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MEASURING ECONOMIC INTEGRATION OF IMMIGRANTS: DEVELOPMENT AND EMPIRICAL VALIDATION OF THE EIIM INDEX IN EU REGIONS

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Abstract. Immigration has become a structural driver of economic development in the European Union, yet its economic impact varies significantly across regions. These differences suggest that immigration scale alone does not explain macroeconomic outcomes; rather, the quality of immigrants' economic integration plays a decisive role. However, existing research typically measures integration using isolated labour market indicators or policy-based indices without constructing a unified framework for assessing economic integration. This study develops the Economic Immigrant Integration Index (EIIM) and assesses its macroeconomic relevance. EIIM treats integration as a multidimensional economic phenomenon and combines four standardized components: migration policy quality, employment convergence between immigrants and native-born populations, income convergence, and a fiscal participation indicator adjusted for regional unemployment levels. Using data from five European regions, the empirical analysis applies OLS regressions with log-transformed regional GDP as the dependent variable and includes immigration intensity together with selected macroeconomic controls. The results show that immigration intensity is consistently the strongest and most robust correlate of regional log(GDP) across all five European regions. EIIM is positively associated with GDP in bivariate models in most regions. However, its independent contribution is region-specific. In reduced multivariate specifications, EIIM remains positive and statistically significant in Central and Southern Europe, indicating additional explanatory power beyond immigration scale. In Eastern Europe, EIIM becomes statistically significant only after controlling for immigration intensity and net migration, with a small coefficient suggesting limited economic relevance relative to scale effects. In Western Europe, EIIM is not robust once migration scale and migration-flow dynamics are included. Overall, the findings indicate that migration scale and integration quality represent distinct dimensions, but the macroeconomic relevance of integration quality varies across European regions. EIIM therefore offers a transparent and policy-relevant tool for comparative assessment of economic integration performance in Europe.

Keywords: economic immigrant integration, EIIM, regional economic performance, European Union, institutional quality, integration measurement, macroeconomic analysis.

JEL Classification: F22, J61, O15, C51.

1. Introduction

Immigration has become a structural feature of contemporary European economies. Over the past decades, demographic ageing, labour shortages and increasing international mobility have reshaped labour markets and fiscal systems across the European Union. Foreign-born populations now represent a growing share of the workforce in many regions, influencing productivity dynamics, public finance sustainability and long-term economic growth patterns. As a result, immigration is no longer treated solely as a demographic or social issue, but increasingly as an economic phenomenon with measurable macroeconomic implications.

However, the economic consequences of immigration remain uneven across European regions. While some regions experience faster labour market absorption and greater income convergence among immigrants, others face persistent employment gaps, wage differentials and fiscal imbalances. These differences suggest that immigration alone does not determine economic outcomes. Rather, the quality of economic integration appears to be an important determinant. Research indicates that labour market participation and earnings convergence

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significantly influence whether immigration contributes positively to growth (Dustmann et al., 2025). Nevertheless, findings remain heterogeneous, partly due to differences in measurement approaches. One of the central methodological challenges in migration research is the fragmented measurement of integration. Integration is frequently assessed using separate indicators such as employment rates, income gaps, fiscal contributions or policy indices. For instance, institutional measures like the Migrant Integration Policy Index (MIPEX) provide valuable information about legal and policy frameworks but do not directly capture actual economic performance outcomes. Labour market indicators reflect observed outcomes but may overlook institutional conditions shaping integration processes. This separation between policy context and economic outcomes limits the ability to evaluate integration as a coherent economic construct.

From a regional economic perspective, integration should be understood as a multidimensional process linking institutional quality, labour market convergence and fiscal participation. Regions differ in their economic structures, governance capacity and demographic composition, which may influence how effectively immigrants are absorbed into productive activities. Without a consolidated measure capturing these dimensions simultaneously, it becomes difficult to compare integration regimes or assess their macroeconomic relevance.

To address this methodological gap, the present study develops the Economic Immigrant Integration Index (EIIM), designed to quantify economic integration in a composite and systematic manner. The index integrates four core dimensions: institutional policy quality, employment convergence between immigrants and native-born populations, income convergence, and a fiscal participation component reflecting labour market contribution under prevailing unemployment conditions. By combining these elements into a standardized composite measure, EIIM seeks to bridge the gap between policy-based and outcome-based indicators of integration. The empirical analysis is conducted at the regional level, using aggregated data for five European regions: Northern, Western, Southern, Central and Eastern Europe over the period 2009–2024. The regional approach allows for the identification of structural economic patterns rather than country-specific features. Given substantial heterogeneity in economic size and demographic composition across regions, the dependent variable is specified in logarithmic form (log GDP), enabling interpretation in proportional terms and improving statistical stability.

The central research question guiding this study is whether higher levels of economic integration, as captured by EIIM, are associated with stronger regional economic performance. Rather than focusing on immigration scale alone, the analysis evaluates integration quality as a structural determinant of macroeconomic outcomes. In doing so, the study contributes to the literature in three ways. First, it proposes a theoretically grounded composite measure of economic integration. Second, it provides an empirical assessment of the macroeconomic relevance of this measure using regional data. Third, it shifts the analytical focus from migration quantity to integration quality as a measurable economic mechanism. By offering a systematic framework for assessing economic integration across regions, the study aims to support more evidence-based policy evaluation and comparative analysis within the European context. Understanding integration not merely as a social objective but as an economic construct may enhance the design of governance strategies capable of translating migration into sustainable growth. Based on the theoretical framework, the study hypothesizes that higher levels of economic integration quality (EIIM) are positively associated with regional macroeconomic performance, controlling for immigration intensity and structural macroeconomic factors.

2. Literature review

Immigration has become one of the most structurally transformative processes in contemporary Europe, reshaping labour markets, demographic structures and fiscal systems. However, empirical evidence consistently demonstrates that the economic consequences of immigration are neither automatic nor homogeneous across countries. Instead, economic outcomes depend on a complex interaction between migration flows, institutional frameworks and the quality of immigrant integration.

Immigration is often treated as a form of human capital mobility. Classical labour market approaches emphasize wage differentials, employment opportunities and structural labour shortages as primary drivers of migration flows (de Haas et al., 2019). Income gaps and employment probabilities remain important determinants of labour migration, particularly in the European context (Engler et al., 2023). However, migration dynamics cannot be reduced to wage differentials alone. Structural demographic ageing, institutional regimes and social networks significantly shape both migration intensity and its long-term economic effects (Gethin & Piketty, 2022).

While immigration may expand labour supply and mitigate demographic decline, its macroeconomic impact depends on integration trajectories. Dustmann et al. (2025) demonstrate that employment absorption and sectoral allocation strongly influence productivity outcomes. Immigration can generate growth effects when immigrants complement native workers and fill structural labour shortages. If immigrants remain concentrated in low productivity segments or experience persistent employment gaps, aggregate productivity gains remain limited.

A distinction is commonly drawn between economic and social dimensions of integration. Economic integration typically refers to employment convergence, income convergence and fiscal participation (Dustmann & Frattini, 2014). Social integration encompasses language acquisition, educational inclusion, institutional access and anti-discrimination

frameworks (Ager & Strang, 2008). These dimensions are interdependent: weak social integration may hinder labour market convergence, while successful economic integration can strengthen social cohesion.

From a macroeconomic perspective, integration operates as a transmission mechanism between immigration and economic performance. Jaumotte et al. (2016) show that immigration contributes positively to GDP growth in advanced economies when labour market participation increases and skill complementarities are realized. Similarly, Caselli et al. (2024) highlight that immigration can offset demographic decline and sustain potential output, but only when employment participation and productivity effects materialize.

Fiscal impacts constitute another central research stream. Empirical findings suggest that working-age immigrants often become net contributors over the long term, although short-term integration costs may be significant (Organisation for Economic Co-operation and Development [OECD], 2024). The fiscal balance depends on employment stability, wage convergence and institutional absorption capacity. In regions where migrants integrate rapidly into formal labour markets, fiscal neutrality or positive contributions are more likely. Where integration is delayed, social expenditure pressures increase.

Beyond labour and fiscal channels, productivity and innovation effects receive growing attention. High-skilled immigration has been associated with patenting activity, technological diffusion and entrepreneurial dynamism (Bongers et al., 2022). However, the magnitude of these effects depends on qualification recognition and occupational mobility. OECD (2023) reports that up to one-third of immigrants in Europe are overqualified for their jobs, indicating substantial human capital underutilization. Recent research shows that technological change, including digitalization and novel technologies, affects migrant employment patterns, with heterogeneous effects across occupations and educational groups in EU labour markets (Ghodsi et al., 2024). More broadly, emerging evidence suggests that artificial intelligence is changing task content, skill demand and wage structures in advanced European labour markets, which is relevant for the employment and income convergence dimensions of immigrant integration (Engberg et al., 2025).

Regional heterogeneity remains a defining feature of European immigration outcomes. Northern and Western European countries often demonstrate faster employment convergence, supported by active labour market policies and structured integration programmes (European Commission, 2024). Southern European countries, by contrast, experience greater labour market segmentation and informality, which may delay fiscal returns (FRONTEX, 2024). Central and Eastern European countries face demographic shrinkage and labour shortages, positioning immigration as a stabilizing factor rather than purely a growth accelerator (OECD & European Union, 2023).

Despite this, integration measurement remains fragmented. Many empirical studies evaluate single indicators: employment rates, wage gaps or fiscal balances, without constructing a unified economic integration framework. Standardized statistical datasets such as OECD's Settling In indicators and Eurostat migrant integration statistics provide harmonized comparative measures (OECD & European Union, 2023). However, these indicators are rarely aggregated into composite economic measures directly linked to macroeconomic modelling.

Similarly, the Migrant Integration Policy Index (MIPEX) captures institutional policy frameworks but does not directly measure labour market or income convergence outcomes (Huddleston et al., 2022). Consequently, institutional quality and economic performance are often analysed separately rather than as integrated dimensions of a broader economic integration construct.

Methodologically, existing models can be grouped into four categories. First, single-dimension labour market models focus on wage and employment convergence (Adda et al., 2021). Second, multidimensional but non-aggregated approaches analyse employment, income and skill mismatch separately (Dauth et al., 2014). Third, mediation models treat integration as an intermediate channel between migration and macroeconomic outcomes (Jaumotte et al., 2016). Fourth, policy-based index approaches rely on institutional measures such as MIPEX.

While these approaches provide valuable insights, they share a common limitation: economic integration is rarely operationalized as a composite economic construct combining employment convergence, income convergence, fiscal participation and institutional context within a unified empirical framework. As a result, empirical research often tests the direct impact of immigration volume rather than distinguishing between migration scale and integration quality.

The literature therefore suggests a conceptual gap. Immigration scale alone does not determine macroeconomic performance, as integration quality acts as a structural moderator. However, there is limited empirical research constructing a standardized economic integration index suitable for regional macroeconomic modelling across Europe.

Given Europe's structural heterogeneity and region-specific institutional regimes, regional-level analysis becomes particularly relevant. Aggregating countries into structurally similar blocks, such as Northern, Western, Southern, Central and Eastern Europe, allows identification of broader integration patterns while reducing country-specific features. Such an approach aligns with comparative integration research emphasizing institutional clusters and welfare regime differences (Heckmann & Schnapper, 2016).

Economic integration is treated in this study as a multidimensional construct rather than as a single isolated outcome. The rationale for combining the four EIIM components into one composite index is based on the view that institutional conditions, labour market performance, income convergence, and fiscal participation form sequentially linked dimensions of the same

integration process. Institutional quality shapes immigrants' access to employment, rights, and labour market opportunities. Labour market integration, in turn, influences earnings convergence relative to native-born populations, while more stable employment and income convergence increase the likelihood of sustained fiscal participation within the host economy. For this reason, the selected components are interpreted not as unrelated indicators but as complementary dimensions reflecting the broader quality of immigrants' economic incorporation into regional economies. A composite index is therefore methodologically appropriate because it captures the structural coherence of integration as an economic regime rather than reducing it to a single labour market or policy indicator.

In summary, the literature demonstrates three consistent findings. First, immigration may contribute to economic growth, labour market stabilization, and fiscal sustainability. Second, these effects depend on integration outcomes rather than migration volume alone. Third, existing empirical models still measure integration in fragmented ways, limiting the ability to evaluate its broader macroeconomic relevance as a coherent economic process. This conceptual and methodological gap provides the foundation for developing the EIIM, which combines institutional context, employment convergence, income convergence, and fiscal participation into a unified economic measure. By treating integration quality as a quantifiable structural variable, the study contributes to the literature by testing whether regional economic performance in Europe is associated with systematic differences in integration quality rather than migration scale alone. In this sense, EIIM operationalizes economic integration as a broader regional regime rather than as a single observed outcome.

3. Methodology

This study employs a quantitative empirical strategy designed to develop a composite measure of economic immigrant integration and to assess its macroeconomic relevance in relation to regional economic performance in the European Union. The methodological framework consists of three interconnected components: the conceptual construction of the EIIM, the compilation and aggregation of regional data, and the econometric specification used to evaluate the relationship between integration quality and economic outcomes. The research logic follows a structured process of synthesis and empirical verification, whereby theoretical insights and empirical findings are integrated into a coherent analytical system, which represents a more complex form of scientific generalization (Tidikis, 2003).

The central methodological contribution of the study lies in the construction of EIIM as a composite economic integration indicator. The index is designed to capture integration as a multidimensional economic process rather than as a single labour market or policy variable. Conceptually, economic integration is defined here as the degree to which immigrants converge toward native-born populations in labour market participation, income levels, and fiscal contribution, within a given institutional context. The index integrates both outcome-based and institution-based dimensions to reflect the structural nature of integration. The use of a composite indicator approach is consistent with methodological principles of combining multiple characteristics into a unified analytical construct (Pabedinskaitė & Činčikaitė, 2017).

EIIM consists of four standardized components, each normalized to ensure comparability across regions and over time. The first component (I) represents institutional integration quality and is proxied by the migrant integration policy index (MIPEX). MIPEX scores are divided by 100 to rescale the index to a [0,1] interval. This transformation ensures comparability with the remaining components and allows the composite index to retain consistent weighting properties. The second component (U) captures labour market convergence and is operationalized as the ratio between the employment rate of immigrants and the employment rate of native-born populations. A value closer to 1 indicates stronger labour market parity and therefore higher economic integration. The third component (P) measures income convergence and is defined as the ratio between the median income of immigrants and that of native-born populations. As with employment convergence, values approaching unity reflect diminishing income gaps and improved integration outcomes. The fourth component (F) captures fiscal participation capacity and is constructed as the immigrant employment rate adjusted by the overall unemployment rate in the region. This proxy reflects the effective contribution of immigrants to the active labour force under prevailing macroeconomic conditions. By incorporating regional unemployment levels, the indicator accounts for cyclical labour market constraints that may affect fiscal participation. The EIIM is intentionally constructed as a hybrid index combining institutional capacity (MIPEX) with realized economic outcomes and a labour-market based fiscal proxy. This design reflects the view that integration is not only an observed labour market outcome but also a structural regime shaped by policy and institutional conditions.

The composite *EIIM* is calculated as the arithmetic mean of the four components, as shown in Equation (1):

$$EIIM = 0.25\left(I + U + P + F\right). \quad (1)$$

Equal weights are assigned to each component to avoid normative prioritization of any single dimension and to maintain transparency in index construction. While alternative weighting schemes could be applied, the equal-weight approach ensures interpretability and replicability, particularly in policy-oriented applications. The index is bounded between 0 and 1, where higher values indicate stronger economic integration quality.

The empirical analysis is conducted at the regional level. Countries are aggregated into five European

regions: Northern Europe, Western Europe, Southern Europe, Central Europe, and Eastern Europe. This aggregation strategy is chosen for two primary reasons. First, European regions exhibit structurally distinct institutional and labour market regimes, which may influence integration trajectories. Second, regional aggregation reduces country-specific volatility and measurement noise, allowing identification of broader structural patterns (Tidikis, 2003).

The dataset covers the period 2009–2024, resulting in 80 region-year observations (5 regions × 16 years). All variables are compiled from harmonized international statistical sources to ensure cross-regional comparability. Regional values are calculated as arithmetic averages of country-level indicators within each regional block. This aggregation shifts the analytical focus from country-specific dynamics to broader regional regimes, but it may also smooth over internal heterogeneity across member states.

Descriptive statistics are employed to summarize the main characteristics of the dataset, including measures of central tendency and dispersion (Anderson Sweeney, 2014). In this study, descriptive statistics are applied to evaluate the dynamics of immigration intensity (IMM) and integration quality (EIIM) across European regions.

To examine preliminary relationships between variables, correlation analysis is conducted. The purpose of correlation analysis is to determine whether a statistically significant relationship exists between variables X and Y (Pabedinskaitė & Činčikaitė, 2017). The Pearson correlation coefficient (r) may take values within the interval from −1 to 1, where values closer to −1 indicate a strong negative relationship, values closer to 1 indicate a strong positive relationship, and values close to 0 indicate weak or no linear association (Pabedinskaitė & Činčikaitė, 2017). Correlation analysis provides the foundation for subsequent regression modelling.

The dependent variable is regional economic performance, measured as gross domestic product (GDP) expressed in million euros and transformed into natural logarithmic form. The logarithmic transformation is applied to reduce scale differences, enable proportional interpretation of coefficients, and mitigate heteroskedasticity commonly observed in macroeconomic data (Anderson Sweeney, 2014). The logarithmic transformation is applied for three methodological reasons. First, it reduces scale differences between economically larger and smaller regions. Second, it allows coefficient interpretation in proportional terms. Third, it mitigates heteroskedasticity commonly observed in macroeconomic data.

To isolate the association between integration quality and macroeconomic outcomes, several control variables are included. Immigration intensity is measured as the share of foreign-born population relative to total population in each region. This variable distinguishes integration quality from migration scale and prevents conflation between volume and structural performance. Additional controls include net migration rate per 1,000 inhabitants, old-age dependency ratio, tertiary education gross enrolment rate, regional unemployment rate, and trade openness expressed as a percentage of GDP. These controls account for demographic pressure, human capital accumulation, labour market conditions, and external economic exposure.

Regression analysis is employed as the main statistical method. Regression analysis is a statistical method in which mathematical procedures are used to obtain an equation that estimates the influence of one or more explanatory factors on the phenomenon under investigation: the resulting mathematical expression is referred to as a regression equation (Karpuškienė, 2018). When examining the relationship between a dependent variable Y and multiple explanatory variables X_1, X_2, …, X_n, multiple regression analysis is applied, allowing evaluation of Y in relation to all explanatory factors simultaneously (Pabedinskaitė & Činčikaitė, 2017). The baseline econometric specification is estimated using ordinary least squares (OLS), as shown in Equation (2):

$$\log(GDP) = \beta_0 + \beta_1 EIIM + \beta_2 IMM + \beta_3 Controls + \varepsilon. \quad (2)$$

EIIM represents the composite integration index, *IMM* denotes immigration intensity, and controls correspond to the set of demographic and macroeconomic covariates. The error term ε captures unobserved regional influences.

All regressions are estimated using OLS with examination of standard errors and multicollinearity diagnostics. Variance Inflation Factors (VIF) are calculated for the extended specifications to assess the degree of collinearity among explanatory variables. Variables with VIF values exceeding 10 were sequentially removed, starting from the most collinear predictor, until acceptable multicollinearity levels and coefficient stability were achieved in the reduced models. Given the moderate sample size (N = 80), model parsimony is maintained to prevent overfitting.

It is important to note that regional aggregation implies that findings capture structural patterns rather than causal country-level effects. The analysis identifies statistical associations between integration quality and economic performance but does not claim causal inference, which is a typical limitation of macro-level quantitative research designs (Tidikis, 2003). In addition, the association between EIIM and regional GDP should be interpreted as an empirical assessment of the index's macroeconomic relevance rather than as a full validation of EIIM as a measure of integration. The empirical strategy is therefore intended to examine whether the index captures economically meaningful variation across regions, not to establish definitive construct validity on its own.

In summary, the methodological framework integrates index construction, regional aggregation and econometric modelling to assess the macroeconomic relevance of EIIM rather than providing a full validation of the index as a measure of integration. By combining

institutional and outcome-based dimensions within a unified quantitative structure, the study provides a replicable and policy-relevant approach to measuring economic immigrant integration in the European context.

4. Results and discussion

This section presents the empirical findings on the relationship between economic integration quality and regional economic performance. It examines whether higher EIIM levels are associated with stronger macroeconomic outcomes and whether the economic impact of immigration depends on integration quality. The empirical assessment is conducted using region-year data for five European regions over the period 2009–2024 (Table 1).

The EIIM serves as the primary explanatory variable in the empirical models. It is constructed as a composite index combining institutional quality, employment convergence, income convergence, and fiscal participation. Higher EIIM values indicate stronger economic integration of immigrants within the regional economy. The empirical analysis covers all 27 European Union member states. For analytical purposes, countries are grouped into five European regions. Regional-level indicators are constructed by aggregating country-level data within each regional block using arithmetic averages. This aggregation approach allows the identification of structural regional patterns while reducing country-specific volatility.

At the country level, the five highest EIIM values (Table 2) are observed in Poland and Portugal in the late 2010s, reaching levels above 0.89. These values suggest relatively strong institutional performance and labour market convergence in specific national contexts. However, the regional aggregation reveals broader structural patterns.

Table 2. Top 5 highest observed EIIM scores by country and year (source: created by author)

Country	Year	EIIM
Poland	2017	0.93
Portugal	2018	0.90
Portugal	2020	0.89
Poland	2018	0.89
Portugal	2021	0.89

Figure 1 illustrates the evolution of EIIM across five European regions between 2009 and 2024. Northern and Western Europe consistently demonstrate higher integration quality compared to Southern, Central and Eastern Europe. Northern Europe exhibits a steady upward trajectory after 2012, reaching peak values above 0.80 in the early 2020s. Western Europe also shows gradual improvement, stabilizing around 0.74–0.75 in recent years.

Central Europe demonstrates significant improvement over time, particularly after 2014, suggesting institutional strengthening and improved labour market convergence. In contrast, Eastern Europe displays greater volatility, including a notable decline around 2020–2021, before partial recovery. Southern Europe remains relatively stable but below Northern and Western levels.

Table 1. Variable definitions, measurement units and data sources (source: created by author)

Variable	Indicator description	Measurement	Source
GDP	Regional gross domestic product	Million EUR; log-transformed for the regression models	Eurostat (n.d.-b)
EIIM	Composite index of economic immigrant integration	Index from 0 to 1 (higher values indicate stronger integration quality)	Author's calculation
MIPEX	Migration policy quality indicator	Index from 0 to 100 (rescaled to 0–1)	MIPEX (2023)
Employment convergence (U)	Ratio of the immigrant employment rate to the native-born employment rate	Ratio: values closer to 1 indicate convergence	Eurostat (n.d.-a)
Income convergence (P)	Ratio of immigrants' median income to native-born median income	Ratio: values closer to 1 indicate convergence	Eurostat (n.d.-d)
Fiscal participation (F)	Immigrant employment adjusted by regional unemployment	Share; proxy for labour contribution	Eurostat (n.d.-a)
IMM	Share of foreign-born population	% of total population	Eurostat (n.d.-c)
Net migration	Net migration rate	Per 1,000 inhabitants	Eurostat (n.d.-c)
Old-age dependency ratio	Ratio of elderly (65+) to working-age population	%	Eurostat (n.d.-c)
Tertiary education	Gross tertiary enrolment rate	%	World Bank (n.d.-a)
Unemployment rate	Regional unemployment rate	%	Eurostat (n.d.-a)
Trade openness	Exports plus imports as % of GDP	%	World Bank (n.d.-b)

These patterns indicate persistent regional heterogeneity in economic integration quality. The upward trends in several regions suggest gradual institutional and labour market adjustments, yet convergence across regions remains incomplete.

Figure 2 presents the evolution of immigration intensity (IMM) measured as the foreign-born population share. The patterns differ from EIIM dynamics.

Southern and Western Europe demonstrate the highest immigration intensity levels throughout the observed period. Southern Europe shows a particularly strong increase after 2015, reaching approximately 19% by 2024. Western Europe follows a similar but slightly more moderate upward trend.

Northern Europe exhibits steady growth, increasing from approximately 9–10% to nearly 15%. In contrast, Central and Eastern Europe maintain considerably lower immigration intensity levels, although moderate growth is observed after 2018.

Importantly, the regions with the highest immigration intensity are not necessarily those with the highest integration quality. This divergence between IMM and EIIM suggests that migration scale alone does not fully determine integration outcomes or economic performance.

These descriptive patterns indicate that immigration intensity and integration quality do not move uniformly across regions. While some regions combine high immigration levels with strong integration outcomes, others exhibit structural gaps. This observation motivates the correlation and regression analyses that follow, which examine whether integration quality contributes independently to regional economic performance.

To explore the preliminary relationships between variables, Pearson correlation coefficients were calculated separately for each European region (Table 3). The results reveal substantial regional heterogeneity in the association between GDP, immigration intensity, integration quality and macroeconomic controls. All correlations and regression models are estimated using log-transformed GDP to reduce scale effects and improve comparability across structurally heterogeneous regions.

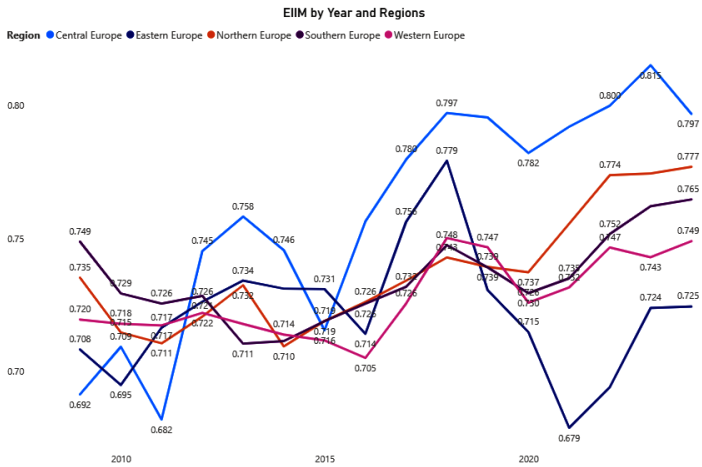

Figure 1. Evolution of EIIM across European regions (source: created by author)

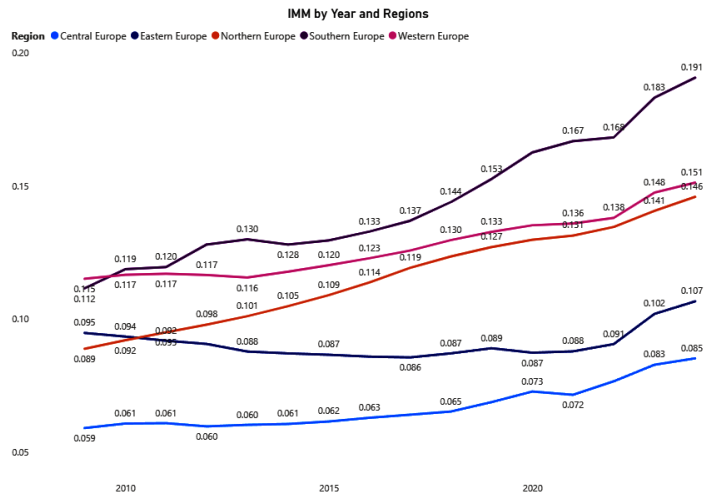

Figure 2. Foreign-Born Population Share (IMM) by European region (source: created by author)

In Central Europe, regional log(GDP) is strongly associated with both immigration intensity and EIIM. A similarly strong positive relationship is also observed for the old-age dependency ratio, whereas unemployment is negatively related to GDP. Taken together, these patterns point to substantial co-movement among key macroeconomic variables and suggest that multicollinearity may become an issue in extended regression models.

A comparable pattern emerges in Southern Europe. Both immigration intensity and EIIM are positively and significantly associated with regional log(GDP), while tertiary education and old-age dependency also display strong positive relationships. Unemployment, by contrast, is negatively associated with GDP. Overall, these results suggest that economic performance in Southern Europe moves closely with both migration scale and integration quality.

Eastern Europe stands out from the other regional cases. Although immigration intensity remains positively associated with GDP, EIIM shows a negative and statistically insignificant bivariate relationship. At the same time, GDP is strongly related to demographic and educational variables, especially old-age dependency and tertiary education. This pattern suggests that broader macro-demographic dynamics may matter more than integration-related factors in explaining regional variation in GDP.

In Northern Europe, immigration intensity and EIIM are again both positively associated with GDP in the bivariate analysis. However, demographic and education-related variables also exhibit very high correlations, pointing to potential multicollinearity once these factors are introduced jointly in multivariate models.

Western Europe shows a similar but slightly weaker pattern. Immigration intensity remains strongly associated with GDP, while EIIM is also positively related to economic performance, although less strongly than in Central or Northern Europe. As in the other regions, the broader set of macroeconomic and demographic indicators displays substantial co-movement.

Overall, the correlation results indicate that immigration intensity is consistently and positively associated with regional GDP across all five European regions. EIIM also shows a positive and statistically significant bivariate association in most cases, with Eastern Europe as the main exception. At the same time, the strong interrelationships among demographic, migration, and macroeconomic variables point to possible multicollinearity in more complex specifications. For this reason, the subsequent regression analysis relies on reduced models aimed at improving coefficient stability and interpretability. Correlation analysis provides a useful first view of the data, but it does not account for joint effects or structural controls. Therefore, multivariate regression models are used to examine whether EIIM retains an independent association with regional economic performance once immigration scale and other macroeconomic factors are considered.

To examine whether economic integration quality is associated with macroeconomic performance, a series of OLS regressions were estimated separately for each European region using annual observations for 2009–2024 (N = 16 per region). Three model types were compared: a bivariate model with immigration intensity (IMM) only, a bivariate model with integration quality (EIIM) only, and an extended specification with EIIM, IMM and control variables.

A key methodological issue in the regional models is multicollinearity among controls, particularly old-age dependency and several macro-structural variables in some regions, reflected in very high VIF values in the extended specifications. Therefore, for interpretability and model stability, variables with VIF values above the accepted threshold were sequentially removed, yielding the reduced specifications discussed below. VIF values before and after model simplification (Table 4).

As shown in Table 4, model simplification substantially reduced multicollinearity across all regional specifications, with final VIF values falling to acceptable levels in the retained reduced models.

After multicollinearity diagnostics and sequential model simplification, the final reduced OLS specifications were retained as the most stable regional models. These models are interpreted as the most stable regional specifications for assessing the relationship between EIIM, immigration intensity, and regional GDP. The discussion below focuses on the most stable reduced specifications per region (Table 5).

Table 3. Pearson correlation coefficients with GDP by European region (source: created by author)

Region	EIIM	IMM	Net migration	Old-age dep.	Education	Unemployment	Trade openness
Central Europe	0.826***	0.931***	0.205	0.966***	0.287	–0.865***	0.584*
Southern Europe	0.765***	0.861***	0.034	0.810***	0.815***	–0.717***	0.796***
Eastern Europe	–0.429	0.661***	0.771***	0.940***	0.841***	–0.825***	0.420
Northern Europe	0.767***	0.904***	0.436	0.942***	0.869***	–0.619*	0.866***
Western Europe	0.691***	0.909***	0.437	0.950***	0.527*	–0.728***	0.388

Note: entries report Pearson correlation coefficients with log(GDP). *** $p < 0.01$, * $p < 0.10$.

Table 4. Variance Inflation Factors (VIF) before and after model simplification (source: created by author)

Region	Model stage	EIIM	IMM	Net migration	Old-age dependency	Education	Unemployment	Trade openness
Central Europe	Before simplification	5.521	8.671	2.615	29.2	3.32	17.07	4.34
Central Europe	Final reduced model	2.015	2.015	–	–	–	–	–
Southern Europe	Before simplification	6.654	42.459	3.784	45.522	67.087	12.991	23.42
Southern Europe	Final reduced model	1.547	1.547	–	–	–	–	–
Eastern Europe	Before simplification	2.048	3.259	5.559	47.083	17.845	20.801	2.969
Eastern Europe	Final reduced model	1.047	1.014	1.06	–	–	–	–
Northern Europe	Before simplification	7.085	38.091	3.269	28.117	9.072	2.219	6.246
Northern Europe	Final reduced model	3.656	3.404	1.144	–	–	–	–
Western Europe	Before simplification	3.281	22.779	2.858	47.863	4.228	19.501	2.248
Western Europe	Final reduced model	–	1.021	1.021	–	–	–	–

Note: VIF values are reported for the extended regional models before simplification and for the final reduced specifications after sequential removal of predictors with VIF > 10. Dashes indicate variables not retained in the final specification.

Table 5. OLS regression results: integration quality and regional GDP (source: created by author)

Region	IMM	EIIM	Controls retained	R^2
Central Europe	1.464***	0.156**	–	0.922
Southern Europe	0.251***	0.240**	–	0.840
Eastern Europe	3.692***	0.054**	Net migration	0.927
Northern Europe	1.107***	–0.104**	Net migration	0.883
Western Europe	0.866***	n.s.	Net migration	0.922

Note: *** $p < 0.01$, ** $p < 0.05$, n.s. = not statistically significant. Reported coefficients are from the final reduced regional specifications.

In Central Europe, both immigration intensity and EIIM are positively associated with regional economic performance. Immigration intensity appears to capture a larger share of the variation when considered on its own, yet EIIM also shows a clear positive relationship with log(GDP). After simplifying the extended model to address multicollinearity, both variables remain statistically significant. This suggests that, in Central Europe, integration quality contributes explanatory information beyond migration scale and should be treated as a distinct dimension of regional macroeconomic performance.

In Southern Europe, a similarly positive pattern emerges. Both immigration intensity and EIIM are associated with higher regional GDP in the bivariate specifications. However, the full model initially reveals substantial multicollinearity among several structural controls. Once the specification is simplified, both EIIM and immigration intensity remain statistically significant. This indicates that, in Southern Europe, integration quality retains an independent association with economic performance and captures variation that cannot be explained by migration scale alone.

Eastern Europe presents a different picture. Immigration intensity is positively associated with regional GDP, whereas EIIM does not show a meaningful positive association when considered separately. After the model is simplified, EIIM becomes statistically significant, but its effect remains comparatively modest. This suggests that, in Eastern Europe, integration quality is linked to regional economic performance only under more restrictive model conditions and appears less important than migration scale and migration dynamics.

In Northern Europe, both immigration intensity and EIIM are positively associated with log(GDP) in the bivariate models. Yet this pattern does not remain stable once additional controls are introduced. After model simplification, immigration intensity and net migration remain positively related to regional GDP, while EIIM enters with a negative coefficient. This result should be interpreted cautiously. It may reflect residual multicollinearity, overlap with broader macroeconomic trends, aggregation effects within the regional grouping, or institutional specificities of Northern European welfare regimes. For this reason, the negative EIIM coefficient

should be interpreted as a region-specific empirical result rather than as direct evidence that stronger integration quality reduces economic performance.

In Western Europe, immigration intensity shows the clearest association with regional GDP, while EIIM is also positively related to GDP in the bivariate specification. However, once migration scale and migration dynamics are considered, EIIM no longer remains robust. The reduced model suggests that macroeconomic variation in Western Europe is captured primarily by immigration intensity and net migration, while EIIM does not provide additional independent explanatory power.

Across the five European regions, immigration intensity remains the most consistent and robust correlate of regional economic performance in the reduced models. In all regions, a higher foreign-born population share is associated with higher regional log(GDP), suggesting that immigration scale is closely linked to broader macroeconomic expansion over the period analysed.

By contrast, the role of the Economic Immigrant Integration Index (EIIM) is more uneven across regions. In Central and Southern Europe, EIIM remains positive and statistically significant, indicating that integration quality contributes additional explanatory value beyond migration scale alone. In Eastern Europe, EIIM becomes significant only after immigration intensity and net migration are considered, and even then, its effect remains relatively modest. In Northern Europe, EIIM enters with a negative coefficient in the reduced model, while in Western Europe it does not remain statistically robust once migration-related controls are included.

Taken together, these findings suggest that migration scale and integration quality should be treated as analytically distinct dimensions of regional economic performance, although their macroeconomic relevance is not uniform across Europe. Immigration intensity appears to function as a broad indicator of long-term regional expansion, whereas the contribution of integration quality appears to be more context-dependent. Where EIIM remains significant, the results support the view that integration quality captures information not reducible to migration scale alone. In other regions, its independent role appears weaker, partly because of overlap with migration trends, regional heterogeneity, and aggregation effects.

Overall, the results support the central premise of the study: immigration quantity alone does not fully explain regional economic outcomes. At the same time, the economic relevance of integration quality varies across European regions and should therefore be interpreted in relation to broader structural conditions, migration dynamics, and model specification limits.

5. Conclusions

This study developed the Economic Immigrant Integration Index (EIIM) as a composite measure of economic integration quality in the European Union and empirically assessed its macroeconomic relevance across EU regions. By combining four dimensions: migration policy quality (MIPEX), employment convergence, income convergence, and a fiscal participation proxy, the index bridges the common separation between institutional frameworks and realized labour market outcomes in the integration literature. Empirically, the analysis evaluated whether integration quality contributes to regional macroeconomic performance beyond immigration scale, using region-year data for five European regions over 2009–2024 and OLS models with log-transformed GDP.

The results yield three central conclusions. First, immigration intensity (IMM), measured as the foreign-born share of total population, is consistently the strongest and most robust correlate of regional log(GDP) across all regions. In both bivariate and reduced multivariate specifications, IMM remains positive and statistically significant, indicating that regional GDP moves closely with changes in the foreign-born population share over time. This pattern suggests that immigration scale behaves as a structural macroeconomic variable capturing long-run expansion dynamics within regions.

Second, integration quality is not redundant, but its macroeconomic relevance is clearly region-specific. EIIM is positively associated with regional GDP in bivariate models in most regions, yet its independent contribution varies once immigration scale and migration-flow dynamics are considered. In reduced multivariate models, EIIM remains positive and statistically significant in Central and Southern Europe, implying that integration quality adds explanatory information beyond migration scale in these contexts. In Eastern Europe, EIIM becomes statistically significant only in the multivariate specification and with a small coefficient, indicating limited economic relevance relative to immigration scale and migration dynamics. In Western Europe, EIIM does not retain robustness once scale and net migration are included, suggesting that integration quality largely overlaps with the macro variation captured by immigration scale. Northern Europe displays a distinct pattern, where EIIM enters with a negative coefficient in the simplified model conditional on IMM and net migration. This result is interpreted cautiously, as it may reflect residual collinearity, overlap with macroeconomic time trends, or aggregation effects within the regional grouping rather than a stable substantive relationship.

Third, these regional differences underscore the methodological importance of distinguishing migration scale from integration quality and of accounting for multicollinearity in macro-regional models. Several controls exhibit very high VIF values, constraining the stability of extended specifications. Consequently, the interpretation of EIIM effects should rely primarily on the most stable reduced models. The evidence supports the conceptual argument that immigration scale and integration quality are analytically distinct dimensions, while also showing that the economic salience of integration quality depends on regional context.

The study has limitations. Regional aggregation reduces country-specific noise and highlights structural regimes, but it also limits causal inference and may mask

substantial within-region heterogeneity. Although the analysis covers all 27 European Union member states, the five regions remain internally diverse in terms of economic size, institutional structure, and migration regimes. As a result, the regional averages used in the analysis may smooth over important country-level differences, while larger or economically dominant member states may exert disproportionate influence on the broader regional profile. This issue is particularly relevant in heterogeneous regions such as Western Europe, where the aggregate regional pattern may partly reflect the weight of major economies rather than evenly distributed regional dynamics. The time-series length per region is moderate (N = 16), and macro variables exhibit strong co-trends, which may inflate statistical associations, increase model fit mechanically, and complicate coefficient interpretation. In addition, the use of aggregate regional GDP may partly capture scale effects, since higher output levels can mechanically reflect larger or expanding populations rather than improvements in per-capita economic performance or productivity alone. This implies that part of the observed association between immigration intensity and GDP may reflect population-related expansion effects rather than purely efficiency-based economic gains. EIIM also relies on available harmonized indicators and a transparent equal-weight construction: alternative weighting schemes or richer fiscal measures could yield different sensitivities. Future research could strengthen the empirical framework by testing the index against alternative dependent variables such as GDP per capita, labour productivity, or fiscal balance indicators.

Despite these constraints, EIIM provides a transparent, replicable, and policy-interpretable tool for the comparative assessment of economic integration regimes in Europe. For policy, the results suggest region-specific priorities rather than a uniform European approach. In Southern Europe, where EIIM remains positively associated with regional GDP, policy attention should focus on improving labour market absorption, income convergence, and institutional integration capacity. In Eastern Europe, where immigration scale appears more economically salient than integration quality as measured here, strengthening the institutional and labour market channels of integration may be necessary before quality effects become macroeconomically visible. In Western Europe, the findings indicate that migration quantity and integration quality should not be treated as interchangeable, since larger immigration scale does not automatically imply an independent role for integration performance in explaining macroeconomic variation. Future research could extend this framework by testing alternative weighting strategies, modelling EIIM and IMM interaction effects, applying dynamic panel approaches, and validating the index against additional outcomes such as productivity, fiscal balances, and sectoral employment structure. Overall, the study contributes a unified measurement approach and empirical evidence supporting a shift from focusing on how much immigration occurs to examining how well immigrants integrate economically as a structural dimension of regional economic performance in Europe.

AI declaration

AI tools, including ChatGPT (GPT-5.4) and Google Translate, were used in a limited way during manuscript preparation for language support, including translation of selected words and short passages from Lithuanian into English, grammar correction, and sentence-level language editing. These tools were not used for data analysis, interpretation of results, or development of the study's conclusions. The authors take full responsibility for the content of the manuscript.

References

Adda, J., Dustmann, C., & Görlach, J.-S. (2021). *The dynamics of return migration, human capital accumulation, and wage assimilation* (IZA Discussion Papers No. 14333). Institute of Labor Economics. https://www.econstor.eu/bitstream/10419/236364/1/dp14333.pdf

Ager, A., & Strang, A. (2008). Understanding integration: A conceptual framework. *Journal of Refugee Studies*, *21*(2), 166–191. https://doi.org/10.1093/jrs/fen016

Anderson, D. R., Sweeney, D. J., Williams, T. A., Freeman, J., & Shoesmith, E. (2014). *Statistics for business and economics*. https://nibmehub.com/opac-service/pdf/read/Statistics%20for%20business%20and%20economics-%20%20Anderson-%20D.R..pdf

Bongers, D., Díaz-Roldán, C., & Torres, J. L. (2022). Highly skilled international migration, STEM workers, and innovation. *Economics*, *16*, 73–89. https://doi.org/10.1515/econ-2022-0022

Caselli, F., Lin, H., Toscani, F., & Yao, J. (2024). *Migration into the EU: Stocktaking of recent developments and macroeconomic implications*. https://doi.org/10.5089/9798400289552.001

Dauth, W., Findeisen, S., & Suedekum, J. (2014). The impact of immigration on native wages: Heterogeneity along the wage distribution. *Journal of the European Economic Association*, *12*(2), 432–464.

de Haas, H., Castles, S., & Miller, M. J. (2019). The age of migration: International population movements in the modern world. In *International migration review* (2nd ed., Vol. 57, Issue 1). Macmillan Press Ltd.

Dustmann, C., & Frattini, T. (2014). The fiscal effects of immigration to the UK. *The Economic Journal*, *124*(580), F593–F643. https://doi.org/10.1111/ecoj.12181

Dustmann, C., D., Otten, S., Schönberg, U., & Stuhler, J. (2025, October). *The effects of immigration on places and people - identification and interpretation*. https://doi.org/10.1086/739196

Engberg, E., Koch, M., Lodefalk, M., & Schroeder, S. (2025). Artificial intelligence, tasks, skills, and wages: Worker-level evidence from Germany. *Research Policy*, *54*(8), Article 105285. https://doi.org/10.1016/j.respol.2025.105285

Engler, P., MacDonald, M., Piazza, R., & Sher, G. (2023). *The macroeconomic effects of large immigration waves* (Working Paper No. 2023/259). International Monetary Fund. https://doi.org/10.5089/9798400261794.001

European Commission. (2024). *Action plan on integration and inclusion 2021–2027*: *Progress report*. https://www.euro-access.eu/_media/file/123_Action_Plan_on_Integration_and_Inclusion_2021-2027.pdf

Eurostat. (n.d.-a). *Employment rates by country of birth*. Retrieved February 10, 2026, from https://ec.europa.eu/eurostat/databrowser/view/lfsa_ergacob__custom_19953952/default/table

Eurostat. (n.d.-b). *Gross domestic product* (*GDP*) *and main components* (*output*, *expenditure and income*). Retrieved February 10, 2026, from https://ec.europa.eu/eurostat/databrowser/view/nama_10_gdp__custom_19966850/default/table

Eurostat. (n.d.-c). *Eurostat population on 1 January by age and sex*. Retrieved February 10, 2026, from https://ec.europa.eu/eurostat/databrowser/view/demo_pjan__custom_20057056/default/table

Eurostat. (n.d.-d). *Mean and median income by group of citizenship* (*population aged 18 and over*). Retrieved February 10, 2026, from https://ec.europa.eu/eurostat/databrowser/view/ilc_di15__custom_19955996/default/table

FRONTEX. (2024). *Strategic risk analysis report 2024*. https://prd.frontex.europa.eu/wp-content/uploads/strategic-risk-analysis-2024-report.pdf

Gethin, A., & Piketty, T. (2022). Global Inequality Dynamics: New Evidence from WID.world. *Journal of International Economics*, *138*, Article 103588.

Ghodsi, M., Stehrer, R., & Barišić, A. (2024). Which migrant jobs are linked with the adoption of novel technologies, robotisation, and digitalisation? *Technology in Society*, *78*, Article 102647. https://doi.org/10.1016/j.techsoc.2024.102647

Heckmann, F., & Schnapper, D. (2016). *The integration of immigrants in European societies*. Edward Elgar. https://dokumen.pub/the-integration-of-immigrants-in-european-societies-national-differences-and-trends-of-convergence-reprint-2016nbsped-9783110507324-9783828201811.html

Huddleston, T., Niessen, J., & Solano, G. (2022). *Migrant Integration Policy Index* (*MIPEX*) *2020*. https://www.migpolgroup.com/wp-content/uploads/2021/01/Solano-Giacomo-Huddleston-Thomas-2020-Migrant-Integration-Policy-Index-2020.pdf

Jaumotte, F., Koloskova, K., & Saxena, S. C. (2016). *Impact of migration on income levels in advanced economies* (Issue SDN/16/08). https://www.imf.org/external/pubs/ft/ar/2017/eng/assets/spillovernote8.pdf

Karpuškienė, V. (2018). *Ekonometrija*: *paskaitų konspektas*. Vilniaus universitetas. https://web.vu.lt/ef/v.karpuskiene/files/2018/03/2018-konspektas.pdf

MIPEX. (2023). *MIPEX 2025 EU policy indicators 2009–2024*. https://mipex.eu/download-pdf#/add-selection

Organisation for Economic Co-operation and Development, & European Union. (2023). *Indicators of immigrant integration 2023*: *Settling in*. OECD Publishing. https://www.oecd.org/content/dam/oecd/en/publications/reports/2023/06/indicators-of-immigrant-integration-2023_70d202c4/1d5020a6-en.pdf

Organisation for Economic Co-operation and Development. (2024). *International Migration Outlook 2024*. https://doi.org/10.1787/50b0353e-en

Pabedinskaitė, A., & Činčikaitė, R. (2017). *Kiekybiniai modeliavimo metodai*. Technika. https://doi.org/10.20334/1563-S

Tidikis, R. (2003). *Socialinių mokslų tyrimų metodologija*. Lietuvos teisės universiteto Leidybos centras. https://repository.mruni.eu/handle/007/15459

World Bank. (n.d.-a). *School enrollment*, *tertiary* (*% gross*). Retrieved February 16, 2026, from https://data.worldbank.org/indicator/SE.TER.ENRR

World Bank. (n.d.-b). *Trade* (*% of GDP*). Retrieved February 16, 2026, from https://data.worldbank.org/indicator/NE.TRD.GNFS.ZS