

ECONOMIC GROWTH AND B-CONVERGENCE IN EUROPE: EMPIRICAL EVIDENCE FROM REGIONAL PANEL DATA, 2011-2023

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Abstract

This paper examines regional economic growth and β -convergence across European regions using panel data for 233 NUTS-2 regions over the period 2011–2023. The analysis explores whether regions with lower initial income levels experience faster growth and investigates the factors associated with regional growth dynamics. The empirical framework relies on alternative panel data specifications to assess the robustness of the convergence process and to examine the role of key economic and demographic variables. The results indicate the presence of β -convergence among European regions, suggesting that regions with lower initial levels of economic development tend to grow more rapidly over time. Investment activity and migration dynamics emerge as important determinants of regional economic performance, whereas labour and demographic variables show less stable effects across model specifications. Using a recent dataset covering both the post-financial crisis and post-pandemic period, the paper provides updated evidence on regional convergence patterns in Europe. The analysis also reveals differences in convergence dynamics across groups of regions, indicating that structural characteristics and regional conditions influence the pace of economic adjustment. These findings contribute to the empirical literature on regional growth and offer insights relevant to regional development and cohesion policies in the European Union.

Keywords: Regional economic growth, β -convergence, regional disparities, panel data analysis, European regions

JEL classification: O47, R11, R12, R58
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1. Introduction

Regional economic disparities remain a persistent feature of the European economic landscape. Despite the long-standing objective of promoting balanced territorial development, substantial differences in income levels, productivity, employment and investment capacity continue to characterize European regions. These disparities raise important questions not only for regional development but also for the broader objectives of economic cohesion and sustainable growth within the European Union. Understanding whether less developed regions are gradually catching up with more advanced ones therefore remains a central concern in both economic research and policy debate.

Over the last decade, this issue has become even more relevant. The aftermath of the financial and sovereign debt crisis, followed by the economic disruptions associated with the COVID-19 pandemic, has affected European regions in uneven ways. While some regions have shown strong recovery and adjustment dynamics, others continue to face structural constraints that limit their growth potential. These developments have renewed interest in the dynamics of regional convergence and in the factors that shape regional growth trajectories across Europe.

The literature on economic growth has long suggested that regions with lower initial income levels may grow faster than more advanced ones, reflecting the dynamics of economic convergence. In the European context, however, empirical evidence remains mixed. While several studies identify signs of convergence across regions, others point to persistent disparities, divergence patterns or the emergence of convergence clubs. These differences partly reflect variations in time periods, spatial scales and empirical approaches, but they also underline the complexity of regional growth processes in Europe.

Regional economic performance is influenced by a range of structural and demographic factors, including investment activity, labour market conditions, demographic change and

migration dynamics. These forces interact in ways that may accelerate or hinder regional adjustment, producing uneven development trajectories across European regions. At the same time, the effects of such factors are not necessarily uniform across space, as regional characteristics and development conditions may shape the way economic and demographic processes influence growth outcomes.

Against this background, this paper examines regional economic growth and β -convergence across 233 NUTS-2 regions in Europe over the period 2011–2023. The analysis explores whether regions with lower initial levels of economic development tend to grow faster and investigates the relationship between regional growth and key economic and demographic factors, including investment activity and migration dynamics. Attention is also given to differences across groups of regions, as convergence processes may vary according to regional development conditions.

By using a recent panel dataset that captures both the post-financial crisis period and the years surrounding the pandemic, the study provides updated empirical evidence on regional convergence patterns in Europe. It also contributes to the empirical literature by examining the role of investment and migration within a common analytical framework while considering potential differences in convergence dynamics across regional development groups.

The remainder of the paper is organized as follows. The next section reviews the relevant literature on regional growth and convergence. The following section presents the data and empirical methodology. The empirical results are then discussed, first for the full sample and subsequently across regional development groups. The final section concludes and discusses the implications of the findings for regional development and cohesion policy in the European Union.

2. Literature review

Regional economic growth has been studied for decades through the convergence hypothesis. In its basic form, the hypothesis assumes that poorer regions tend to grow faster than richer ones, because lower initial capital stocks allow stronger marginal returns, easier technological diffusion and a broader scope for structural adjustment (Barro and Sala-i-Martin, 1992; Mankiw et al., 1992). Empirical work usually tests this proposition through β -convergence models, where a negative coefficient on initial income is taken as evidence of catching-up over time (Sala-i-Martin, 1996).

This framework remains central in the analysis of European regions, but its interpretation has become less straightforward. Recent studies confirm that convergence can still be detected, although its strength varies across periods and depends on how disparities are measured (Costa et al., 2024). Comparable findings have also been reported for the Balkan area (Grodzicki and Jankiewicz, 2024). At the same time, the European evidence no longer supports the idea of a smooth or uniform adjustment process. Investment capacity, productive structure, demographic conditions and exposure to shocks all shape the pace and direction of regional growth, making convergence conditional rather than automatic (Gkatsikos and Christoforidis, 2025).

This point is particularly important in the European Union, where cohesion remains a core policy objective, but regional inequalities have not disappeared. The period after the sovereign debt crisis, and even more the years following the pandemic, has been marked by fragile and uneven adjustment across regions (Kallioras et al., 2025). Under these conditions, convergence and divergence can coexist within the same territorial system, which means that cohesion cannot be inferred simply from aggregate growth trends (Alexiadis et al., 2010). Differences in technological change, structural transformation and the capacity to benefit from wider integration processes have further widened the distance between regions following stronger adjustment paths and those trapped in weaker ones (Capello and Cerisola, 2023; Kallioras et al., 2021).

Policy literature increasingly interprets these disparities as the outcome of cumulative structural disadvantages rather than temporary imbalances. This has strengthened the argument for place-based policy approaches instead of uniform interventions applied across all territories in the same way (Constantin and Volintiru, 2024). Lagging regions often combine weak productive bases, limited development opportunities and lower resilience to shocks, which reduces their capacity to benefit from broader growth dynamics (Rodríguez-Pose, 2018). OECD

work reaches a similar conclusion, linking regional convergence in the European Union to productive upgrading and stronger territorial support mechanisms (Pina and Sicari, 2021). Other studies also show that marked spatial imbalances remain a defining feature of the European regional system, despite the long-standing objective of territorial cohesion (Petraikos et al., 2021; Polyzos and Tsiotas, 2025).

Within this broader discussion, investment remains one of the most important determinants of regional growth. Its role is not limited to capital accumulation. It also affects infrastructure, productive capacity and the potential for technological upgrading. Evidence on European cohesion funding shows that investment can support regional growth, but that its effectiveness weakens when macroeconomic uncertainty increases (Pinar and Karahasan, 2024). At the same time, broader evidence on European firms points to strong territorial differences in investment capacity, innovation performance and resilience (European Investment Bank, 2024). Investment therefore cannot be treated as a uniform growth factor. Its contribution depends on the local conditions under which resources are absorbed and transformed into productive outcomes. This makes gross fixed capital formation a necessary variable in the empirical analysis of regional growth.

Demographic change adds another layer to this discussion. Migration affects labour supply, the age composition of the population, the distribution of skills and the strength of local demand. Its effects, however, are not uniform. Inflows may support renewal and growth, while persistent outflows may weaken the adjustment capacity of regional economies. This becomes particularly important when migration is selective in terms of age, skills or labour-market position. Recent studies show that internal migration can influence regional growth through exactly these channels (Anastasiou, 2020; Anastasiou and Duquenne 2020; Centofanti et al., 2024). Ageing follows a similarly uneven spatial logic. Its relationship with growth differs across European NUTS-2 regions, which means that demographic pressure should not be interpreted as a common or spatially identical burden (Nicolini and Roig, 2024). For this reason, net migration and natural population balance are not secondary controls, but part of the substantive explanation of regional growth differences.

A further issue concerns the internal heterogeneity of the European regional system itself. Less developed, transition and more developed regions do not enter the growth process from the same structural position, and there is no strong reason to expect investment, labour-market conditions or demographic adjustment to have identical effects across all three groups. The post-2011 period makes this especially clear, since recovery, structural change and demographic pressures have unfolded unevenly across European space (Kallioras et al., 2025; Tsiotas and Polyzos, 2025). What remains less explored is whether the main determinants of regional growth operate with different intensity across these development groups. This is the point on which the present study places particular emphasis.

3. Data and Methods

3.1. Data structure and scope

The empirical analysis is based on a regional panel dataset covering 233 NUTS-2 regions of the European Union over the period 2011–2023. The unit of observation is a region–year pair, resulting in an unbalanced panel comprising 2,710 observations, reflecting missing values for certain regions and years. The data are obtained from Eurostat regional statistics, which provide harmonised economic and demographic indicators across European regions. The dataset includes information on regional gross domestic product, gross fixed capital formation, employment, and demographic indicators such as migration flows and natural population change.

Regional economic growth is measured as the first difference of the logarithm of real GDP,

$$gGDP_{it} = \Delta \ln(GDP_{it}) \quad (1)$$

which approximates the annual percentage change in regional output. All monetary variables are expressed at constant prices, ensuring comparability across regions and over time. The

variables included in the empirical analysis and their descriptive statistics are reported in Tables 1 and 2.

Table 1. Definition and Measurement of Variables

Variable	Definition	Measurement	Transformation	Expected Effect
GDP growth (gGDP)	Regional economic growth rate	Gross Domestic Product of region i in year t	First difference of logarithm:	Dependent variable
GFCF	Gross Fixed Capital Formation	Total investment in fixed assets in region i	Natural logarithm: $\ln(\text{GFCF})$	Positive
EMP	Employment	Total number of employed persons in region i	Natural logarithm $\ln(\text{EMP})$	Positive
NETMIGR	Net migration rate	Net migration flows divided by regional population	Per capita indicator	Positive
NATBAL	Natural population balance	Difference between births and deaths divided by regional population	Per capita indicator	Ambiguous
Lagged GDP	Initial income level	GDP per region in previous period	Natural logarithm, lagged by one period	Negative (convergence)

Table 2. Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
gGDP	.0376	.0518	-.253	.690
lnGDP	10.394	1.080	7.078	13.628
lnGFCF	8.817	1.114	5.245	12.146
lnEMP	6.346	.902	2.639	8.649
NETMIGR	5.220	16.158	-149.43	169.233
NATBAL	-2.316	9.719	-69.174	116.971

The descriptive statistics highlight substantial variation across European regions over the period of analysis. Investment and employment levels display considerable dispersion, reflecting differences in regional productive capacity and economic structure. Demographic indicators such as net migration and natural population change also vary significantly across regions, suggesting heterogeneous demographic dynamics within the European regional system. Such variation supports the use of panel data techniques that exploit both cross-regional differences and temporal dynamics.

3.2. Econometric Specification

Model (1) Growth model

To identify the contemporaneous drivers of regional growth, the baseline specification relates regional GDP growth to investment, labour input, and demographic dynamics:

$$gGDP_{it} = \beta_1 \ln(\text{GFCF}_{it}) + \beta_2 \ln(\text{EMP}_{it}) + \beta_3 \text{NETMIGR}_{it} + \beta_4 \text{NATBAL}_{it} + \mu_i + \tau_t + \varepsilon_{it} \quad (2)$$

where μ_i are region fixed effects capturing time-invariant structural characteristics (geography, sectoral composition, long-run institutions, persistent productivity differentials), and τ_t are year fixed effects capturing common shocks (European business cycle, EU-wide

policy shifts, crisis episodes). The demographic variables are introduced in population-normalised form, such that $NETMIGR_{it}$ and $NATBAL_{it}$ reflect migration and natural change rates rather than size-driven level effects.

Model (2): Absolute β -convergence

To test whether regions with lower initial GDP levels tend to record faster subsequent growth, the analysis first estimates an absolute β -convergence specification:

$$gGDP_{it} = a + \gamma \ln(GDP_{i,t-1}) + \mu_i + \tau_t + \varepsilon_{it} \quad (3)$$

A negative and statistically significant γ is consistent with β -convergence, indicating that regions with lower initial income levels exhibit higher subsequent growth rates, conditional only on time-invariant regional heterogeneity and common time shocks.

Model (3): Conditional β -convergence (main model)

$$gGDP_{it} = a + \gamma \ln(GDP_{i,t-1}) + \beta_1 \ln(GFCF_{it}) + \beta_2 \ln(EMP_{it}) + \beta_3 NETMIGR_{it} + \beta_4 NATBAL_{it} + \mu_i + \tau_t + \varepsilon_{it} \quad (4)$$

This formulation allows convergence to be assessed net of investment accumulation, labour dynamics, and demographic change, thereby aligning the empirical design with standard growth theory and the regional convergence literature.

To ensure that inference is not driven by restrictive assumptions on the disturbance process, robustness is assessed using an alternative estimator that accommodates serial correlation and heterogeneous regional components. Specifically, the baseline growth framework is re-estimated under a mixed (random-effects) structure with AR(1) correlation in idiosyncratic errors. Inference is based on heteroskedasticity-consistent standard errors in the fixed-effects models (HC-type corrections), given the typical presence of heteroskedasticity in macro-regional panels. Importantly, the robustness specification is treated as a sensitivity check: the preferred identification of within-region effects is obtained from the two-way fixed-effects estimations

3.3. Regional Development Groups

To account for structural heterogeneity across European regions, the analysis incorporates the classification of regional development levels used in the European Union's Cohesion Policy framework (European Commission, 2021). According to this classification, NUTS-2 regions are grouped into three development categories based on their GDP per capita relative to the EU average: less developed regions, transition regions, and more developed regions. Regions with GDP per capita below 75% of the EU average are classified as less developed regions, those with GDP per capita between 75% and 100% are defined as transition regions, and regions with GDP per capita above 100% are categorized as more developed regions.

The classification of regions into development groups is treated as time-invariant (fixed) throughout the analysis. This approach reflects the institutional logic of the EU Cohesion Policy framework, where regional development status is determined based on multi-year averages of GDP per capita and used to guide structural funding allocations over programming periods. Treating the development category as fixed avoids potential endogeneity that could arise if regions were allowed to switch categories over time due to short-term fluctuations in income.

To examine whether the determinants of economic growth differ across levels of development, the conditional convergence model is estimated separately for each regional group: less developed, transition, and more developed regions:

$$gGDP_{it} = a_g + \gamma_g \ln(GDP_{i,t-1}) + \beta_1 \ln(GFCF_{it}) + \beta_2 \ln(EMP_{it}) + \beta_3 NETMIGR_{it} + \beta_4 NATBAL_{it} + \mu_i + \tau_t + \varepsilon_{it} \quad (5)$$

where i indexes regions belonging to development group g , t denotes time, and μ_i and τ_t represent region and year fixed effects respectively. The group-specific coefficients γ and β allow both the speed of convergence and the marginal effects of structural and demographic variables to differ across development regimes.

Estimating the growth model separately for each development group provides insights into whether investment accumulation, labour dynamics, and demographic changes exert heterogeneous effects across regions with different structural characteristics. This approach allows the empirical assessment of whether convergence dynamics and the impact of structural and demographic factors differ systematically across regions with different development levels.

4. Results

The baseline estimations examine the determinants of regional economic growth across European NUTS-2 regions using alternative model specifications (Table 3). The fixed-effects growth model suggests that investment and demographic dynamics contribute to regional growth, although the magnitude and significance of the effects vary across specifications.

Gross fixed capital formation exhibits a positive and statistically significant association with regional growth in the baseline fixed-effects specification ($\beta = 0.027$, $p < 0.01$), indicating that higher levels of investment are associated with faster economic expansion across regions. However, this effect becomes weaker and negative in the mixed-effects robustness specification ($\beta = -0.009$, $p < 0.01$), suggesting that the estimated impact of investment may depend on the modelling of regional heterogeneity and serial correlation.

Employment does not display a stable relationship with growth across specifications. The coefficient is not statistically significant in the fixed-effects growth model, whereas it becomes positive and statistically significant in the robustness specification ($\beta = 0.012$, $p < 0.01$). This result indicates that labour dynamics may contribute to regional growth once the disturbance structure allows for serial correlation and random regional components.

Net migration exhibits a positive and statistically significant effect across models, although the magnitude of the coefficient remains small due to the scale of the variable. The results therefore suggest that regions experiencing higher net migration tend to exhibit slightly stronger growth dynamics. In contrast, the natural population balance does not appear to have a systematic influence on regional growth.

The convergence specifications provide additional insights into regional income dynamics. In the absolute β -convergence model, the coefficient of lagged GDP per capita is negative and statistically significant ($\gamma = -0.094$, $p < 0.01$), indicating that poorer regions tend to grow faster than richer ones. This finding provides empirical evidence of regional income convergence across European regions.

When structural and demographic controls are introduced in the conditional convergence specification, the coefficient of lagged GDP per capita remains negative and statistically significant ($\gamma = -0.133$, $p < 0.01$). The persistence of the convergence suggests that regional income disparities tend to diminish over time even after controlling for investment, labour dynamics, and demographic changes.

The baseline estimations indicate that regional growth in Europe is associated with investment activity and migration dynamics, while the results also provide evidence supporting the existence of β -convergence across European regions.

Table 3. Regional Growth Models and β -Convergence Estimates

Variables	(1) Growth model (FE)	(2) Growth model (Robustness: Mixed)	(3) Absolute β - convergence	(4) Conditional β - convergence
lnGDP(t-1)			-0.094*** (0.029)	-0.133*** (0.032)
lnGFCF	0.027*** (0.008)	-0.009*** (0.002)		0.057*** (0.014)
lnEMP	-0.026 (0.020)	0.012*** (0.002)		-0.016 (0.019)
NETMIGR	0.000*** (5.09e-05)	0.000*** (6.49e-05)		0.000*** (4.61e-05)
NATBAL	0.000 (0.000)	0.000*** (0.000)		0.000* (0.000)
Regional effects	Fixed	Random	Fixed	Fixed
Year fixed effects	Yes	Yes	Yes	Yes
AR(1) correlation	No	Yes	No	No
Observations	2,710	2,710	2,710	2,710
R ²	0.632		0.642	0.658
Adjusted R ²	0.595		0.606	0.624

Note: Robust standard errors reported in parentheses. ***p < 0.01, **p < 0.05, *p < 0.10.

Table 4 reports the estimation results of the conditional β -convergence model for the three regional development groups defined by the EU Cohesion Policy classification: less developed, transition, and more developed regions. The results reveal notable heterogeneity in the convergence dynamics across regional development groups. The coefficient of lagged GDP per capita becomes progressively larger in absolute value as the level of development increases, ranging from -0.117 in less developed regions to -0.145 in transition regions and -0.220 in more developed regions. This pattern indicates that the convergence process appears to be stronger among more developed regions.

Gross fixed capital formation is positively associated with regional economic growth in all development groups. The coefficient is 0.033 ($p < 0.05$) in less developed regions, 0.085 ($p < 0.01$) in transition regions, and 0.057 ($p < 0.10$) in more developed regions. Employment displays heterogeneous patterns across regional groups. The coefficient is negative and statistically significant in less developed regions (-0.084 , $p < 0.01$), while it is positive but statistically insignificant in transition regions (0.037). In more developed regions the coefficient becomes positive and statistically significant at the 10% level (0.137).

Net migration does not exhibit a statistically significant effect in less developed regions, whereas it is positive and statistically significant in both transition regions and more developed regions. Natural population balance is statistically insignificant in less developed and transition regions, while a positive and statistically significant coefficient is observed in more developed regions.

The explanatory power of the model varies across development groups. The R² values are 0.777 for less developed regions, 0.738 for transition regions, and 0.573 for more developed regions, with adjusted R² values of 0.751 , 0.706 , and 0.526 respectively. All specifications include regional and year fixed effects.

Table 4. Conditional β -Convergence Estimates by Regional Development Club

Variables	Less developed	Transition	More developed
lnGDP(t-1)	-0.117*** (0.018)	-0.145*** (0.032)	-0.220** (0.106)
lnGFCF	0.033** (0.013)	0.085*** (0.023)	0.057* (0.033)
lnEMP	-0.084*** (0.025)	0.037 (0.030)	0.137* (0.070)
NETMIGR	0.000 (9.845e-5)	0.000*** (0.000)	0.000*** (8.786e-5)
NATBAL	0.000 (0.000)	0.001 (0.001)	0.001*** (0.000)
Regional effects	Fixed	Fixed	Fixed
Year fixed effects	Yes	Yes	Yes
Observations	850	739	1121
R ²	0.777	0.738	0.573
Adjusted R ²	0.751	0.706	0.526

The empirical findings highlight the presence of regional income convergence across European regions, while also revealing substantial heterogeneity in the determinants of growth across development levels. Investment activity and migration dynamics appear to be consistently associated with regional economic performance, whereas the role of labour and demographic variables varies across regional groups. At the same time, the convergence estimates indicate that the adjustment process differs across development categories, suggesting that regional growth dynamics are not uniform across the European territory. These results provide the empirical basis for further discussion of the mechanisms underlying regional growth and convergence patterns in Europe.

5. Discussion

The results indicate that regional growth in Europe still follows a convergence pattern, but not one that can be interpreted as automatic or spatially uniform. The negative and significant coefficient of initial income supports the view that lower-income regions tend to grow faster. At the same time, the persistence of this effect after the introduction of structural and demographic controls suggests that catching-up depends on the conditions under which regional adjustment takes place. This interpretation is in line with evidence showing that the Great Recession disrupted earlier convergence dynamics and reinforced the emergence of differentiated regional paths rather than a single common trajectory (Mazzola and Pizzuto, 2020). More recent work further suggests that European regional dynamics are better understood in terms of multiple convergence clubs, rather than full convergence across all regions (Pintera, 2024). This reading is also consistent with evidence that the COVID-19 shock further affected the spatial pattern of regional convergence within the European Union (Jankiewicz, 2024).

Seen from this angle, the positive role of gross fixed capital formation is one of the most important findings of the analysis. Investment appears to operate not simply as a correlational growth factor, but as an indicator of a region's ability to expand productive capacity and sustain adjustment. This interpretation is consistent with recent evidence showing that EU cohesion-related resources contribute positively to regional growth, although their effectiveness tends to weaken under conditions of high macroeconomic uncertainty (Pinar and Karahasan, 2024). At the same time, the literature also suggests that the developmental returns of such resources depend on the institutional quality and economic structure of recipient regions (Rodríguez-Pose and Garcilazo, 2015; Percoco, 2017). More broadly, this is in line with the view that territorial capital shapes the capacity of regions to convert policy support and investment into stronger development outcomes (Fratesi and Perucca, 2019). For the present results, this suggests that where investment contributes positively to growth, it may capture not only capital accumulation itself, but also a broader developmental capacity that enables regions to translate resources into output gains more effectively.

The migration results are consistent with this broader pattern. The positive association between net migration and regional growth suggests that demographic mobility forms part of the growth process rather than a secondary background trend. Migration can renew the labour force, alter the composition of skills, and support local demand, but its effects are unlikely to be uniform across regions. Recent regional evidence shows that internal migration can stimulate growth while at the same time slowing convergence, especially when flows involve more productive and mobile population groups moving towards stronger regions (Centofanti et al., 2024; Incaltarau et al., 2021; González et al., 2024). This helps explain why migration in the present study appears to be more growth-supportive in transition and more developed regions than in less developed ones: the contribution of population inflows seems to depend on whether the receiving regional economy has the productive structure and absorptive capacity needed to translate those inflows into sustained growth.

The results also suggest that ageing does not exert a uniformly negative effect on regional growth. Recent evidence indicates that the economic consequences of ageing vary across regions and depend on the spatial organization of labour markets and demographic dynamics (Nicolini and Roig, 2024; Prenzel, 2021). In parallel, research on migration and regional development shows that population movements can either reinforce or offset these pressures, depending on the capacity of regions to attract and retain economically active populations (OECD, 2022). This perspective is particularly relevant considering evidence that the attractiveness of regions as places of settlement and adjustment is itself spatially differentiated, with territorial conditions shaping migration choices and demographic redistribution (Anastasiou and Duquenne, 2020). From this perspective, population ageing is less an automatic constraint on growth than a demographic process whose effects are mediated by broader territorial conditions.

The differences across development groups are substantively important, because they show that the determinants of regional growth operate with varying intensity across less developed, transition, and more developed regions. This suggests that convergence in Europe unfolds through distinct regional growth regimes rather than through a single and homogeneous adjustment mechanism. Recent evidence indicates that regional inequality in Europe has increasingly been driven by the faster progress of already stronger regions, while persistent differences in performance are reinforced by capital intensity, knowledge-related assets, and agglomeration economies (Gómez-Tello et al., 2025). More broadly, this is consistent with the view that spatial concentration, specialization, and the geography of highly productive activities continue to shape uneven regional development across Europe (Hudecz, 2020; Iammarino et al., 2019). Convergence may still be present, but it takes place within a regional system in which stronger regions retain structural advantages in translating investment, labour-market dynamics, and demographic change into growth.

Taken together, the findings support a conditional interpretation of regional convergence in Europe. The key issue is not simply whether poorer regions catch up, but whether they possess the productive and demographic conditions that enable effective adjustment. From this perspective, the coexistence of convergence and persistent disparities is not contradictory. European regions may converge within clubs while the wider regional system remains fragmented by differences in innovative capacity, manufacturing specialization, and metropolitan advantage (Pintera, 2024). The present results point in the same direction: convergence exists, but its pace and substantive content vary with territorial structure.

From a policy perspective, this means that cohesion cannot rely on passive diffusion effects alone. If investment matters but its return depends on territorial conditions, and if migration is growth-enhancing only in regions with sufficient absorptive capacity, then regional policy must intervene more directly in the structural features that shape adjustment. In practical terms, the findings support a differentiated policy approach aimed at strengthening productive capacity in weaker regions, improving the local conditions under which investment becomes effective, and treating demographic pressures not as isolated social trends but as part of the regional growth challenge itself. This is consistent with recent evidence showing that growth-supporting policies in Europe are more effective when they recognize territorial heterogeneity rather than assuming a uniform adjustment mechanism across regions (Pinar and Karahasan, 2024; Nicolini and Roig, 2024).

6. Conclusions

This paper examined regional economic growth and β -convergence across European NUTS-2 regions over the period 2011–2023, with particular emphasis on the role of investment, labour-market conditions and demographic dynamics. The results provide evidence that convergence remains present within the European regional system, as regions with lower initial income levels tend to record faster subsequent growth. At the same time, the findings show clearly that convergence is not an automatic or spatially uniform process. Its pace and intensity depend on the structural conditions under which regional growth takes place.

A central finding of the analysis is the positive role of investment. Gross fixed capital formation is consistently associated with stronger regional growth, suggesting that capital accumulation remains a key mechanism through which regions improve productive capacity and strengthen their development prospects. Migration also emerges as an important factor, particularly in transition and more developed regions, indicating that demographic mobility can support growth when regional economies are able to absorb and utilize population inflows effectively. By contrast, employment and natural population balance display weaker and less stable effects, pointing to a more context-dependent relationship between labour and demographic change, on the one hand, and regional growth, on the other.

The analysis by development group further underlines that European regional growth does not follow a single common path. Less developed, transition and more developed regions differ not only in their speed of adjustment, but also in the way key determinants of growth operate. This finding is particularly important, because it suggests that convergence may coexist with persistent territorial disparities. In other words, the European regional space may display overall catching-up tendencies while remaining structurally uneven.

These results have direct implications for regional policy. If convergence depends on investment capacity, demographic adjustment and the broader structural characteristics of regions, then cohesion cannot be expected to arise through market mechanisms alone. Policies aimed at reducing regional inequalities need to strengthen the productive base of weaker regions, improve their capacity to attract and retain population, and support territorial differentiated development strategies rather than uniform interventions. In this sense, the findings support a place-sensitive understanding of cohesion, one that recognizes the diversity of regional growth regimes across Europe.

The study also has some limitations. The analysis focuses on a selected set of economic and demographic variables and does not explicitly incorporate institutional quality, innovation performance or spatial econometric interdependence, all of which may further shape regional growth trajectories. Future research could extend the present framework by examining these dimensions more directly, while also exploring whether the drivers of convergence differ across longer time periods or under alternative regional classifications.

Overall, the paper shows that regional convergence in Europe remains a meaningful but conditional process. The key issue is not simply whether lagging regions grow faster, but under what structural conditions they are able to do so. Seen from this perspective, regional growth in Europe is better understood as a differentiated process of adjustment shaped by investment, demographic dynamics and persistent territorial heterogeneity.

7. References

- Alexiadis, S., C. A. Ladias, and A. Polo. 2010. Converging and Diverging Regions in the EU: Implications for Regional Policy. *Regional Science Inquiry* 2 (2): 55–70.
- Anastasiou, E. 2020. Modelling Population Shifts to the Rural: Resilience, Attractiveness and Revitalization Issues in the Era of Crisis. *Region and Periphery*, 10: 5–25. <https://doi.org/10.12681/rp.25478>.
- Anastasiou, E., and M.-N. Duquenne. 2020. Determinants and Spatial Patterns of Counterurbanization in Times of Crisis: Evidence from Greece. *Population Review* 59 (2): 85–110. <https://doi.org/10.1353/prv.2020.0004>.
- Barro, R. J., and X. Sala-i-Martin. 1992. Convergence. *Journal of Political Economy* 100 (2): 223–251. <https://doi.org/10.1086/261816>.
- Capello, R., and S. Cerisola. 2023. Industrial Transformations and Regional Inequalities in Europe. *The Annals of Regional Science* 70 (1): 15–28. <https://doi.org/10.1007/s00168-021-01097-4>.

- Centofanti, F., R. Basile, F. Licari, and J. Pitari. 2024. "The Effect of Internal Migration on Regional Growth in Italy: A Dynamic Spatial Panel Data Analysis." *Investigaciones Regionales – Journal of Regional Research*. Advance online publication. <https://doi.org/10.38191/iirr-jorr.24.035>.
- Constantin, D.-L., and C.-A. Volintiru. 2024. Place-Based Policy Responses to Spatial Inequalities. *Regional Science Inquiry* 16 (2): 43–62.
- Costa, À., V. Galletto, J. Garcia, et al. 2024. Evolution of the Convergence in the European Regions: 2000–2019. *The Annals of Regional Science* 73: 1625–1648. <https://doi.org/10.1007/s00168-024-01308-8>.
- European Commission. 2021. *New Cohesion Policy*. Brussels: European Commission.
- European Investment Bank. 2024. *Investment Report 2023/2024: Transforming for Competitiveness*. Luxembourg: European Investment Bank. https://www.eib.org/files/publications/20240354_investment_report_2024_en.pdf. (accessed February 8, 2026)
- Fratesi, U., and G. Perucca. 2019. EU regional development policy and territorial capital: A systemic approach. *Papers in Regional Science* 98 (1): 265–281. <https://doi.org/10.1111/pirs.12360>
- Gkatsikos, A., and A. Christoforidis. 2025. Regional Income Inequality and EU Cohesion Policy in Greece: Convergence Dynamics, 2001–2022. *GeoJournal* 90: 201. <https://doi.org/10.1007/s10708-025-11449-8>.
- Gómez-Tello, A., M.-J. Murgui-García, and M.-T. Sanchis-Llopis. 2025. Labour productivity disparities in European regions: The impact of agglomeration effects. *The Annals of Regional Science* 74 (3): 69–123. <https://doi.org/10.1007/s00168-025-01400-7>.
- González, M. C. B., M. Jandrić, D. Molnar, and S. Tanasković. 2024. The effects of internal migration on regional convergence: Evidence from Serbia. *Papers in Regional Science* 103 (6): 100062. <https://doi.org/10.1016/j.pirs.2024.100062>.
- Grodzicki, T., and M. Jankiewicz. 2024. Economic Growth in the Balkan Area: An Analysis of Economic β -Convergence. *Acta Geographica Slovenica* 64 (2). <https://doi.org/10.3986/AGS.12797>.
- Hudecz, G. 2020. Regional disparities in Europe: Should we be concerned? ESM Discussion Paper 13. Luxembourg: European Stability Mechanism.
- Incaltarau, C., G. C. Pascariu, A. Duarte, and P. Nijkamp. 2021. Migration, regional growth and convergence: A spatial econometric study on Romania. *The Annals of Regional Science* 66 (3): 497–532.
- Iammarino, S., A. Rodríguez-Pose, and M. Storper. 2019. Regional inequality in Europe: Evidence, theory and policy implications. *Journal of Economic Geography* 19 (2): 273–298. <https://doi.org/10.1093/jeg/lby021>
- Jankiewicz, M. 2024. Economic Convergence in the European Union at the Regional Level with Particular Attention to the Impact of the COVID-19 Pandemic: A Spatio-Temporal Approach. *Bulletin of Geography. Socio-economic Series* 63: 65–74. <http://doi.org/10.12775/bgss-2024-0005>.
- Kallioras, D., S. Niavis, G. Petrakos, and M. Tsiapa. 2025. Regional Business Cycles Synchronization and Regional Inequalities in the EU. *Regional Science Inquiry* 17 (2): 37–51.
- Kallioras, D., N. Tzeremes, P. Tzeremes, and M. Adamakou. 2021. Technological Change, Technological Catch-Up and Market Potential: Evidence from the EU Regions. *Regional Science Inquiry* 13 (1): 135–151.
- Mankiw, N. G., D. Romer, and D. N. Weil. 1992. A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics* 107 (2): 407–437. <https://doi.org/10.2307/2118477>.
- Mazzola, F., and Pizzuto, P. 2020. Great Recession and club convergence in Europe: A cross-country, cross-region panel analysis (2000–2015). *Growth and Change* 51 (2): 676–698. <https://doi.org/10.1111/grow.12369>.
- Nicolini, R., and J. L. Roig. 2024. The Spatial Dimension of Ageing and Growth in European Regions. *The Annals of Regional Science* 73: 1649–1679. <https://doi.org/10.1007/s00168-024-01311-z>.
- OECD. 2022. *The Contribution of Migration to Regional Development*, OECD Regional Development Studies, OECD Publishing, Paris, <https://doi.org/10.1787/57046df4-en>.
- Percoco, M. 2017. Impact of European Cohesion Policy on regional growth: does local economic structure matter? *Regional Studies* 51 (6): 833–843. <https://doi.org/10.1080/00343404.2016.1213382>.
- Petrakos, G., P. Artelaris, and D. Kallioras. 2021. Convergence and Public Debt in the European Union: An Overlooked Trade-Off? *Regional & Federal Studies* 31 (5): 671–688. <https://doi.org/10.1080/13597566.2020.1809382>.
- Pina, Á., and P. Sicari. 2021. *Enhancing Regional Convergence in the European Union*. OECD Economics Department Working Papers 1696. Paris: OECD Publishing. <https://doi.org/10.1787/253dd6ee-en>.

- Pinar, M., and B. C. Karahasan. 2024. Asymmetric Effects of EU Cohesion Policy on EU Regional Growth: The Role of Macroeconomic Uncertainty. *Journal of Economic Asymmetries* 30: e00382. <https://doi.org/10.1016/j.jeca.2024.e00382>.
- Pintera, J. 2024. Regional convergence in the European Union – Factors of growth between the great recession and the COVID crisis. *Economic Systems*, 48(1), 101169. <https://doi.org/10.1016/j.ecosys.2023.101169>.
- Polyzos, S., and D. Tsiotas. 2025. Spatial Disparities in the European Union: A Macroscopic Review. *Regional Science Inquiry* 17 (1): 13–36.
- Prenzel, P. 2021. Are old regions less attractive? Interregional labour migration in a context of population ageing. *Papers in Regional Science* 100 (6): 1429–1448. <https://doi.org/10.1111/pirs.12627>
- Rodríguez-Pose, A. 2018. The Revenge of Places That Don't Matter (and What to Do about It). *Cambridge Journal of Regions, Economy and Society* 11 (1): 189–209. <https://doi.org/10.1093/cjres/rsx024>.
- Rodríguez-Pose, A., and E. Garcilazo. 2015. Quality of government and the returns of investment: Examining the impact of cohesion expenditure in European regions. *Regional Studies* 49 (8): 1274–1290. <https://doi.org/10.1080/00343404.2015.1007933>
- Sala-i-Martin, X. X. 1996. The Classical Approach to Convergence Analysis. *The Economic Journal* 106 (437): 1019–1036. <https://doi.org/10.2307/2235375>
- Tsiotas, D., and S. Polyzos. 2025. Spatial Patterns of Development in the European Union: A Review. *Theoretical and Empirical Researches in Urban Management* 20 (2): 5–31.