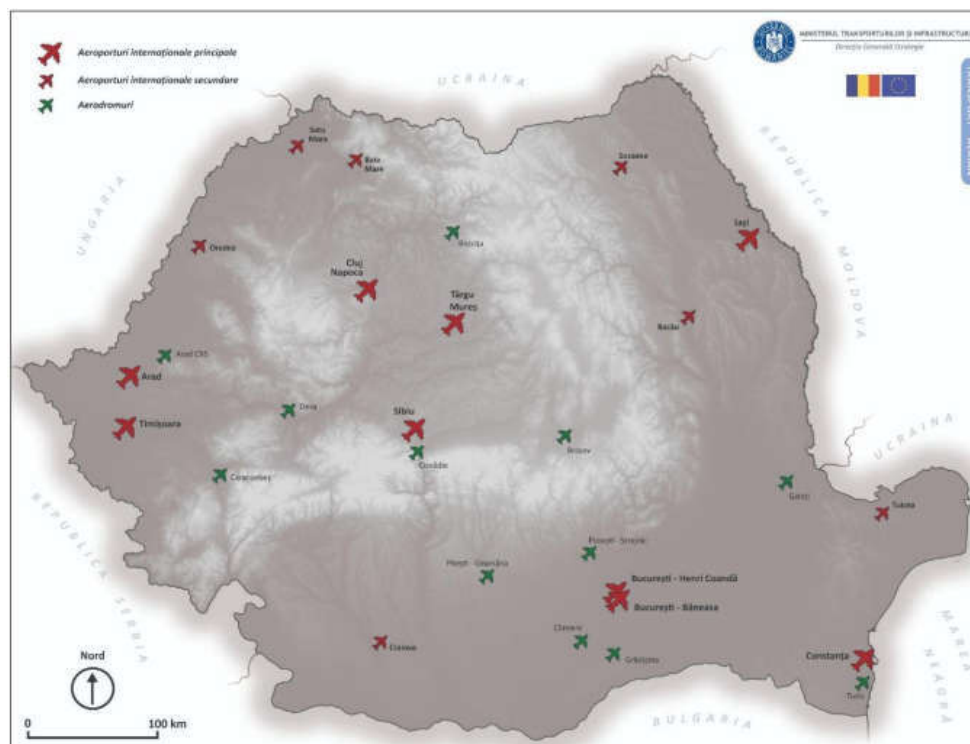
Source: MTI (2021), p. 208
Note: In the meantime Brasov airfield has become a secondary international airport.

Thus, there is one international hub (Henri Coanda International Airport of Bucharest-Otopeni), one strategic international airport (Mihail Kogalniceanu International Airport of Constanta, which, besides civil flights, serves the NATO forces deployed in the military base nearby), seven principal international airports (of which the most important are those in Cluj, Timisoara and Iasi), eight secondary (regional) international airports and eleven national airfields, of which some are to benefit from investments that will transform them into small operational airports. From the relief shape viewpoint, most of them located in plain areas and

just a few of them at the bottom of mountain areas, which explains the lower number in the core of Romania, crossed by the Carpathian mountains.

In institutional-administrative terms, excepting Henri Coanda International Airport of Bucharest-Otopeni and Mihail Kogalniceanu International Airport of Constanta, which are subordinated to the Government of Romania, all other airports are subordinated to the county councils, following the general orientation of an integrated development at regional level.

The distribution of airports by development region looks quite balanced, creating favourable conditions for a proper support of air transport to regional development. There is just one NUTS2 region with no airport on its territory (but just a couple of small airfields) – South-Muntenia, given its particular situation (depicted in Figure 2) of 'external hinterland' for the Bucharest Metropolitan Area (which covers the whole Bucharest-Ilfov development region and several other localities beyond) (Grosu et al., 2014).

In quantitative terms, the National Institute of Statistics (NIS, 2023) provides data for air transport with regard to the number of passenger dynamics, the freight transport dynamics as well as the evolution of aircraft movements, all of them being synthesised in Figure 4, Figure 5 and Figure 6, which cover the 2015-2022 time span.

Figure 4: Air transport -the number of passenger dynamics, 2015 – 2022

	2015	2016	2017	2018	2019	2020	2021	2022
Passengers	13272745	16398045	20221814	21815809	23193313	7186456	11176808	20971809
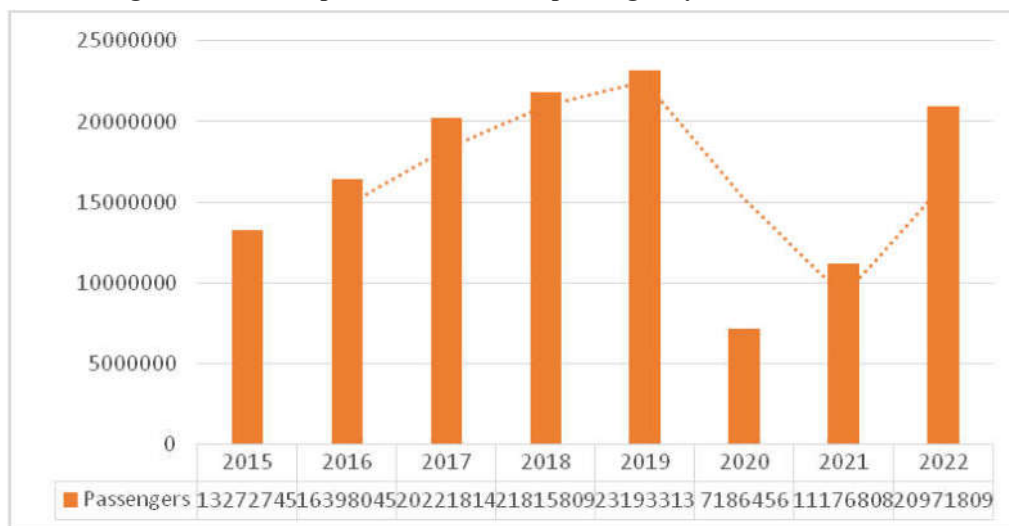
Source: authors' representation based on NIS (2023)

Figure 5: The freight air transport dynamics, 2015 – 2022 (tones)

	2015	2016	2017	2018	2019	2020	2021	2022
Goods	36585	40130	44983	48520	47315	40398	41178	50534
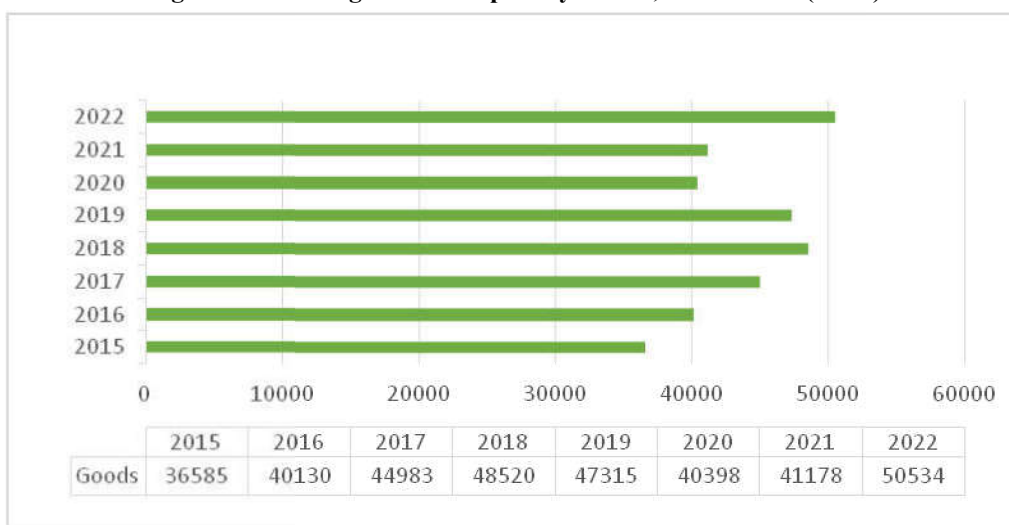
Source: authors' representation based on NIS (2023)

Figure 6: The evolution of aircraft movements, 2015 – 2022

	2015	2016	2017	2018	2019	2020	2021	2022
Aircraft movements	138598	162652	186665	194940	195989	86578	121281	173436
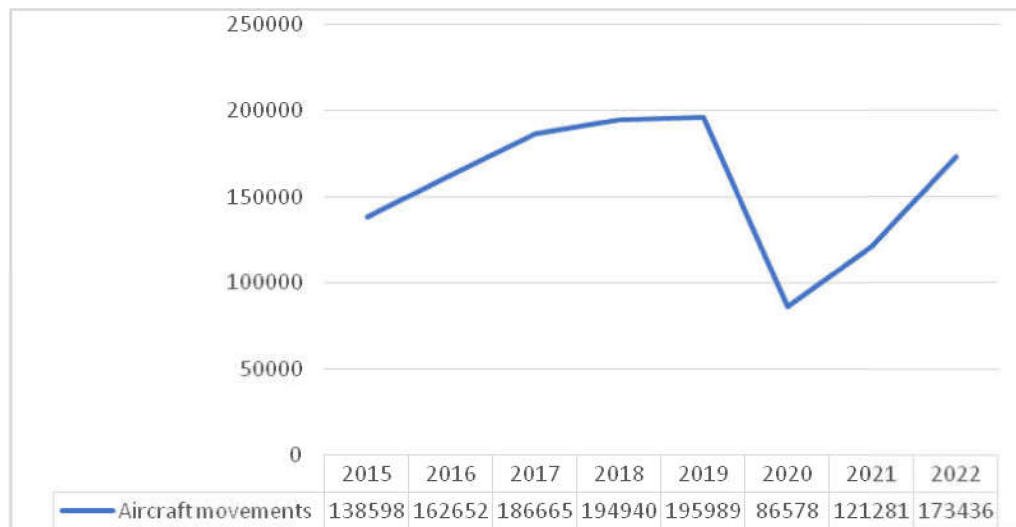
Source: authors' representation based on NIS (2023)

Besides the important dynamism in the 2015-2019 period, the above figures also capture the impact of the COVID-19 pandemic on the air transport industry in Romania, which recorded dramatic decreases in 2020 (69% in passenger number and 14.6% in freight volume, compared to the 2019 level). Then, the growth resumed, favourable conditions being ensured in order to reach and even exceed the pre-pandemic levels in 2023. The important increase in 2022 can be mainly explained by the economic recovery and related economic policy support measures; at the same time, the Ukrainian refugee flows that transited Romania after the beginning of the war also played its role, with the airports of Bucharest-Otopeni, Iasi, Suceava and Cluj as the main gates for the flights to Western Europe.

At regional level the most important indicator – number of passengers – also reflects the recovery trend (Figure 7).

Figure 7: International and domestic passenger transport of airports by development region
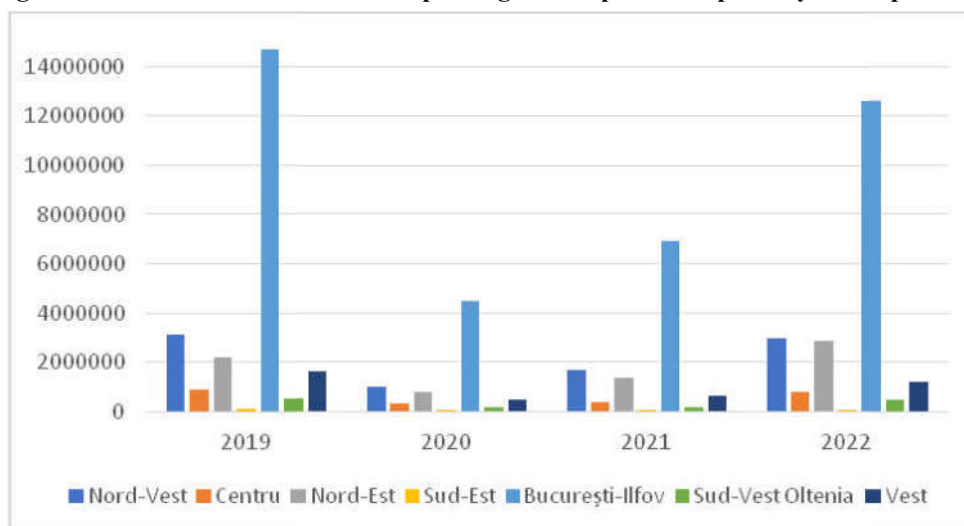
Source: authors' representation based on NIS (2023)

The above trends can be associated with the regions' vulnerability/resilience to the COVID-19 induced economic crisis, clearly reflected by the air transport dynamics.

In terms of the overall economic activity, as demonstrated by empirical studies with regard to the 2007-2008 global economic crisis (Goschin and Constantin, 2010), the underdeveloped areas are better protected from the effects of severe shocks compared to the developed ones, given the fact that the latter are much more connected to the evolution of the world economy and, as a consequence, much exposed to the crises shocks. The research undertaken by Goschin and Constantin (2021) in respect to the COVID-19 crisis, which provided vulnerability indexes by NUTS2 and NUTS3 territorial units, confirmed these findings,

revealing that Bucharest-Ilfov region displayed the highest vulnerability index, followed by Centre region, a well-developed region as well, while the lowest vulnerable was the North-East region - the least developed region in Romania, closely followed by South-West Oltenia and South Muntenia regions, also included in the lagging behind regions category. However, given their high economic potential, the most developed regions proved to be capable to absorb the shocks and to come closer to the pre-pandemic levels – in other words, a high resilience capacity.

From a broader view, the EU perspective confirms the capacity of Romanian regions to recover their air passenger services, all of them showing important positive changes in the number of air carried passengers compared to 2020 (Figure 8). Excepting the North-East region, all other regions recorded increases between 40% and 60%. In the case of the North-East region the increase is in the 60%-100% interval. This is in line with the general Eurostat's conclusion that "some of the fastest increases in passenger number were reported for several regions characterised by relatively small regional airports" (Eurostat, 2023a, p.1). At the same time, for the North-East region – still lagging behind –this statistics confirms the potential of air transport to give a boost to its future development. Especially considering its peripheral location, the improvements in transport infrastructure – here in particular in air transport infrastructure – can determine the reduction of travel time, the improvement of accessibility and thus local advantages are created for attracting new firms, new investments in this region (Vickerman et al., 1999).

Figure 8: Air passengers carried in 2021 in EU by NUTS2 region
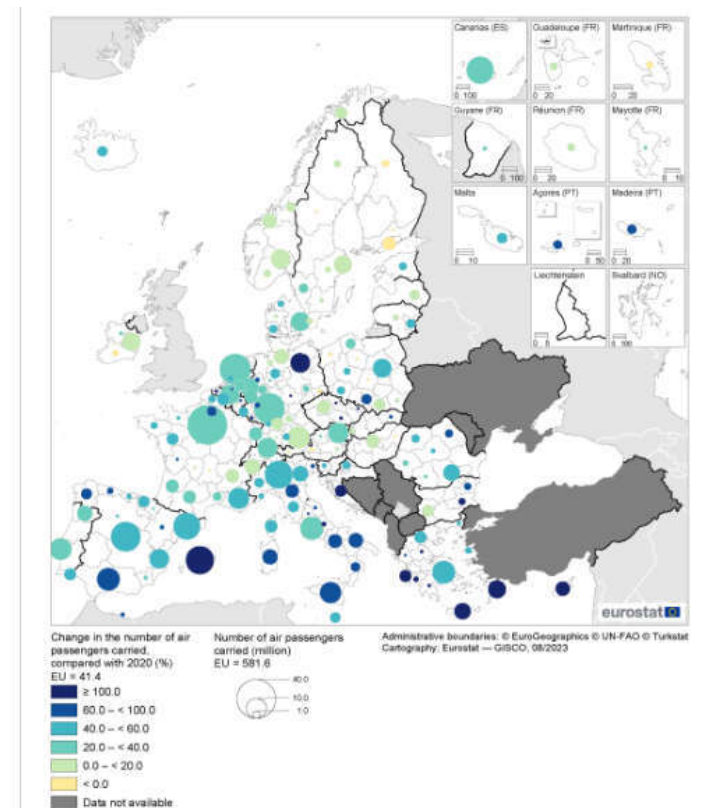
Source: Eurostat (2023a)

Further on, Table 2, which presents the development level in terms of GDP per capita (PPS) indicates that Bucharest-Ilfov region has succeeded to preserve its winner position not only in Romania, but also at EU level, while important regional disparities continue to exist (the relative amplitude being 3.4 : 1).

Table 2. Regional disparities in Romania by NUTS region, 2021

Development Region	GDP per capita PPS - euros	Realative inequalities (EU-27 = 100)
North-East	15800	48.7
South-East	19000	58.5
South-Muntenia	18400	56.7
South-West Oltenia	18700	57.6
West	24300	74.8
North-West	22600	69.6
Centre	22900	70.5
Bucharest-Ilfov	53900	166.0
EU-27	32470	100.0

Source: authors' processing based on Eurostat

The higher resilience capacity of the most developed regions is confirmed by Eurostat (2023b) as well: Figure 9 highlights that these regions recorded higher overall changes in real terms compared with 2019, Bucharest-Ilfov being in top position, followed by North-West, Centre and West regions. At the same time (again!), the North-East region is no longer included in the lowest change class among the Romanian regions.

Figure 9: Change in GDP in EU, 2021 by NUTS2 regions (2019 = 100)
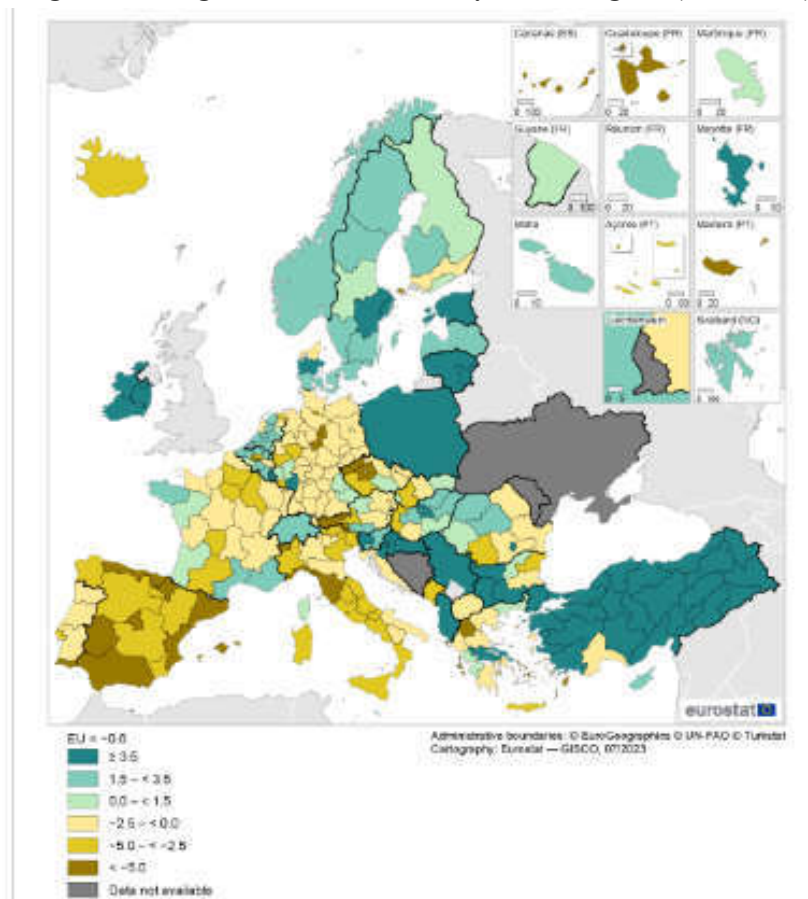
Source: Eurostat (2023b)

The most optimistic perspective is explicitly offered, however, by the Eurostat statistics regarding the changes in the regional disparities in GDP per capita in 2021 compared with 2019 (Figure 10), which points to the fact that "in Romania (…) regional differences narrowed due to the faster than average growth in a number of relatively 'poor' regions that were 'catching-up'" (Eurostat, 2023b, p.1).

Figure 10: Regional disparities in GDP per capita, EU, NUTS2 level, 2021 compared with 2019

Regional disparities in GDP per inhabitant, 2019 and 2021
(coefficient of variation in %, by NUTS 2 regions)

Note: as measured by the coefficient of variation for EU Member States with more than four NUTS 2 regions (Estonia, Ireland, Croatia, Cyprus, Latvia, Lithuania, Luxembourg, Malta, Slovenia and Slovakia: not available).
(¹) 2021: not available.
(²) 2018 instead of 2019.
Source: Eurostat (online data code: nama_10r_2gdp)

eurostat ▪

Source: Eurostat (2023b)

Finally, if the findings on air transport regional dynamics are connected with those regarding the economic development level and the evolution of regional inequalities, one can notice that in the former case the North-East region has a much better situation, indicating that the air transport has the potential to contribute to speeding up the development process in this lagging behind region while, the other way round, the high development level in Bucharest-Ilfov region (166% above the EU average) creates the need of further investments in the air transport sector so as to keep the pace with its economic dynamism, the same indication applying for the other well-developed regions, such as West or North-West.

3.2. Findings from semi-structured interviews

In addition to the previous analysis, significant information about the relationship between air transport infrastructure and regional development can be drawn from the semi-structured interviews. Interviewees were selected starting from the fact that in Romania there is a diversity of airports in terms of category to which they belong, located in regions with very different development levels, and considering the relevance of the institutions represented. Also, the leadership position and professional expertise mattered for selection, so as to get proper data and information as well pertinent opinions about the main theme discussed.   As a result, the Director-General of the Bucharest Airports National Company (BANC), the Director of the Civil Aviation School and the Past President of the Suceava County Council were approached and accepted to be interviewed.

The Director-General of the BANC is in charge with the largest and most frequented airport of Romania – Bucharest-Otopeni, so he could provide statistical and technical information, such as necessary improvements in terms of activity or transport infrastructure so as to generate positive effects on the regional economy, while the Director of the Civil Aviation School drew attention to the importance of promoting professional training programmes for flight personnel, technicians or traffic controllers, but also to the strategic planning and the correlation of the interests and activities of all stakeholders in the aviation field, which are aspects that can contribute to an upward path in the evolution of the Romanian aviation industry and to the propagation of positive effects in related sectors.

With regard to the latter, it is worth adding that Suceava county (NUTS3) is included in the North-East region (NUTS2), the least developed region of Romania. In this region, Suceava county has a special development mission, based, inter alia, on a sector with a huge

potential – tourism (in Bucovina area), which, considering the peripheral position of this county (in the North, at the border with Ukraine) has a lot to benefit from a well-developed air transport sector, in terms of accessibility. The interview with the Past President of the Suceava County Council also took into account his expertise from the perspective of carrying out, during his mandate, the modernization works of the airport located in that area, namely "Ştefan cel Mare" International Airport of Suceava. He discussed the effects generated by the modernization process carried out on the airport from the angle of the administrative position he held, correlated with the perspective on the regional development strategy and policy which he coordinated as well. He also addressed the effects of the military crisis in Ukraine, the Suceava airport being the closest to Romania's border with this neighbouring state.

For the sake of ensuring a reasonable length of the article, only two interviews are to be extensively discussed in this paper, namely the interview with the Director-General of BANC - relevant for the international hub class - located in a developed region, and with the Past President of Suceava County Council – relevant for secondary international (regional) airports and lagging behind regions.

The interviews were conducted in March – May interval of 2022. In order to ensure the comparability of the information obtained similar questions were asked to the interviewees, so as to get a complex image of the studied phenomenon, but also of the collaborative relationships between the different stakeholders in the civil aviation field in Romania. Depending on the answers they offered, certain questions were accompanied by additional, complementary ones, aiming to deepen the understanding of the key issues addressed.

The results are organised and presented in Table 3 and Table 4.

Table 3. Findings from the interview with the General Director of the Bucharest Airports National Company (BANC)

Debated aspects	Results/ Interpretation	Quotes
The contribution of air transport infrastructure to the economic development of the region	The positive effect of air transport on the economy of the region is clearly highlighted, from the perspective of cargo transport, but the analogy can also be extended to the transport of passengers, who can cover longer distances much faster, traveling by the safest mode of transport used so far. As Henri Coanda International Airport of Bucharest-Otopeni is located in the capital region of Romania, it has an important contribution to its integration in international networks, with visible impact on region's economy.	"An airport is a very important driver for the region, with important influence on transport costs." "Although, at first glance, it seems more expensive, air transport of perishable products is more efficient in terms of transport time."
The direction of causality between (air) transport infrastructure and development	A well-developed infrastructure supports regional economic development.	"Although they influence each other a lot, personally, I believe that infrastructure development determines economic growth. "
The degree of development/preparedness of Romania's airport infrastructure at the present time	The Director-General's statements reiterate the need to expand the capacity to manage transport demand, by developing the infrastructure for both passengers and cargo, especially in the recent period, characterized by a post-COVID economic recovery.	"BANC's infrastructure is designed to handle 8-9 million passengers, but the level reached in 2019 was 14.5 million."
Impact on employment/tourism	Tourism may be one of the economic sectors impacted by airport development, but not necessarily directly. At the same time, for a sustainable development of tourism, the need to promote the region, to invest in types of services specific to tourism activities, to design and operationalize tourist circuits, etc.	"Indeed, the location of an airport in a region helps to develop tourism, but it is debatable. Airports are usually not 100% dedicated to tourist flights. Bucharest is an eloquent example from this point of view. It does not mean that if I have air access to that region, tourism will necessarily develop. Other efforts are also

Debated aspects	Results/ Interpretation	Quotes
	must be taken into account. Business purposes-related travel must be also considered. Regarding the degree of employment, it indicates low values, at the moment, at the air transport level, mainly caused by layoffs during the pandemic. But usually, the air transport infrastructure generates a positive effect on the labour market, by creating many jobs both in the administrative sector, staff who carry out activities on the platform, in passenger information services, the outsourced, subcontracted by the aviation companies, but also the related ones, of transport, commercial or accommodation services that develop around the airport.	needed. I wouldn't say it's a direct proportional relationship, but rather an indirect effect." "From the point of view of the employed staff, the restructuring during the pandemic generated shortages in the context of the increase in activity of the last 2 months, but normally, an airport generates many jobs, through the actual transport activity, as well as in related activities. "
Passenger flow management capacity	Investments are clearly needed in the development and expansion of the Henri Coanda International Airport of Bucharest-Otopeni infrastructure, in order to increase the attractiveness of air transport for goods/cargo, but also for passengers. But this cannot be possible without investment in the road sector, which will facilitate the access of cargo carriers to and from the airport.	"The infrastructure is not ready at the moment to accommodate such a large number of passengers. This is also the reason why we have congestion, we wait too long for the luggage, etc." "We are also undersized in the area of processing the cargo component, although it has grown exponentially compared to the flow of passengers. Although we would have a 3-4 times greater potential, comparing ourselves with other European capitals, we only process 56,000t/year, while Budapest processes 185,000t/year, and Belgrade 350,000t/year. "
Funding sources	The main source of financing that can be used to start airport infrastructure development projects remains the own source. Since the aviation field is, by its nature, a field that generates massive pollution, and with a significant carbon footprint, in the absence of significant green or sustainable elements it is problematic to access non-refundable EU funds. However, such funding will be accessed for safeness, security and climate neutrality-related projects.	"The main sources of income are airport taxes paid by passengers, company fees for landing/parking and those obtained from auxiliary activities (parking lots, advertisements, cafes). " "Through the monopolistic structure of an airport, it can generate a lot of cash. In 2019, we had a turnover of 1.6 billion lei, of which we made a profit of 800 million lei." "The main sources of financing are our own sources, bank loans, loans offered by international financial institutions, such as the World Bank, public private partnership or the Build - operate - and transfer system. "
Security level	The Henri Coanda International Airport of Bucharest-Otopeni is the main air gate to Europe and not only, a fact that requires compliance and the implementation of all European norms and standards in transport, starting from take-off/landing procedures, cargo handling, up to passenger checks, their luggage and documents. From the safeness point of view, illegal acts are present, but not to the	"There are no security breaches at the European level that we cannot cover. Everything is done according to European standards, starting from the passenger check to the take-off, landing, storage, loading, handling procedures. In India they still fly the Boeing 737 – 300. In the EU, it is only allowed in the cargo area." "The security structure consists of: the transport police, the Anti-

Debated aspects	Results/ Interpretation	Quotes
	extent and severity of those manifested in larger airports in the world, known for violent crimes, such as the transport of drugs or armed attacks.	Terrorism Brigade, which ensures security at the baggage lanes, performs anti-drug and pyrotechnic checks, the Border Police (checks passports) and customs officers who register goods to be declared by passengers upon entry or exit from the country."
Deficiencies of the Romanian air transport system/ necessary future investments	The airport's shortcomings are numerous, attracting necessary investments in the order of millions of euros. These mainly aim at the expansion of Terminal 2, the increase in the number of parking spaces, the renewal of the interior infrastructure, the reorganization of the premises, the development of a business center, the purchase of scanners, vital tools for airport security, but also the development of cargo facilities, on a considerable area of 90 hectares. All these should be matched by public investment in the associated transport infrastructure to facilitate access for passengers and freight carriers. At the international industry level, a major change would be the time slot coordination between airports.	"The extension of Terminal 2 will facilitate the access of another 15 million passengers, thus doubling the current capacity." "Along with this terminal, it will also be necessary to develop the other transport branches in the area, both the railway that connects with the North Station and the highway junction, which will facilitate both passenger access and freight transport." "We do not have an intermodal node, which should include a train station, a bus station and a metro station." "Coordinating the time slots between the source and destination airports could lead to avoiding congestion and streamlining traffic." "Increasing the number of airplane parking spaces from 40 we currently have to at least 60 to be able to handle aircraft movements." "Interior infrastructure: elevators, escalators (unchanged since 1992), baggage lanes at both terminals, both arrivals and departures (unchanged since 1998). Reorganizing the layout of passenger aisles, using spaces efficiently, creating more security filters." "We do not have a business centre where passenger meetings can be organized to avoid trips to the city centre." "We do not have enough body scanners, shoe scanners." "Regarding the value of future investments, 800 million lei are allocated for strategic objectives, excluding the expansion of Terminal 2." "90 hectares are intended for the development of cargo facilities in a build-operate and transfer regime."
The impact of COVID-19	The industry is gradually recovering, passengers are resorting more and more often to traveling by plane, which may soon lead to reaching the passenger threshold recorded in the pre-pandemic period.	"In 2020 the passenger flow decreased by 50%, and in 2021 we recorded 65% of the pre-pandemic flow. In April 2022 we reached 85%, which leads us to think that this year we will be able to exceed the forecast of 10.5 million passengers, maybe a little more, but with a larger distribution during the summer months, as a result of the holiday period. "
Postponed/suspended works	The lack of necessary funds during	"Projects were underway at the

Debated aspects	Results/ Interpretation	Quotes
	the pandemic did not allow the company to take advantage of the suspension of flights, so the projects that were being implemented at that time were suspended.	time of the outbreak of the pandemic, but they were suspended due to lack of funds. The state redistributed the profit in the form of dividends to shareholders."
The relationship with the coordinating ministry	It can be noted an impartial nature of the relationship between the Henri Coanda International Airport of Bucharest-Otopeni and the coordinating ministry, which only consists in legislative support procedures in order to operationalize the projects started at the level of the subordinate company.	"The ministry that coordinates us has in its structure an air transport department, with attributions, of a rather regulatory nature, not of an operational nature. "

Table 4. Findings from the interview with the Past President of the Suceava County Council

Debated aspects	Results/ Interpretation	Quotes
The contribution of air transport infrastructure to the economic development of the region	Fundamental contribution to a sustainable development, which can compensate for the shortcomings of the road network (the highway project in the North-East region is just in the incipient implementation stage)	"The airport, aviation means development, access to new markets (revenues), it means tourism, exchanges."
The direction of causality between (air) transport infrastructure and development	The relationship can go in both directions, depending on the region's features and its current development level	"For Romania, in particular, infrastructure leads to development. However, there are also examples, at European level, where the development has attracted a need to expand the airport network, such as the tourist areas on the territory of Spain, Italy, Turkey."
The degree of development/preparedness of Romania's airport infrastructure at the present time	Sufficiently well prepared, without, however, reaching international intensity/ frequency (flights can be seen in real time via the Flyradar application). The current ratio between supply and demand can be satisfied and international openness is an opportunity for both airlines and travellers	"Prepared well enough" "We have a sufficiently well-developed air transport development, well distributed by region, so as to ensure accessibility to all areas of the country." "Even smaller, regional airports have international openness, with regular flights to various areas of Europe."
The impact on employment	The impact can be both direct, at the level of the actual activities in the aviation field, and indirectly, propagated in the related economic sectors (e.g. tourism).	"I could not say that it is an important direct impact. An airport the size of the one in Suceava has approximately 50 employees, but it leads to significant indirect creation of jobs: in transport, in the hotel industry, in restaurants or cafes, in commercial spaces inside the airport, in rental services, but also at the level of local businesses, by linking tourist circuits, connecting economic zones, human resource inputs, the future hope consisting in the development of the transport of goods intended for export. "
Passenger flow management capacity	Currently, the Romanian market still allows development, but this must be done in accordance with the level of demand. However, it does not exclude the need for modernization works for airports that have not yet benefited from	"The development of low-cost companies and, implicitly, the price accessibility for increasingly numerous categories of passengers has led to an important development. In the case of the airport in Suceava, at the time of

Debated aspects	Results/ Interpretation	Quotes
	such projects (e.g. Tulcea, Caransebeş), which would further determine a significant economic development of these areas.	signing the contract for the modernization works financing, it was estimated to have a processing capacity of 100,000 passengers annually, the number having been exceeded since the first year by 300%. A ranking made at the level of the Ministry of Transport indicates that Bucharest-Otopeni, Cluj airports (13 million passengers) were ranked first, while Iaşi or Suceava (both in NE region) are in the middle of the ranking with 2 million passengers in 5 years."
Funding sources	They can be external (mainly European) or national (local or governmental)	"In most cases, the works were financed from the budgets of the county councils (Bacău, Oradea, Iaşi), external sources being more rigid and more difficult to access."
Security level	At the time of the interview, no risks were mentioned, as Romania is not a significant transit zone for the illegal transport of narcotic substances, human trafficking or affected by immigration, but there is a possibility that the levels may have increased with the outbreak of the conflict in Ukraine.	"The geo-political situation of Ukraine generated a mobilization of NATO forces on the eastern flank, with daily patrol missions." "The crash of 2 aircrafts, the non-compliant landing of a Ukrainian air convoy in Bacău are also events that generate some panic at the level of the population. " "Many airlines have supplemented flights to foreign destinations, with a load ratio of 5 to 1 on departure to return, but it does not raise important security issues. " "We are, however, affected by the closure of the flight lanes over Ukraine."
Deficiencies of the Romanian air transport system	A vision on the future in the sustainable transport development field would be the design of strong regional airports, concentrically positioned, which can take over the transport demand from the whole region.	"An integrated vision!" "The best opportunity to develop the infrastructure is lost! What we could have done in the past with 10 million euros, we do now with 30! "
The effects of the modernization works of the Suceava airport	The modernization of the airport was a starting point for capitalising on the tourist potential of Bucovina, and not only that.	"It it the only airport that benefited from complete reconstruction works in the last 32 years: new runways, modern beaconing, grounding systems, platforms, access roads."
Good practices that can be transferred to other projects	Suitability Teamwork Development of marketing activity	"Given the long duration of implementation and execution of the works, legislative changes occurred to which we had to adapt. " "In the past it handled an insignificant flow of passengers for any airline - 20,000 annually." "The results obtained following the implementation of the project were 3 times higher than those initially projected!"
The impact of COVID-19	The state aid offered to the autonomous authorities constituted the only opportunity for these entities to be able to continue their activity, the financial year ending well for all 12 airports in the	"Flights were cancelled, the flight schedule was restricted, and the lack of demand also led to a resizing of the offer. The government intervened with a state aid procedure in order to

Debated aspects	Results/ Interpretation	Quotes
	country.	compensate for the financial losses." "It can be said that we are close to reaching the pre-pandemic level."

4.   A look ahead

The coordination of air transport infrastructure development at national scale is ensured by the Ministry of Transport and Infrastructure, which is expected to integrate it in a comprehensive approach of all modes of transportation following a EU-based perspective, on the one hand, and to offer place-based policy responses to the specific needs of each territory, on the other hand, in the latter case a close cooperation with the institutions in charge with regional development being required as well.

In strategy and planning-related terms the main instruments are Romania's General Transport Master Plan (GTMP) and the Investment Programme for Transport Infrastructure Development (IPTID) – 2021-2030 period.

The GTMP (MTI, 2016) is seeking to increase the national and trans-national connectivity for business environment and people as well, being driven by the efficiency, durability, flexibility and safety objectives. In terms of the associated implementation strategy, the identification of the needs reflected by transport infrastructure projects has been followed by their prioritisation, the examination of project costs in connection with the available financial resources and, last but not the least, the establishment of mechanisms for the projects' sustainable implementation. As regards the air transport infrastructure, the main objective envisages its development at the same time with the creation of new national and international linkages so as to ensure the increase of freight volume and the number of passengers transported.

The GTMP has been updated by the IPTID (MTI, 2021), as an expression of the milestones assumed by Romania within the National Recovery and Resilience Plan, in connection with the multi-annual financial framework 2021-2027 as well. Moreover, it covers the whole 2021-2030 decade, so that, building on the experience already gained by the MTI since 2016, to give an efficient course of the projects and to recover a large development gap compared to the other Member States, thus contributing to the modernization of the European connectivity and the implementation of new, sustainable technologies. It serves as a reference framework document for the most important public policies and for the institutions in charge with the accomplishment of the national transport infrastructure development objectives. The investment programme aims at a paradigm shift in the sense of "focusing Romania's political, institutional and financial efforts on a clear set of priorities, in line with national and European interests, leading at the end of the 2021-2030 decade to the creation of a national transport network that to represent the backbone of the development of the national economy" (MTI, 2021, p.1).

When it comes to the air transport the IPTID's strategic vision, which is correlated with that of the GTMP, has several pillars, as follows:

1.The structuring of airports and aerodromes overall network in Romania into a primary, secondary and tertiary network, in order to serve cargo and passenger transport performed by commercial air transport operators, general aviation air transport, as well as school flights and leisure (Figure 11).

Figure 11: The proposed structuring of the airport network in Romania according to IPTID
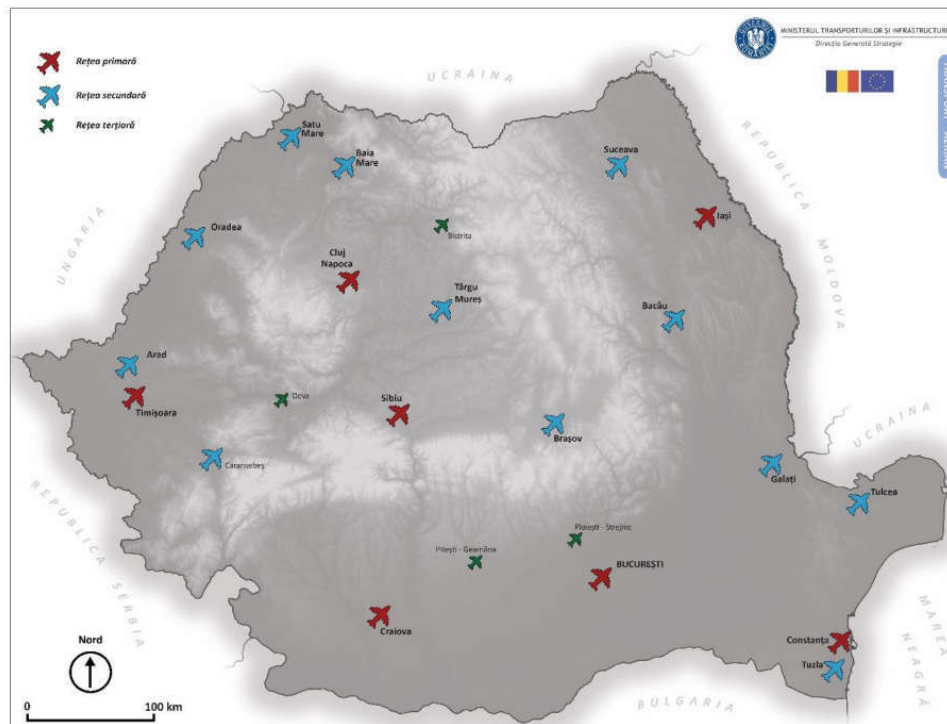
Source: MTI (2021, p. 216)

The primary network consists of international hub airports, principal international airports and strategic international (red colored symbol). These airports are meant to develop cargo and passenger terminals for national and international traffic and will need intermodal linkages with railway and road infrastructure.

The secondary network consists of secondary international (regional) and small regional airports (blue colored symbol). They have to develop passenger terminals for national and international traffic and may develop cargo terminals if the socio-economic analyses demonstrate their economic viability. Secondary network airports must have intermodal connections.

The tertiary network (green colored symbol) consists of aerodromes for national traffic, in particular for general aviation, school, sports and recreational activities which are not located in localities served by an operational airport.

The geographical distribution of the airports included in the above three networks lays a good foundation for the correlating with the other development objectives of the corresponding regions. At the same time, this structuring will respond to the differentiated needs identified for the bigger airports and the smaller ones depending on the area they are located in: wealthy, well-developed regions or lagging behind ones.

2.Investing in the increase of capacity to offer airport services, with emphasis on projects aiming at the infrastructure development as well as safety, security and climate neutrality.

3.Elaboration of state aid schemes for the development of passenger transport performed by Romanian air operators, as well as for the recovery of the air transport sector after the COVID-19 pandemic crisis.

4.Continuation of the EU funding-based support for the modernization of the air traffic management system by implementing the European policy built around the "Single European Sky" concept.

5. Deploying measures to underpin the climate neutrality of Romanian airports by "greening" the equipment, vehicles and airport infrastructure. In this context, the users of the aircrafts that operate on the basis of alternative fuels must easily find their place on the EU territory, including Romania, the airfields in this country being required to provide facilities for alternative fuels that are interoperable and easy to use, in accordance with the European Ecological Pact.

6. Strengthening the Henry Coanda International Airport of Bucharest-Otopeni status of international hub by creating the favourable conditions for long-haul flights to the central and western areas of North America, to Central America, Africa and Asia (including the Far East). This implies the increasing of the capacity of national operator (Tarom) to operate these destinations and the substantial improvement of the airline governance, so as to become more competitive in the international environment. For this goal to be achieved, most important investments will be oriented to this airport. The other Bucharest airport – Baneasa Airport will serve as a so-called 'city airport' in order to alleviate the pressure of the capital city's numerous population, complementary to Henri Coanda airport.

In order to substantiate the successful implementation of this vision, a major concern/requirement is the integration and coordination of the air transport infrastructure development objectives with the overall provisions of the Partnership Agreement between Romania and EU and those of the Recovery and Resilience Facility, reflected in the National Recovery and Resilience Plan. A special emphasis should be placed on the correlation between the resulted Transport Operational Programme 2021-2027 and the eight Regional (Operational) Programmes, the Just Transition Operational Programme, etc., with a clear coordination of the actions supported by specific funds. For example, while the Cohesion Fund is aimed at contributing to the increase of the freight volume and number of passengers transported via substantial infrastructure projects, the European Regional Development Fund is expected to contribute to increasing the accessibility of business and local communities to air transport (i.e. good connections of the city and surrounding areas with the airport). In this way the expected synergies between air transport development and local and regional development can be ensured.

5. __Concluding remarks__

As revealed by our inquiry, there is a sustained interest in the literature devoted to the air transport infrastructure for the exploration of its relationship with regional development from various perspectives, such as: intensity and causality direction, direct and indirect effects generated, implications for regional disparities, required policy measures, etc.

The resulted findings suggest that air transport can have an important contribution to regional development provided it is integrated in a comprehensive strategy which combines the EU and national vision with the place-based approaches so as to create synergetic relationships between this sector and the related ones, driven by a rational combination between short, mid a long term sustainability goals and resilience-based policy measures and actions.

Depending on regions' development level and differentiated needs, tailored responses in terms of air transport infrastructure should be provided. Thus, for the less developed regions, ensuring a proper infrastructure is a pre-requisite for attracting investments in sectors that can support the diminishing of development gaps, while in the developed regions additional investments in air transport infrastructure are required to keep the pace with the intense economic and social development. As such, the development perspective in the former category of regions has to be based on the messages conveyed by the supply-driven growth models, whereas the latter have to be guided by the perspective outlined by the demand-driven models. In the case of Romania, the North-East and Bucharest-Ilfov regions are relevant examples for the two cases. In a broader view, the quite balanced geographical distribution of the airport network, with a good representation of this mode of transportation even in the less developed regions, contributes to creating favourable conditions for a proper support of air transport to regional development.

6. **References**

Aguirre, J., Mateu, P. and Pantoja, C. 2019. "Granting airport concessions for regional development: Evidence from Peru". Transport Policy, 74, 138 – 152. https://doi.org/10.1016/j.tranpol.2018.12.003

ATAG. 2005.The Economic and Social Benefits of Air Transport. Geneva: The Air Transport Action Group. https://www.icao.int/meetings/wrdss2011/documents/jointworkshop2005 /atag_socialbenefitsairtransport.pdf

Baltaci, N., Sekmen, O. and Akbulut, G. 2015. "The Relationship between Air Transport and Economic Growth in Turkey: Cross-Regional Panel Data Analysis Approach". Journal of Economics and Behavioral Studies, 7(1), 89 – 100. https://core.ac.uk/download/pdf/288022838.pdf

Bekisz, A. and Kruszynski, M. 2021. "Analysis of the Diversity of Regional Development of Road Transport Infrastructure in Poland". European Research Studies Journal, 24(2B), 712 – 723. https://www.proquest.com/docview/2578204106

Brueckner, J.K. 2003. "Airline Traffic and Urban Economic Development". Urban Studies, 4(8), 1455-1469. https://doi.org/10.1080/0042098032000094388

Cascetta, E., Carteni, A., Henke, I. And Pagliara, F. 2020. "Economic growth, transport accessibility and regional equity impacts of high-speed railways in Italy: ten years ex post evaluation and future perspectives". Transportation Research Part A: Policy and Practice, 139, 412 – 428. https://doi.org/10.1016/j.tra.2020.07.008

Champman, A. 2023. Losing Altitude. The Economics of the Air Transport in Great Britain. New Economics Foundation. https://neweconomics.org/2023/07/losing-altitude

Elburz, Z., Pels, E. and Nijkamp, P. 2020. "Spatial Effects of Air Transport on Regional Development: Evidence from Turkey". International Journal of Transport Economics, 47(2), 127-143. https://doi.org/10.19272/202006702002

Eurocontrol. 2022. Aviation Outlook 2050. Main Report. https://www.eurocontrol.int/sites/default/files/2022-04/eurocontrol-aviation-outlook-2050-report.pdf

Eurostat. 2023a. Transport statistics at regional level. Eurostat Statistics Explained – Air Traffic. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Transport_statistics_at_regional_level&oldid=574131#Air_traffic

Eurostat. 2023b. Transport statistics at regional level. Eurostat Statistics Explained – GDP at regional level. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=GDP_at_regional_level

Gherghina, S., Volintiru, C. and Sigurjonsson, T.O. 2023. Making a difference: the effects of institutional resilience in society during COVID-19. European Political Science, 22, 426–435. https://doi.org/10.1057/s41304-022-00380-y

Goschin, Z. and Constantin, D.L. 2010. "The geography of the financial crisis and policy response in Romania". In: G. Gorzelak and Ch. Goh (Eds), Financial Crisis in Central and Eastern Europe – from Similarity to Diversity, 161-191. Warsaw: Wydawnictwo Naukowe Scholar Publishing House.

Goschin, Z. and Constantin, D.L. 2021. "Estimating the short-term economic impact of COVID-19 pandemic: A regional perspective". Geographia Polonica, 94(3), 441-457. https://doi.org/10.7163/GPol.0214

Grosu, R., Constantin, D.L., Goschin, Z., Ailenei, D., Alpopi, C. 2014. "Bucharest Metropolitan Area and its external hinterland: spread or backwash effects?". Sankt Petersburg: The 54th Congress of European Regional Science Association (ERSA). https://www.econstor.eu/bitstream/10419/124297/1/ERSA2014_00382.pdf

Hong, J., Chu, Z., and Wang, Q. 2011. "Transport infrastructure and regional economic growth: evidence from China". Transportation, 38(5), 737-752. https://doi.org/10.1007/s11116-011-9349-6

Hu, Y., Xiao, J., Deng, Y. and Shouyang, W. 2015. "Domestic air passenger traffic and economic growth in China: Evidence from heterogeneous panel models". Journal of Air Transport Management. 42, 95 – 100. https://doi.org/10.1016/j.jairtraman.2014.09.003

Kucukonal, H. and Gulşah. S. 2017. "The Causality Analysis of Air Transport and Socio-economics Factors: The Case of OECD Countries". Transportation Research Procedia. 28, 16 – 26. https://doi.org/10.1016/j.trpro.2017.12.164

Morphet, H. and Bottini, C. 2013. "Air connectivity: Why it matters and and how to support growth". Worldwide Air Transport Conference - ICAO 2013. https://www.pwc.com/gx/en/capital-projects-infrastructure/pdf/pwc-air-connectivity.pdf

MTI. 2016. General Transport Master Plan of Romania. (In Romanian). Bucharest: Ministry of Transport and Infrastructure. https://support-mpgt.ro/master-planul-general-de-transport/

MTI. 2021. The Investment Programme for Transport Infrastructure Development in Romania. (In Romanian). Bucharest: Ministry of Transport and Infrastructure..https://support-mpgt.ro/programul-investitional-2021-2030/

NIS. 2023. Passenger and freight air transport in Romania, 2022. (In Romanian). Bucharest: National Institute of Statistics. https://insse.ro/cms/sites/default/files/field/publicatii /transportul_aeroportuar_de_pasageri_si_marfuri_in_anul_2022.pdf

Stilianos, Alexiadis, and Ladias Christos 2011. Optimal Allocation of Investment and Regional Disparities. Regional Science Inquiry, 3(2), 45 - 60. https://www.rsijournal.eu/ARTICLES/December_2011/RSI_J_Dec_2011.pdf

Tisdall, L., Zhang, Y. and Zhang, A. 2021. "COVID-19 impacts on general aviation – Comparative experiences, governmental responses and policy imperatives". Transport Policy, 110, 273 – 280. https://doi.org/10.1016/j.tranpol.2021.06.009

Tsiotas, Dimitris 2022. "A Network-Based Algorithm for Computing Keynesian Income Multipliers in Multiregional Systems". Regional Science Inquiry, 14(2), 25-46. https://www.rsijournal.eu/ARTICLES/December_2022/2.pdf

Tu, A.T., Ducksu, S., Unchong, K., Thi, N.Q.P. and Thi, H.H.N. 2022. "Air Transport Centrality as a Driver of Sustainable Regional Growth: A Case of Vietnam". Sustainability, 14(15), 9746-9760. https://doi.org/10.3390/su14159746

Van de Vijver, E., Derudder, B. and Witlox, F. 2016." Air passenger transport and regional development: cause and effect in Europe". Promet – Traffic&Transportation, 28(2), 143 – 154. https://doi.org/10.7307/ptt.v28i2.1756

Vickerman, R., Spiekermann, K., and Wegener, M. 1999. "Accessibility and economic development in Europe". Regional Studies, 33(1), 1-15. https://doi.org/10.1080/00343409950118878

AN EMPIRICAL STUDY ON FAMILY BUSINESS FINANCING

Brikena LEKA
Associate Professor, University of Tirana
brikenaleka@feut.edu.al

Etleva BAJRAMI
Associate Professor, University of Tirana
etlevabajrami@feut.edu.al

Gentiana SHARKU
Professor, University of Tirana
gentianasharku@feut.edu.al

Abstract

Family business in Albania, as well as in the other countries, is the oldest dominant form of business. Usually for the small businesses which are part of this study these businesses are managed by family members, and some of family members are engaged in this business. These businesses started to recover in Albania, after the 1990 with the overthrow of communism regime. Although during this system the word "private property" almost completely disappeared from the vocabulary, again its traces remained in the focus of the family business (FB). This study is based on primary data, collected through questionnaires for family businesses. A total of 327 questionnaires are considered, covering micro and small family businesses. The questionnaires are completed by directly interviewing the individual who runs their business. The data are elaborated in SPSS, since the data were mainly of a qualitative nature. The study consists of two statistical analyses. First, Chi- square tests are performed to analyze the significance of the relationship and Second, a regression equation was performed to analyze the main factors that determine the way these businesses are financed. This study finds that the owners with high level of education are more prone to use external source of financing, the "older" businesses will finance the greater part of their activity by their own funds, and as the turnover of the previous year increases, a major part of the profit will be reinvested in the business for short-term and long-term investment.

Keywords: family business, financing, lifetime, education, turnover

JEL classification: D14, G51, M13

1. Introduction

The family business started to recover in Albania in 1990-s, after the overthrow of communism regime. Although during this system the word "private property" almost completely disappeared from the vocabulary, again its traces remained. This is the reason why we come across with the phrase - this is the business of "Xxxx…the name of the person" because it has been a family tradition for generations. This term "family tradition" in the business language means "family business".

Family business in Albania, as well as in the other countries, is the oldest dominant form of business (IFC 2007). The term "family" is what distinguishes this kind of business from all other businesses. It means that the business is owned by the family, where employees are mainly family members, especially in the initial stages. Usually, these businesses are managed by family members. The government policies towards SME-s need to have in their focus the family- owned businesses as it is directly connected with the wellbeing of the households, meaning of its citizens. Shimamoto (2020) in a study for 47 prefectures in Japan, found that it may be necessary to review the policies, systems, and management to have the greatest impact in improving subjective well-being in the region.

When it is said "the property of the family", the meaning goes a little wider that the family in the social or financial contest since its members can be: members of nuclear family, of a large family, or even with kinship ties (relatives)- a little more distant than in the first two cases.

Mostly they start as small businesses to grow over the years, as a result of good financial performance. Considering the opportunities offered by the Albanian market, a relatively very small market, they mainly continue to be part of the group of micro or small businesses, and in special cases part of medium enterprises. It is very important to have economic growth in the country, as referring to Batabyal (2016) this economic growth in a region produces a final consumption good with creative and physical capital. The creative capital is a term attributed to people who add their economic value through their creativity. This conclusion is the same with the Deichman at al. (2022) in a study for European countries (considering the enlargement in 2004, 2007, 2013) that emphasizes the importance of the good governance in promoting overall happiness, as governance can also impact other dimensions, which in turn improve the overall satisfaction.

Based on European Union legislation, referring the number of employees, enterprises with less than 250 employees are considered as Small and Medium Enterprises (SME); Micro enterprises: up to 9 employees, Small enterprises: 10-49 employees, Medium enterprises: 50-249 employees.

There is another categorization in Albania, done by the National Institute of Statistics (INSTAT), in four main categories based in the number of employees, as in the table below (with the data for the year 2021).

Table 1. Business Categorization

No of employees	No of enterprises	%
1-4	101,559	85.6%
5-9	8,247	6.9%
10-49	6,862	5.8%
50+	1,959	1.7%
Total	118,627	100%

Source: INSTAT 2022

As is seen in the table above the micro and small businesses take up the large weight of the businesses in our country by reaching 92.5% of the total. Despite the highest weight of the employees with over 50 employees with 51.1%, again the hiring weight in micro and small businesses is considerable, because the micro businesses with 1-4 employees take up 21.7% of the total number of employees. The contribution of the micro businesses to the yearly turnover is moderate, with only 17.8%, if it would be compared with two big businesses which contribute 46.5% of the yearly turnover. At first glance, it seems like the percentage of the yearly turnover fades the importance of micro and small businesses, but if it is considered the weight in the number of employees, so in the impact of the consume of goods and services, it is evident the undiscussable importance of these businesses in the economic development of the country.

Meanwhile, as the SME-s in Albania referring to the law are considered businesses based on the number of employees and annual turnover or total balance sheet assets, which is different by the definition of INSTAT we referred above.

Table 2. Business Categorization referring Albanian Law

Size	Employees	Turnover
Micro	0-9	ALL 10 million
Small	10-49	ALL 50 million
Medium	50-249	ALL 250 million

Source: Law No. 1042 of 22.12.2008

When it is spoken for family businesses in Albania, which usually have 1-9 employees, it means that this is the most representative part of SME-s. Moreover, the findings and conclusions reached regarding family businesses can be applied to the SME-s sector.

The SME-s sector in Albania, and especially the family business is mainly engaged in the trade and service sector. The agricultural sector also has a significant weight, considering that a significant part of the population lives in rural areas (46.5% referring Census 2011) where the main activity is agriculture and livestock.

Individuals that own land are known as self-employed by the employment authorities. This is evident, even referring to the employees according to INSTAT in the table below, where 33.8% of the total employees are employed in the agricultural sector.

Table 3. Employees for Agricultural Sector

Description	2020	2021
Total number of employees	1.243.343	1.248.749
Employed in agriculture private sector	36,1%	33,8%

Source: INSTAT 2022

The focus of this study is the family business of the micro and small categories, meaning businesses with 1-10 employees.

2. Literature review

In Europe the family business sector is dominated particularly by micro enterprises with less than 10 employees and SME-s, meanwhile across Europe around 70-80% of all enterprises are family businesses, providing 40%-50% of employment (Mandl I, 2008).

In our country, as well as in many other ex-communist countries of Southeast Europe, for example Bulgaria (Fletcjer &Helienek &Zafirova, 2009), the start-up of family businesses after the 1990-s was an economic emergency. They also suggested that the family is the key channel for small business creation. If the role of family businesses is not taken into consideration, it means that it is not considered the role that families have in the economic development of the country.

A significant number of individuals who had lost their jobs after the collapse of state-owned enterprises, had no other alternatives than to start a business, meaning the first micro family businesses; or to immigrate abroad: a mostly illegal immigration accompanied by very high risks. Referring to a study by Constantin at al. (2013) for Romania the private sector is much more interested in the profitable services rather than in those requiring a high value of preliminary investments in infrastructure.

However, despite the emergency and importance in country economic development, there are very few studies for the family business in Albania, mainly we believe by the lack of the data for this kind of business.

The risk faced by the Albanian businesses is very high considering the number of businesses that close their activity year by year. Thus, referring to the data for the year 2017-2018, in the trade and service sector, where most of family businesses operate, based on INSTAT data, 15.41% of economic units have closed their activity. The largest number of closed activities is in the service sector. This is expected since the structure of the economy is dominated by the trade, especially for the SME-s sector. Referring to risk factors that businesses face, Shibusawa and Miyata (2011) found that the investment-savings balance should be endogenously determined by both the firm's and consumer's optimizing behaviors. Another risk factor relates to the innovation adaptation for this kind of business. Having financing problems means that they are not properly focused on new technology, as the positive impact it has on the financial performance of the company. Kalaj and Barbullushi (2023) in an analyses for the digitalization of enterprises and its performance impact in Albania, found that manufacturing-sector enterprises are less likely to use digital technology in their business activity if compared to the other sector.

Although the small businesses, including the family-owned businesses, are the ones that face many financing problems in developing countries, there is a lack of data about their financial situation and the financing sources. The initial capital to start a family business mainly consists of family savings, remittances, loans from relatives and friends and bank loans. They tend to reinvest a major part of the turnover in the business. Rob and Farlie (2009) found that Asian owners are much more likely to rely on family sources for borrowed start-up capital for their businesses. The same situation is for some European countries as well, for example for Bulgaria, the main financial source for start-ups is family savings (50 %) and loans from friends and relatives (30 %) (Ministry of Economy, 2006); for Cyprus, 87 % of Cyprus' family businesses only have family shareholders (Cyprus Chamber of Commerce and Industry, 2004).

Badulescu (2011), concluded that the main sources for start-up financing remain internal sources: own fund and savings, and financial assistance from family and friend, both for male

and female entrepreneurs, both for EU as an aggregate and Romania, a new member state and still developing economy.

Although there are many studies that find the debt (mainly bank loans) as one of the most important sources of family business financing, there are other studies that show a reduced use of debt. Chavis et al. (2011) in a study for 70,000 mainly small businesses, many from lower-middle income countries, found that younger firms rely less on bank financing and more on informal financing. There is a clear substitution effect: as firms mature, more firms switch out of informal finance toward bank finance, while the total proportion of firms using external finance remains relatively unchanged.

Also, in a study of (Strebulaev & Yang, 2013) it is found that the lower use of debt in family businesses is more closely related to the logic of "zero-leverage" company, which tends to occur more often in family than in nonfamily firms, explained by a stronger aversion in family firms to the risks linked to financial distress. Williams (2010) in a study for 250 family-owned businesses in Jamaica found that internal financing are usually used to finance business start-up while external sources are used to finance business growth.

Problems related to financing of small businesses in Albania are emphasized for the tourism sector, in a study of Kushi and Caca (2010) as in general they do not use advertising or just spend a very restricted amount of money because of the limited financial capacities.

The empirical results of Abor and Biekpe (2007) for Ghana show that age (longevity) has a positively significant relation to the bank-debt ratio, meaning that older SMEs, in terms of how long they have been operating in this business or the length of the relationship they have with banks, tend to have good track records and therefore fewer problems acquiring bank loans.

Robb and Fairlie (2009) in the study for USA found that that Asian-owned businesses are more successful than white-owned businesses because of high levels of human capital. In the same conclusion, that small business outcomes are positively associated with the education level of the business owner have arrived (Astebro and Bernhardt 2003; Headd 2003).

Berge et al. (2015) found that long-term finance is an important constraint for microfinance entrepreneurs, but that business training is essential to transform financial capital into productive investments. In the same conclusion for the importance of human capital have arrived Field et al. (2010), Karlan and Valdivia (2011), Klinger and Schiindeln (2011), Bruhn and Zia (2013), De Mel et al. (2014), Drexler et al. (2014), and Giné and Mansuri (2014).

Barjami and Leka (2020) in a study for human capital in Albania, found that education is very important for the economic growth of the country, considering the role that they have in the entrepreneurship. The high school and University must play an important role in financial education for the individual who will become family business owners or entrepreneurs. Polo and Nano (2015) concluded that school is the primary source of gaining financial knowledge. Lincaru et al. (2022) in a study for CEE and Visegrad countries concluded that the human capital is mobile and supports growth, with the remittance as positive externalities. In our study we have considered remittances as one of the main sources of family business financing as Albania is characterized by high number of emigrants and high level of remittances. The level of remittances for 2022, according to the World Bank, is 9.2% of GDP.

In a study for Germany and China (Scmitt.A; Frese M. 2011) it was found that the number of individuals working in the family businesses in Germany is very low, compared to those working in family businesses in China. This finding we think is related to the country culture referring to the business clime, but there is a number of other factors that may deal with the average level of wages, the level of unemployment, demographic factors- as the average number of the persons in a family, living in nuclear or large family, the strength of family ties, etc.

Meantime, if we refer to our survey, for the number of individuals involved in the family business the data are as in the table below:

Table 4. No. of households engaged in Family Business

Description	Weight
1 Household	15.6%
2 Households	37%
3 Households	31.5%
4 Households	11.6%
5 or more Households	4.3%

Source: Authors' calculations

So, even in our country the number of households involved in the family business is relatively low. Businesses with 2-3 households engaged in it prevail. This refers not only the culture and the small number of members per family (less than 4 for Albania- 3.7 persons per family-INSTAT 2021), but also the fact that these businesses are very small.

Compared to German business owners, Chinese owners get most of the capital to start a business by family members.

3. Methodology

This study is based on primary data, collected through questionnaires for family businesses. A total of 348 questionnaires were completed, but of these 327 questionnaires are correct, have answered all the questions and that cover micro and small family businesses with 1-9 employees. The questionnaires are completed in the city of Tirana (the capital of Albania), by directly interviewing (asking) the individual who runs the business. The selection of businesses has been random, but in proportion to the population of each Tirana municipality unit. Since Tirana is the city with highest number of businesses in the country, where 54.461 businesses operate, which is 46.1% of the total number of businesses in the country, it is appropriate that the conclusions reached in this study are representative for entire country. Meanwhile in a previous study (Leka & Shkurti, 2010) for family businesses in Albania it is found that the link between the initiative to open a family business and the living residency was significant at the 0.05 level favoring individuals who live in the capital city, justifying that the data gathered for family businesses in Tirana are representative for the whole country.

The data are elaborated in SPSS, since the data were mainly of a qualitative nature. The study consists of two statistical analyses. First, Chi- square tests are performed to analyze the significance of the relationship between main factors of the family business and the financing sources. The Chi-square analysis tests the differences in attitude of groups and categories and in the case that such differences are significant then the conclusions may be generalized for the whole population. Second, a regression equation was performed to analyze the main factors that determine the way these businesses are financed, the internal and external kind of sources used.

4. Analyze and results

This study has as its focus the issues related to the financing sources of family businesses in Albania. Business financing is one of the most important issues for all businesses, but in the case of family business, it is also related with some factors within households prospective.

Therefore, in this study we will also focus on these elements that have to do with the individual or the family. We will determine the main factors that influence the financing of family business.

Financing funds are grouped into four main categories: Saving, Remittances, Loan from relatives and friends and Bank Loan, as the most classic form of business financing in Albania.

As mentioned above, family businesses in Albania are mainly micro and this is the reason for the selection of these main financing sources. In the analysis, the focus is on how we will move from internal financing sources to external ones. So from savings, income/profit from the family business, to remittances, which means money secured by the previous emigration of family members ((mainly it is an instrument to ensure a good part of the capital when

individuals/families have defined in their medium-term objectives the start-up of a business), considered as internal sources, towards external sources, when first we consider loan from relatives or friends, which has a lower risk than loan from banks and other financial institutions, which is listed as the last way of financing the family business.

The data based on our survey regarding the source of financing for family business are as follows:

Table 5. Family Business' financing

Description	Weight
Savings	43.0%
Remittances	20.7%
Loan from relatives/friends	22.2%
Bank loan	14.1%

Source: Authors' calculations

Referring to the above table, financing a family business in Albania, usually in the phase of start up as these businesses are relatively new, most of the funds are provided by individual savings, loans from relatives and friends, money from emigration (remittances) and the last source is the part financed by bank loans. Since the businesses are relatively small, with a modest initial capital, this is probably the main reason why the funds are mainly provided by the savings and loans from relatives and friends (mostly with no interest). This goes with the Albanian culture as well, to support relatives and friends in difficulties, as is the situation where they are in need for financing in affordable amounts by family members. Another reason for explaining the reason for the use of mostly internal financing sources, is that these businesses are relatively new ones, so in the start-up phase, and in this phase the investors use mostly their funds in order to minimize the risk. In the following phases, which correspondents with the enlargement of the company (the same as in the above-mentioned study of Willliam 2010), it is observed a wider use of credits.

However, considering that family businesses that start activity in Albania face a high risk of bankruptcy (or failure to be successful ones), means that providing funds from relatives, is safer than providing from banks and lending institutions. Meanwhile, the fact that the level of obtaining loans is low means that these families may face barriers to obtaining loans. Such a conclusion has also emerged from a study conducted by Business Albania (2011) on the barriers encountered by Albanian businesses, where the difficulty in lending, mainly related to the high cost of credit, was identified as a barrier by 62.4% of 500 businesses taken in the study. Ruxho and Ladias (2022) found in a study for the increase in financing of the manufacturing industry of Kosovo that the bank interest is a key factor in the absorption of bank loans.

The businesses with the higher use of loans are the ones that are operating for 1-5 years, with 18.03% of them using the loan as financing source, and the ones operating for 5-10 years with a 16.7% of them using loan as financing source. Meanwhile the situation changes if loans from relatives and friends are also considered in the borrowed funds, where the dominating newly created businesses with a lifespan of less than 1 year (45.5%) and businesses with a lifespan of 1-5 years (42.6%). In this second scenario, the culture of our country has a greater influence, for supporting financially relatives and friends in their initiatives for starting a business. These funds for Albanians are considered the same as internal resources, because in the case of bankruptcy they don't face the same risk and push to return the money as when they are provided by the banks.

For this reason, one of the independent variables (explanatory variable) used in this study is the lifetime or the age of the business, meaning the period that this business has been operating in the market.

Table 6. The lifetime (age) of Family Business

Description	Weight
Less than 1 year	10.1%
1-5 years	37.3%
5-10 years	27.5%
Over 10 years	25.1%

Source: Authors' calculations

Family businesses operating in Albania are relatively new. Only 25% are businesses that have been in the market (have their age) for over 10 years. Undoubtedly, some of the family businesses that started in the early 1990s have grown and turned into medium and large businesses, but most of them have gone bankrupt, closed down, or have changed their activity.

Family businesses mainly are focused on long-term sustainability of their business, not just on the short-term profits. They want to build something by themselves, and then to pass it to the second and third generation. This fits very well with the Albanian culture, as everywhere in world. They are taking a "satisfactory" salary for covering daily needs, and the profit usually is reinvested in the business.

To test statistically the linkage between Financing Sources and Family Business Age, we have used Person Chi-Square Test, in order that if we found out this connection to be statistically significant, we can generalize the conclusion for the Family Businesses in Albania.

The value of Chi-square is 31.355, for 9 degrees of freedom, and the significance is 0.011, so less than 1.1%, meaning that this link is statistically significant.

Person Chi- Square Test

	Business Age	
Financing Sources	*Chi Square*	*31.355*
	Df	*9*
	Significance	*<.011*

Source: Author's calculation

X^2 (9, N=327) = 31.355   p<0.011

The analysis of frequencies and the Chi-square test led to the conclusion that the relationship between the financing decision on the family business and "the age" of the business is important. As the family business becomes "older" in the activity, the businesses have overcome the difficulties and obstacles they have faced and now the greater part of their activity will be financed by their own funds.

Referring to the literature review, the second independent variable we consider is the owners' education. It is expected that educated people are more prone to finance their business activity by lending funds from banks and financial institutions, because they have more information about the risk and risk management. The data referred to this study, based in our survey regarding the business owner's education are as follows:

Table 7. Business Owner Education

Description	Weight
Elementary Education	10.01%
High Education	53.8%
University and Post University	36.1%

Source: Authors' calculations

The value of Chi-square is 29.167, for 6 degrees of freedom, and the significance is 0.001, so less than 0.1%, meaning that this link is statistically significant.

Person Chi- Square Test

	Owner's Education	
Financing Sources	*Chi Square*	*29.167*
	Df	*6*
	Significance	*<.001*

Source: Author's calculation

X² (6, N=327) = 29.167   p<0.001

The analysis of frequencies and the Chi-square test led to the conclusion that the relationship between the financing decision on the family business and the owner's education is very important. For higher educated business' owners, the probability of finding external resources for financing reasons will be increased, mainly from banks and financial institutions. This is the category of people who have more information about credit, risk, bank services, etc., so more prone for the use of credits as well.

The other variable we considered is the previous year turnover of the business. The members of the family used to take money from their business to support their daily life expenses and the other money is left in the business to be reinvested.

The value of Chi-square is 10.584, for 6 degrees of freedom, and the significance is 0.102, so less than 10.2%, meaning that this link is almost statistically significant.

Person Chi- Square Test

	Previous Year Turnover	
Financing Sources	*Chi Square*	*10.584*
	Df	*6*
	Significance	*<.102*

Source: Author's calculation

X² (6, N=327) = 10.574   p<0.102

As the turnover of the business increases, the majority part of them will be reinvested in the business, meaning that the probability is that these businesses will be focused more on the internal sources.

In our analysis, based on our economical logic and literature review we tested some other independent variables, but they were not statistically significant. It is considered the sector of economy the family business operates, owner's gender, the age of the owner, and the succession of the business.

We run a regression equation to express better the connection between the way how the family business is financed and the three independent variables: owner's education, business age, and the turnover of the previous year. The equation of regression based on the survey's data is:

$$Financing = 1.9 + 0.42 * Owner\_Education - 0.17 * FB\_Age - 0.21 * Prev.year\_Turnover$$

(1)

As can be seen in the following table the connections are statistically significant, and they are determinant in the way the business is financed.

Depended Variable	Financing Sources	
Independent Variable	Coefficients	Probability
Owner's Education	0.424***	<0.001
Business Age	-0.174***	0.005
Previous year turnover	-0.213***	0.009
R-squared	0.10	<0.001
Durbin Watson	2.135	

Source: Author' calculations

The first factor explaining the financing that resulted statistically significant (***) is the owner's education. This connection is positive, meaning that owners with a high level of education are more prone to use external sources of financing. Understanding financial instruments better pushes them to take more risk in their way of financing. This result converges with literature review findings, which concludes that the human capital and the highly educated entrepreneurs have long term approach and are interested in the structure of the capital even for the small businesses, the case of our study.

The second factor explaining the financing that resulted statistically significant (***) is the lifetime (longevity) of the activity of the business. This connection is negative, meaning that as the time passes, the businesses have overcome the difficulties and obstacles they have faced and now the greater part of their activity will be financed by their own funds. External sources are also part of the capital structure, but the greatest part is finances by their own sources. This result converges with literature review findings, most of them, because the literature is divided on the linkage between financing and the life of the business. But the majority arrive at the same conclusion as our study as it is explained above.

The third factor explaining the financing that resulted statistically significant (***) is the previous year's turnover of the family business. This connection is negative, meaning that as the turnover increases, part of it is used for family expenses, so the part that is left in the business is higher and will be used for finning the investment- short and long terms.

5. Conclusions

Family business is a form of business that "reappeared" in Albania in the 1990s, after the fall of communism regime, period where the concept of free enterprise (free economy) did not exist. However, although not formal, the family business was present in Albania during the period of communism.

The eagerness for the free economy flourished the family businesses in post-communist Albania. However, financing, infrastructure and legal problems related to the transitional period that the country was going through, caused these businesses to encounter many difficulties and many of them went bankrupt.

Nowadays, even though more than 20 years have passed, family businesses continue to face difficulties in the market, as the competition is really high, and the economic structure has a number of problems.

The characteristic of family businesses in our country is that they are very small businesses, mainly micro businesses. This is to be expected, because most businesses in Albania are SME, and less than 2% are large businesses.

This study addresses issues regarding the financing of the family business by identifying the main internal factors that determine the way of financing.

The business financing source, which also represent the dependent variable in this study, are: Saving, Remittances, Loan from relatives and friends and Bank Loan, as the most classic forms of business financing in Albania, especially for micro businesses.

As independent variables, a number of factors were analyzed and tested, but only 3 of them resulted statistically significant: the owner's education, the age (longevity) of the business and the turnover of the family business. The link between the owner's education and business financing resulted statistically significant, with a positive value of the coefficient in the regression equation, meaning that owners with high level of education are more prone to use external source of financing. Understanding financial instruments better pushes them to take more risk in their way of financing. The link between the "age" of the business and the financing resulted statistically significant, with a negative value of the coefficient in the regression equation, meaning that as the time passes, the businesses have overcome the difficulties and obstacles they have faced and now the greater part of their activity will be financed by their own funds. The link between the third factor, the turnover of the previous year, and business financing resulted statistically significant, with a negative value of the coefficient in the equation of regression, meaning that as the turnover increases, a major part of the profit will be reinvested in the business for short-term and long-term investment.

6. References

Abor, J., Biekpe, N. (2007). Small Business reliance on Bank financing in Ghana. Emerging Markets Finance & Trade Journal, Vol. 43, No. 4, pp. 93-102

Astebro, T., Bernhardt, I. (2003). Start-up financing, owner characteristics and survival. Journal of Economics and Business, 55 (4): 303-320

Badulescu, A. (2011). Start-Up Financing Sources: Does Gender Matter? Some Evidence For EU And Romania. Annals of Faculty of Economics, University of Oradea, Faculty of Economics, vol. 1(special), pp 207-213

Bajrami, E., Leka, B. (2020). Human Capital and Higer Education as Drivers of Economy of Albania. Regional Science Inquiry. Vol. XII (2), pp.153-164

Batabyal, A. (2016). Increasing Returns in a Model with Creative and Physical capital: Does a balanced growth path exist? Regional Science Inquiry, Vol. VIII, (3), pp. 31-35

Berge, L. I. O., Bjorvatn, K., Tungodden, B. (2015). Human and Financial Capital for Microenterprise Development: Evidence from a Field and Lab Experiment. Management Science. Vol. 61, No. 4, pp. 707-722

Biznes Albania. (2011). Identifikimi i problemeve dhe barrierave që hasen nga biznesi në Shqipëri dhe përcaktimi i rrugëve për heqjen e tyre. Pp 23-33

Bruhn, M., Zia, B. (2013). Stimulating managerial capital in emerging markets: The impact of business training for young entrepreneurs. Journal of Development Effectiveness 5(2):232-266

Chavis, L. W., Klapper, L. F., Love, I. (2011). The Impact of the Business Environment on Young Firm Financing. The World Bank Economic Review, Vol. 25, No. 3, pp. 486-507

Constantin, D.L., Iosif, A.E., Profiroiu, A.G., Grosu, R.M. (2013) The services of general interest in Romania: Insights into legal and institutional issues at national and territorial level. Regional Science Inquiry Journal, Vol. V, (2), pp.151-162

De Mel, S., McKenzie, D., Woodruff, C. (2014). Business training and female enterprise start-up, growth, and dynamics: Experimental evidence from Sri Lanka. Journal of Development Economics. 106:199-210

Deichmann, J. I., Haughton, D., Li, M., Wang, H. (2022). Does European Union Membership Result in Quality-of-Life Convergence? Regional Science Inquiry. Vol. XIV, (1), pp.31-46

Drexler, A., Fischer, G., Schoar, A. (2014). Keeping it simple: Financial literacy and rules of thumb. American Economic Journal: Applied Economics, 6 (2), pp. 1-31

European Investment Bank (2016). Albania Assessment of financing needs of SMEs in the Western Balkans countries. August 2016. Pg. 12-25

Field, E., Jayachandran, S., Pande, R. (2010). Do traditional institutions constrain female entrepreneurship? A field experiment on business training in India. American Economic Review. Papers Proc. 100(2):125—129

Fletcher, D., Helienek, E., Zafirova, Z. (2009). The role of family start ups in the emergence of a small business sector in Bulgaria. Journal of Enterprising Culture 17(3), Pg. 351–375

Giné, X., Mansuri, G. (2014). Money or ideas? A field experiment on constraints to entrepreneurship in rural Pakistan. Policy Research Working Paper 6959, The World Bank, Washington, DC

Headd, B. (2003). Redefining business success: distinguishing between closure and failure. Small Business Economics. 21(1):51-61

Ivar, L., Berge, O., Bjorvatn, K., Tungodden, B. (2015). Human and Financial Capital for Microenterprise Development: Evidence from a Field and Lab Experiment. Management Science, Vol. 61, No. 4, pp. 707-722

Kalaj, E., Barbullushi, E. (2023). How and How Much digitalization affected enterprise performance during covid-19 pandemic. Regional Science Inquiry. Vol. XV (1), pp.97-108

Karlan, D., Valdivia, M. (2011) Teaching entrepreneurship: Impact of business training on microfinance clients and institutions. Review of Economics and Statistics. 93:510-527

Klinger, B., Schündeln, M. (2011). Can entrepreneurial activity be taught? Quasi-experimental evidence from Central America. World Development Volume 39(9):1592—161

Kushi, E., Caca, E. (2010). Some Problems of the Micro, Small and Medium Enterprises in Albanian Holiday Hotels. Regional Science Inquiry. Issue. II (1), pp.63-70

Leka, B., Shkurti, R. (2010). Characteristics of family businesses in Albania – a statistical study. Revista Tinerilor Economisti (The Young Economists Journal), vol. 1, issue 14, 168-177

Lincaru, C., Pîrciog, S. (2022). Mapping clusters in Central and Eastern European regions based on FDI, Remittances and Employment – a spatial statistics grouping analysis. Regional Science Inquiry, Vol. XIV, (1), pp. 67-104

Mandl, I. (2008). Overview of Family Business Relevant Issues Contract No. 30-CE-0164021/00-51 Final Report. Austrian Institute for SME Research

Polo, A., Nano, D. (2015). The role of university on students money management practices. Regional Science Inquiry. Vol. VII (2), pp.87-96

Robb, A. M., Fairlie, R.W. (2009). Determinants of Business Success: An Examination of Asian-Owned Businesses in the USA. Journal of Population Economics. Vol. 22, No. 4, pp. 827-858

Ruxho, F., Ladias, Christos, Ap. (2022). Increasing funding for the regional industry of Kosovo and the impact on economic growth. Regional Science Inquiry. Vol. XIV (1), pp.117-127

Schmitt, A., Frese, M. (2011). Family Involvement In Chinese And German Small Businesses. Journal of Enterprising Culture (JEC), World Scientific Publishing Co. Pte. Ltd., Vol. 19(03), pp 261-285

Shibusawa, H., Miyata, Y. (2011). Evaluating the dynamic and spatial economic impacts of an earthquake: a CGE application to Japan. Regional Science Inquiry Journal, Vol. III, (2), pp 13-25

Shimamoto, K. (2020). Effects of Leisure Activities on Happiness in the Case of Japan. Regional Science Inquiry. Vol. XII (1), pp.11-22

Siakas, K., Naaranoja, M., Vlachakis, S., Siakas, E. (2014). Family Businesses in the New Economy: How to Survive and Develop in Times of Financial Crisis. Procedia Economics and Finance, Volume 9, pp 331-341

Strebulaev, I. A., Yang, B. (2013). The mystery of zero-leverage firms. Journal of Financial Economics. Volume 109, issue 1, pp 1-23

William, D. (2010). An Empirical Investigation into the Financing of Small, Family-owned Businesses in Jamaica. Social and Economic Studies, Vol. 59, No. 3, pp. 31-57

Announcements, Conferences, News

Twenty-Eighth Pacific Conference of the RSAI
Sustainability of the Region in the Era of Great Transformation
August 5-7, 2024 | EXCO, Daegu, South Korea

RSAI

The 28th Pacific Conference of the RSAI
Abstract submission opening on Dec 1, 2023
Abstract submission deadline on Mar 15, 2024

Event Overview

The Twenty-Eighth (28th) Pacific Conference of the RSA, titled "Sustainability of the Region in the Era of Great Transformation", will be hosted by the Korean Regional Science Association (KRSA) in partnership with the Regional Science Association International.

The conference will be held at EXCO, Daegu, South Korea, on August 5-7, 2024.

This theme of the conference reflects the need to address the challenges and opportunities that arise from the great transformation in regions. The conference aims to explore ways in which the region can adapt and thrive in the face of these changes sustainably, focusing on the examination of economic, social, and environmental aspects of sustainability, and identifying strategies and solutions that can contribute to the long-term well-being and resilience of the region. The conference aims to bring together experts, scholars, and practitioners from various fields to share their insights and experiences, fostering meaningful discussions and collaborations to drive positive change toward a more sustainable future for the region.

The conference committee calls for papers on various topics related to this overall theme in regional science for presentation at the conference. The committee will welcome papers on any aspect of regional science, and would particularly welcome papers reporting research or case studies on the following topics:

- Regional economics and development
- Income inequality and regional disparities
- Infrastructure, basic utilities, and regional management
- Public services and human development
- Trade, investment, and economic growth
- Decentralization and regional fiscal policies
- Regional macro and financial policies
- Local government innovation and governance
- Economic shocks and social safety nets
- Culture, land and village development
- Environmental and climate change
- Big data, artificial intelligence, and regional analysis
- GIS and spatial econometrics

An abstract of about 500 words should be submitted online via the link http://prsco2024.krsa83.or.kr/, by Mar 15, 2024. Abstracts should be submitted in English and consist of background, data and methodology, potential contributions, and keywords.

Paper sessions are seminar-style for each paper and given ample time for discussion so that participants may provide constructive feedback to authors. Paper presentations will be made in English.

For more information please visit the following link:

https://www.regionalscience.org/index.php/news/upcoming-events/item/3272-call-for-papers,-the-28th-pacific-conference-of-the-rsai-in-2024.html

Important dates:

Dec 1, 2023 : Abstract submission opening
Mar 15, 2024 : Abstract submission deadline
Apr 15, 2024 : Early bird registration open
Apr 15, 2024 : Notification of abstract acceptance
Jun 1, 2024 : Full Paper submission deadline
Jun 15 2024 : Early bird registration end
Jun 30, 2024 : Paper presenter registration deadline

In Partnership with

Regional Science Association International (RSAI)

Hosted and Organized by

Pacific Regional Science Conference Organization (PRSCO)

Event overview edited by Dimitrios Tsiotas,
Assistant Professor, RSI J.

23rd SCIENTIFIC CONFERENCE OF THE ASSOCIATION OF GREEK REGIONAL SCIENTISTS (ΣΕΠ)
Demographic Transition in 2050 and Regional Policies
October 18-19, 2024 | Hellenic Mediterranean University & University of Western Macedonia

Event Overview

The twenty-third (23rd) Scientific Conference on Demographic Transition in 2050 and Regional Policies will take place on October 18-19, 2024, at Heraklion, Crete, Greece. The conference is co-organized by the Department of Business Administration and Tourism, Hellenic Mediterranean University (Greece), and the Department of Business Organization and Management, University of Western Macedonia (Greece).

The purpose of the conference is twofold: On the one hand, it aims to highlight the connection between demographic transition and regional policies, and on the other hand, to present regional competitions and power shifts resulting from demographic imbalances.

The **Main Themes** of the Conference are:

- Demographic Challenge and Regional Cohesion
- Demographic Changes and Regional Competitions
- Demographic Imbalances and Power Shifts

Authors' Guidelines

- Submission of abstracts and full papers should take place by email at: sepgov@gmail.com
- The text of the paper should be in Open Document or equivalent Microsoft Word format, in A4 size with margins (top, bottom, right, left) of two (2) centimeters.
- The total length of the paper should be up to seven (7) pages, including abstracts, tables, diagrams, and bibliography (references).
- The font of the text should be Times New Roman, size 12pt, with single line spacing, the first-line indentation (except for chapter and subchapter titles) one (1) centimeter, no spacing between paragraphs, and one (1) centimeter spacing between chapters.
- The official language of the conference is Greek; however, papers can also be submitted in English language.
- The abstract should be no more than one (1) page and should include at least three (3) keywords (similar to the English version).
- Both in the initial abstract and in the full paper, without abbreviations: title, authors, their affiliation, the organization they represent, and their email address. In case the full paper is in Greek, provide an English summary with the same specifications on the last page.
- Chapter and subchapter numbering (Arabic) should start with the introduction and should not include the bibliography.
- The bibliography (references and in-text citations) should follow the APA format.

Important Dates

- Submission of abstracts by 28/02/2024
- 1st evaluation for abstract acceptance by 30/03/2024
- Submission of full papers by 15/06/2024
- 2nd evaluation for paper acceptance by 15/07/2024
- The final deadline for paper submission, after the second evaluation, by 10/08/2024
- Further information can be found on the official website (https://sepgov.wordpress.com)
- For further correspondence sepgov@gmail.com

Event overview edited by Dimitrios Tsiotas,
Assistant Professor, RSI J.

Academic Profiles

Professor **Susan Carleton Athey** is the Economics of Technology Professor at Stanford Graduate School of Business. She received her bachelor's degree from Duke University (Economics, Computer Science, and Mathematics) and her Ph.D. (in Economics) from Stanford, and she holds an honorary doctorate from Duke University.

She previously taught at the economics departments at MIT, Stanford, and Harvard and she has delivered several distinguished lectures (as invited keynote speaker).

She has earned several honors and awards, amongst which is an elected member of the National Academy of Science (of the USA) and is the recipient of the John Bates Clark Medal, awarded by the American Economic Association to the economist under 40 who has made the greatest contributions to thought and knowledge. Besides academic and scholar awards, she also earned non-academic honors for her professional, collaboration, and business activity, amongst which by the Microsoft Corporation.

As one of the first "tech economists," she served as consulting chief economist for Microsoft Corporation for six years and has served on the boards of multiple private and public technology firms. She also served as a long-term advisor to the British Columbia Ministry of Forests, helping architect and implement their auction-based pricing system. She was a founding associate director of the Stanford Institute for Human-Centered Artificial Intelligence, and she is the founding director of the Golub Capital Social Impact Labopen in a new window at Stanford GSB.

In 2022, she took leave from Stanford to serve as Chief Economist at the U.S. Department of Justice Antitrust Division.

Professor Athey is the 2023 President of the American Economic Association, where she previously served as Vice President and Elected Member of the Executive Committee.

Prof. Susan Athey's current research focuses on the economics of digitization, marketplace design, and the intersection of econometrics and machine learning. She has worked on several application areas, including timber auctions, internet search, online advertising, the news media, and the application of digital technology to social impact applications. She has published over 240 scientific documents and her research enjoys a high impact, which according to the Google Scholar database exceeds 35,000 citations.

Academic Profile by:
Dimitriost TSIOTAS, Assistant Professor, RSI J

References

https://gsb-faculty.stanford.edu/susan-athey/cv/ [accessed: 16/11/2023]
https://scholar.google.com/citations?hl=el&user=UdaJi94AAAAJ [accessed: 16/11/2023]
https://www.gsb.stanford.edu/faculty-research/faculty/susan-athey [accessed: 16/11/2023]

Professor **Lisa M. Lynch** is the Maurice B. Hexter Professor of Social and Economic Policy at Brandeis University's Heller School for Social Policy and Management and Director of the Institute for Economic and Racial Equity. She earned her BA in economics and political science at Wellesley College, and her MSc. and Ph.D. in economics at the London School of Economics. She previously served in also distinguishable academic positions, such as Brandeis University's Provost and Executive Vice President of Academic Affairs from 2014-15 and 2016-2020; Interim President of Brandeis University from 2015 to 2016; and Dean of the Heller School for Social Policy and Management from 2008 to 2014. She has also been a faculty member at Tufts University, MIT, the Ohio State University, and the University of Bristol.

Professor Lisa M. Lynch is currently a member of the Economic Advisory Panel of the New York Federal Reserve Bank and is an elected member of the executive committee of the American Economic Association. She has served as chief economist at the U.S. Department of Labor (1995-1997); director (2004-2009), chair (2007-2009) of the board of directors of the Federal Reserve Bank of Boston; chair of the Conference of Chairmen of the Federal Reserve System (2009); and president of the Labor and Employment Relations Association (2013-2014). In addition, she has served on the Governor's Council of Economic Advisors for the Commonwealth of Massachusetts (2008-2015) and the National Academies Committee on National Statistics (2009-2015).

She is a research associate at the National Bureau of Economic Research and a research fellow at IZA (Institute for Labor Economics, Germany). She has published extensively on the impact of technological change and organizational innovation (especially training) on productivity and wages, the determinants of youth unemployment, and the school-to-work transition, among other issues. She has published over 130 scientific documents and her research enjoys almost 10,000 citations, according to the Google Scholar database.

Professor Lisa M. Lynch is currently an Editorial Board Member of the journal Industrial and Labor Relations Review and has previously served on the Editorial board of the Journal of Labor Economics, Journal of Population Economics, and Labour Economics: An International Journal. Since 1978 she earned several awards and honors for her academic, research, and overall professional activity.

Academic Profile by:
Dimitriost TSIOTAS, Assistant Professor, RSI J

References
https://scholarworks.brandeis.edu/esploro/profile/lisa_lynch/overview [accessed: 16/11/2023]
https://scholar.google.com/citations?hl=el&user=FOv-8e0AAAAJ [accessed: 16/11/2023]

Book Reviews

Report on the outcome of 2021-2027 Cohesion Policy programming, 02 May 2023

On 2 May 2023, the European Commission published a Staff Working Document titled "Cohesion 2021-2027: Forging an Ever-Stronger Union - Report on the Outcome of 2021-2027 Cohesion Policy Programming". Being imbued by the spatial planning disciplines of tracking, evaluation, and feedback, this report communicates how the Policy is set to mobilize investments worth a total of €545 billion, with nearly 70% funded by the EU. These funds aim to foster lasting socio-economic convergence; territorial cohesion; a social and inclusive Europe; and a smooth and fair green and digital transition; in an attempt to stimulate inclusion and convergence.

The European Commission's unequivocal objective is to lead the way for the transition to a healthy planet and a new digital world. Employing a territorial approach and emphasizing the green and digital transitions, the Cohesion Policy seeks social and regional inclusion, aligning with the principles of the European Pillar of Social Rights Cohesion Policy. To this end, it will provide targeted assistance including addressing inefficiencies in the labor market, education, training, and adult learning systems; improving innovation and public governance performances, the business environment; and increasing the level of and access to services.

Despite that negotiations were delayed by the COVID-19 crisis, the war in Ukraine, and new counter-cyclical emergency instruments, the flexibility and adaptability of cohesion policy have been evident in the past three years. Towards a re-focus on its core long-term mission, the Cohesion Policy aims to enhance the quality of life by promoting sustainable growth and development, reducing regional disparities, supporting business competitiveness, fostering skill development, creating quality jobs, and aiding vulnerable groups. Simultaneously, it will continue to adapt to socio-economic changes, tackle the outcomes of the energy crisis and price increases, and help address the needs of the significant number of war refugees, as well as enhance the competitiveness of Europe's industry and support the fast transition to climate neutrality. By ensuring the involvement and engagement of different partners and stakeholders, the implementation of investments and reforms on the ground can effectively and efficiently target the key challenges.

Cohesion Policy is expected to have a significant impact and spill-over effects on the EU's economies and regions, as it is expected to increase the EU's GDP by 0.5% by the end of the implementation period; and 1.3 million additional jobs are expected to be supported by 2027. According to the RHOMOLO model, each euro spent on the policy will have generated EUR 2.8 of additional GDP in the EU 25 years after the beginning of the programming period. Further, the Policy will help the less developed regions to catch up with the more developed ones and close the gap between the 10% most developed and the 10% least developed regions of the EU by up to 3.6%, while also promoting aggregate growth for the EU as a whole and in all regions.

■ A smarter and more competitive Europe

A primary policy objective under this goal is to develop and enhance research and innovation capacities and uptake the adoption of advanced technologies. Smart specialization strategies that underpin investments in all Member States will enable a targeted allocation of funding to strengthen innovation. A second objective involves Support to Small and Medium-sized Enterprises (SMEs), which remains essential, especially in the current context of supply constraints, high energy prices, and inflation. Towards the EU's digital transition, vital modernization measures build on developing digital infrastructure; modernization of public services; digital skills and infrastructure; digitization of public services, and the digital transformation of businesses. Synergies between the Digital Europe and ERDF programs, aiming to support the digital transformation of businesses and public sector organizations. The Digital Europe program (DIGITAL) further supports the establishment of a network of European Digital Innovation Hubs (EDIHs) spanning the entire territory of the EU.

■ A greener, low-carbon transitioning towards a net zero-carbon economy and resilient Europe

Cohesion Policy is poised to make a substantial contribution to the European Green Deal, supporting investments in all regions in energy; climate change adaptation and mitigation; environment; and sustainable urban mobility. Unprecedented support from Cohesion Policy is dedicated to the energy transition and the achievement of the EU's mid- and long-term energy and climate goals. Sizeable support will be provided to projects in the fields of energy efficiency, renewable energy, urban transport infrastructure, and railway investments. These investments are expected to directly contribute to reducing EU emissions in the EU by at least 55% by 2030 compared to 1990 levels and to reaching EU climate neutrality by 2050. Further, they are expected to provide essential support to tackling the current energy crisis by boosting energy savings (including significant financing in building renovation) and increasing energy security for the future via the further deployment of renewable energy production. Cohesion Policy will also help Member States, regions, cities, and towns to green their energy supply to renewable energy development, which will be largely focused on solar energy. Support for smart energy systems will contribute to building the necessary power infrastructure (grids, storage, etc.) so that it can cope with the increase in renewable energy generation and the overall electrification of the energy system, including e-mobility. Investments dedicated to protecting and preserving nature and biodiversity and tackling all sorts of pollution will be supported with a 50% increase on the 4% allocation in the 2014-2020 period. In this context, the Cohesion Policy will provide significant support to climate change adaptation and disaster risk management to deal with the unavoidable consequences of climate change. This agenda includes investments in water services and improved wastewater collection and treatment; support for waste prevention, recycling, and reuse of municipal waste; circular production and consumption practices; improving resource efficiency; water reuse and reducing plastics pollution; recycling systems as well as alternative consumption and production patterns; sustainable urban mobility.

■ A more connected Europe

A primary policy objective is centered on shifting transferring more passengers and freight toward low-carbon (public) transport, and to increase investment in the digital and green transition of the transport sector. At the same time, efforts will

persist in enhancing connectivity and traffic safety. Support in non-fossil fuel rolling-stock trains and investing in the European Rail Traffic Management System within the Trans-European Transport Network are anticipated to result in faster and safer rail connections. The focus for road transport investments remains on improving Trans-European Transport Network connectivity and completing it by 2030, prioritizing investments that facilitate public transport. While port and airport infrastructure will receive limited support, this assistance will encompass decarbonization measures and integration into multimodal networks.

■ A more social and inclusive Europe

Social and inclusive growth is a priority for Cohesion Policy in the 2021-2027 period with a dedicated policy objective for a more social and inclusive Europe, accounting for almost 20% of the total program's budget. Through the European Social Fund Plus (ESF+), a focal point is given to investments that address the adaptability of workers and the acquisition of new skills, and an emphasis on attracting as many inactive people as possible into the labor force. The ESF+ prioritizes strengthening the resilience of social systems; fostering skills; increasing employability; improving the quality; labor market relevance; and inclusiveness of education and training; and enhancing access to affordable social and health services. These efforts contribute to realizing the European Pillar of Social Rights and aid in achieving its targets. Employment remains a key area supported by the ESF+, particular focus on vital youth employment to secure the EU's future prosperity. Investments in youth employment have been strategically programmed across all ESF(+)-specific objectives by 23 Member States. The investment in skills development stands out as a major objective, aiming to upskill and reskill 4.5 million employed people in the EU throughout their working lives by 2029. A significant portion, more than 80% of the investment assigned to social inclusion will be allocated to measures for active inclusion and access to services. This allocation aims to enhance the social integration of individuals at risk of social exclusion, offering support to marginalized groups such as the Roma community; integration efforts for marginalized communities and third-country nationals; support for health infrastructure and equipment; assistance for the most deprived individuals; and initiatives to tackle child poverty.

■ A Europe closer to citizens

The Cohesion Policy aims to bring Europe into closer proximity to its citizens and bridge the gap between local development needs and the broader objectives of the EU and the global community. This is achieved through a focused approach to supporting place-based investments via integrated territorial development strategies, fostering enhanced ownership, and encouraging the active participation of local stakeholders and communities. Investments are addressed towards initiatives that promote integrated and inclusive development, spanning social, economic, and environmental dimensions. These efforts also extend to encompass culture, natural heritage, sustainable tourism, and security. The Cohesion Policy further emphasizes integrated territorial investments, executed through either national territorial tools, or community-led local development, and other tools as defined at the national level. These investments are strategically deployed in rural and mountainous areas, islands, and other territories, thereby reinforcing a holistic and community-driven approach to regional development.

■ Towards a just transition

, leading to job losses and other negative impacts, and territories that depend on carbon-intensive industries such as steel, cement, and chemicals, which need to change fundamentally, including changes in skills and job profiles. This scope is programmed through investment planning to phase out coal from production chains; develop skills and economic diversification; promote clean energy; and support the regeneration of sites and the circular economy.

The primary objective of this goal is to assist people and places expected to be most affected by the transition to climate neutrality, ensuring that no region is left behind. The geographical scope of this initiative includes territories that depend on the extraction or production of coal, lignite, peat, and oil shale, which are expected to decline with the shift towards a climate-neutral EU economy. This transition may result in job losses and other adverse impacts. Additionally, it includes territories dependent on carbon-intensive industries (steel, cement, and chemicals), necessitating fundamental changes, including changes to skills and job profiles. This scope is programmed through strategic investment planning, focusing on the phase-out of coal from production chains; skills development and economic diversification; promotion of clean energy; and regeneration of sites and circular economy.

■ Interreg

Defined to support territorial cooperation across the EU and its neighbors via 86 cooperation programs, the primary focus of Interreg lies in supporting the governance of cooperation in jointly/shared territories that span across borders. Additionally, it emphasizes collaboration between the outermost regions and their neighboring countries, motivating the participation of youth entrepreneurship.

Overall, the report concludes that according to the levels of investments addressed to the 2021-2027 program period, the Cohesion Policy remains the main long-term investment instrument in the EU. The monitoring provided by the Report on the outcome of 2021-2027 Cohesion Policy programming, 02 May 2023, brings into light positive indications that the Cohesion Policy will suffice to meet the standards for achieving the goals that have been set.

For more details, the interested reader should refer to the following link: https://ec.europa.eu/regional_policy/information-sources/publications/reports/2023/report-on-the-outcome-of-2021-2027-cohesion-policy-programming_en

Report Review by
Dimitrios TSIOTAS, Assistant Professor – RSI J
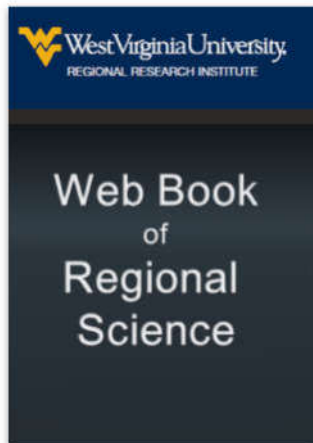
The Web Book of Regional Science: Classics in Regional Science | West Virginia University, Regional Research Institute.

The Web Book of Regional Science is an initiative from the West Virginia University, Regional Research Institute, to provide a service to the regional research community to make a wide range of reference and instructional materials freely available online. Approximately 30 books and monographs have been published under the series of Web Book of Regional Science, covering diverse subjects such as regional networks, land use, migration, and regional specialization. The books include descriptions of many of the basic concepts, analytical tools, and policy issues important to regional science.

As far as history is concerned, The Web Book of Regional Science was launched in 1999 by Scott Loveridge, with Regional Research Institute directors serving as Web Book editors. Scott Loveridge performed that role through 2000 and Randall Jackson served as editor from 2001 through 2022.

The series Classics in Regional Science includes the following items (books):

- An Introduction to Regional Economics, by Edgar M. Hoover and Frank Giarratani
- The 1975 West Virginia Input-Output Study: Modeling A Regional Economy, by Anthony L. Loviscek, Randy E. Holliday, Lucinda A. Robinson, and Melissa S. Wolford
- The Elements of Input-Output Analysis, by William H. Miernyk
- Optimal Location of Facilities, by Gerard Rushton
- Scientific Geography Series, Vol. 1 through 10.

The Scientific Geography Series begins with several important topics in human geography, followed by studies in other branches of scientific geography. The modules are intended to be used as classroom texts and as reference books for researchers and professionals. Wherever possible, the series will emphasize practical utility and include real-world examples.

The Series consists of the following items (books):

- Central Place Theory, by Leslie J. King
- Gravity and Spatial Interaction Models, by Kingsley E. Haynes and A. Stewart Fotheringham
- Industrial Location, by Michael J. Webber
- Regional Population Projection Models, by Andrei Rogers
- Spatial Transportation Modeling, by Christian Werner
- Regional Input-Output Analysis, by Geoffrey J.D. Hewings
- Human Migration, by W.A.V. Clark
- Point Pattern Analysis, by Barry N. Boots and Arthur Getis
- Spatial Autocorrelation, by John Odland
- Spatial Diffusion, by Richard Morrill, Gary L. Gaile, and Grand Ian Thrall

The Web Book of Regional Science suggests an excellent initiative for communicating Regional Science to the regional research community and more broadly the academic community. The included material is sufficient to support undergraduate courses and can provide an excellent basis or supplement to postgraduate courses. The Web Book of Regional Science can also motivate beginners to get with Regional Science, as it includes classic and valuable material, and can excellently attract a multidisciplinary audience, as it provides a diversity of topics going beyond the fundamentals, including methodological and empirical approaches and policy and practice debates.

The Web Book of Regional Science is available at: https://researchrepository.wvu.edu/rri-web-book

All Web Book material, including text and graphics, is available to users for personal use and any other usage (e.g. redistribution in whole or in part, in print, online, or on electronic media) requires permission from the Regional Research Institute of the West Virginia University.

Through the dissemination of scientific knowledge, the Web Book of Regional Science fosters knowledge communication, thus heartfelt congratulations are due to the dedicated contributors of this Book Series.

Book Review by
Dimitrios TSIOTAS, Assistant Professor – RSI J

GUIDELINES

**for the Writers & a format model for the articles
submitted to be reviewed & published in the journal**

Guidelines for the Writers & a format model for the <u>articles submitted to be reviewed & published in the journal</u>

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 <u>contact</u> <u>e-mail address</u> 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 <u>a single paragraph, no longer than 250 words</u>. 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, <u>separated by commas</u>

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 <u>separate them by commas</u>. You can find information on the JEL system here: https://www.aeaweb.org/jel/guide/jel.php

1. <u>Introduction</u>

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
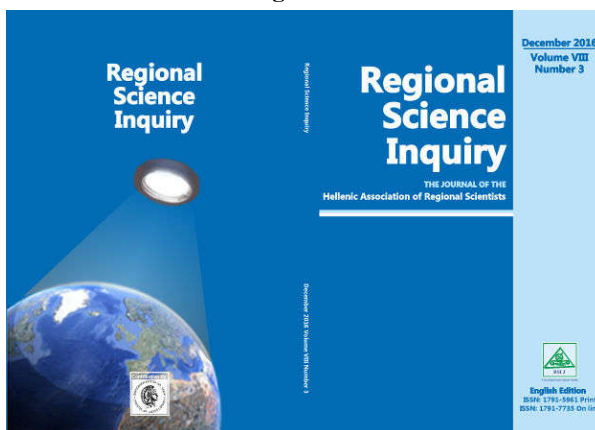
Source: cite the source

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:

$$y = ax^2 + bx + c$$

(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 <u>TeX form</u> if they so wish.

7. <u>References</u>

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).

Leiss, Amelia. 1999. "Arms Transfers to Developing Countries, 1945–1968." Inter-University Consortium for Political and Social Research, Ann Arbor, MI. ICPSR05404-v1. doi:10.3886/ICPSR05404 (accessed February 8, 2011).

Romer, Christina D., and David H. Romer. 2010. "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks: Dataset." American Economic Review. http://www.aeaweb.org/articles.php?doi=10.1257/aer.100.3.763 (accessed August 22, 2012).

Ausubel, Lawrence M. 1997. "An Efficient Ascending-Bid Auction for Multiple Objects." University of Maryland Faculty Working Paper 97–06.

Heidhues, Paul, and Botond Kőszegi. 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.