

# Financial Innovations and Economic Convergence in the European Union: Evidence from Regional Cohesion Policy Reconfiguring

OTILIA MANTA

Romanian Academy, School of Advanced Studies of the Romanian Academy,  
Doctoral School of Economic Sciences, National Institute of Economic Research "Costin C.  
Kirițescu", Center for Financial and Monetary Research "Victor Slăvescu", Bucharest  
Romanian Academy, Mountain Economy Centre CE-MONT Vatra Dornei, ROMANIA  
[otilia.manta@rgic.ro](mailto:otilia.manta@rgic.ro)

TEODOR EMANUEL PETREANU

Romanian Academy, School of Advanced Studies of the Romanian Academy,  
Doctoral School of Economic Sciences, National Institute of Economic Research "Costin C.  
Kirițescu", Center for Financial and Monetary Research "Victor Slăvescu", Bucharest, ROMANIA  
[teodor.emanuel.petreanu@gmail.com](mailto:teodor.emanuel.petreanu@gmail.com)

*Abstract: This study analyses the structural transformations of European cohesion policy in the context of the acceleration of inter- and intra-regional disparities within the European Union, with a focus on the post-2014 period and the specific challenges of the 2021–2027 multiannual financial framework. By capitalising on an integrated theoretical framework, which combines neoclassical convergence theory, institutionalist approaches to regional economics and financial innovation perspectives, the study assesses the capacity of structural financial instruments to generate real and sustainable economic convergence. The empirical analysis uses panel data for 234 NUTS-2 regions from 27 Member States, covering the period 2000–2023, and applies econometric models with fixed effects, complemented by robustness tests using GMM-Arellano-Bond. The results demonstrate that financial innovations, in particular repayable financial instruments (RFIs), social impact bonds and public guarantee mechanisms, significantly amplify the multiplier effect of cohesion funds, with an estimated elasticity of 1.47 compared to 0.89 for classic grants. The article proposes an integrated dynamic allocation model based on composite indices of territorial vulnerability, with direct implications for the architecture of post-2027 cohesion policy.*

*Keywords: cohesion policy, economic convergence, financial innovations, regional disparities, structural funds, NUTS-2, repayable financial instruments, regional development, European Union, econometric panel model*

*JEL Classification: R11, R58, O47, F15, G20.*

## 1. Introduction

The European Union's cohesion policy is the most important redistributive instrument of the European project, absorbing approximately one third of the EU budget and aiming to reduce economic, social and territorial disparities between regions of the Member States (Barca, 2009; Crescenzi and Giua, 2020). However, despite the massive financial transfers carried out over five decades of European regional policy, the persistence of regional disparities remains a worrying reality, fuelling heated debates in academic literature and in the sphere of political decisions regarding the real effectiveness of these interventions (Rodríguez-Pose, 2018; Becker et al., 2018).

The post-global financial crisis context and the effects of the COVID-19 pandemic have accentuated territorial asymmetry at the level of the European Union, creating new centers of vulnerability in peripheral and semi-peripheral regions, while large metropolises and regions with high human capital have consolidated their competitive advantages (McCann, 2015; Iammarino et al., 2019). This divergent dynamic calls into question the traditional paradigm of automatic convergence through budgetary redistribution, requiring a conceptual and instrumental reconfiguration of cohesion policy.

This article addresses this issue from the perspective of three complementary axes: (i) a critical assessment of the theoretical framework of regional economic convergence; (ii) an empirical analysis of the differential effectiveness of financial instruments within the cohesion policy 2014–2020 and 2021–2027; and (iii) the proposal of an innovative model for the dynamic allocation of structural resources, which integrates financial

innovations as a vector for multiplying the impact. The originality of the approach lies in combining advanced econometric methodologies with the institutionalist-evolutionary perspective, going beyond the limits of the purely quantitative analyses prevalent in the specialized literature.

The article is structured as follows: section 2 presents the theoretical framework and literature review; section 3 describes the methodology and data used; section 4 presents the empirical results; section 5 proposes the dynamic allocation model; section 6 includes discussions and policy implications; section 7 concludes.

## **2. Theoretical Framework and Literature Review**

### **2.1. Theories of Regional Convergence: From Neoclassical to Institutional**

The debate on regional convergence within the EU revolves around two fundamental paradigms. The neoclassical approach, rooted in the Solow-Swan model (1956) and extended by the contributions of Barro and Sala-i-Martin (1992), postulates that less developed economies tend to grow faster than advanced ones, due to diminishing returns to capital and technological diffusion. Absolute and conditional beta convergence have been the standard analytical tool for assessing European regional dynamics (Mankiw et al., 1992).

However, post-enlargement empirical developments have often contradicted neoclassical predictions. The new model of economic geography (Krugman, 1991; Fujita et al., 1999) has demonstrated that centripetal forces, agglomeration economies, market access, knowledge externalities, can generate persistent divergence, even in the presence of substantial financial transfers. The concept of “underdevelopment traps” (Rodríguez-Pose, 2018) and that of “regional resilience” (Martin and Sunley, 2015) have added institutional and systemic dimensions to the analysis, highlighting the role of administrative capacity, social capital and local innovation ecosystems in determining the convergence trajectory (Manta, O. and Petreanu, T. E., 2025).

A relevant theoretical contribution to our analytical framework is the Economic Complexity perspective (Hidalgo and Hausmann, 2009), which approaches regional development through the lens of productive diversification and the accumulation of collective capabilities. This perspective suggests that the effectiveness of structural funds critically depends on their ability to stimulate the accumulation of complex productive capabilities, not just to finance one-off investments in physical infrastructure.

### **2.2. Financial Innovations in Cohesion Policy: Conceptualization and Evolution**

The notion of “financial innovation” in the context of cohesion policy refers to the set of instruments and mechanisms that transcend the traditional grant model, introducing elements of reimbursement, risk sharing and leverage on private sources of financing (Dąbrowski, 2018; Wislade and Yuill, 2016). The main categories of innovative financial instruments include: (i) loans and guarantees managed through the European Investment Fund (EIF) and the European Investment Bank (EIB); (ii) venture capital instruments for innovative SMEs; (iii) social impact bonds (SIB); and (iv) results-based financing mechanisms (Results-Based Financing).

The gradual adoption of these instruments in the architecture of cohesion policy reflects a profound conceptual shift: from the paradigm of “public spending as an end in itself” to the paradigm of “public value maximized by catalysing private investment” (Mazzucato, 2018). The EU regulations for the period 2014–2020 (Reg. 1303/2013) and 2021–2027 (Reg. 2021/1060) have strengthened the legal framework of financial instruments, introducing incentives for Member States that opt for their use instead of traditional grants.

### **2.3. Gaps in the Existing Literature and the Contribution of the Present Study**

Although the literature on the effectiveness of cohesion policy is extensive (Dall'erna and Le Gallo, 2008; Eberle and Werneck, 2021; Fratesi and Wislade, 2017), we identify three major gaps: (1) the lack of systematic comparative analyses that isolate the specific effect of financial innovations versus classic subsidies, controlling for endogeneity; (2) the absence of integrated models that combine the analysis of allocative efficiency with the institutional dimension of regional administrative capacity; and (3) the rarity of studies that explicitly address the period 2021–2027 and the context of new priorities (green transition, digital transformation, resilience). However, comparatively limited attention has been devoted to disentangling whether financial innovations generate additional convergence effects relative to traditional grant-based mechanisms. This gap is particularly salient when accounting for heterogeneity in institutional quality and the evolving policy architecture characterising the

post-2021 programming period. Against this backdrop, three interrelated gaps can be identified. First, there is a paucity of systematic comparative analyses that isolate the marginal effects of financial instruments vis-à-vis classic subsidies while rigorously addressing endogeneity concerns. Second, existing frameworks insufficiently integrate allocative efficiency considerations with the institutional dimension of regional administrative capacity, thereby limiting explanatory power with respect to heterogeneous policy performance. Third, empirical evidence remains scarce regarding the 2021–2027 programming cycle and its reoriented priorities, notably the green transition, digital transformation, and resilience-building objectives. By addressing these gaps, this article advances an original methodological strategy and an expanded analytical framework that explicitly differentiates financial innovations from traditional grant-based mechanisms within the contemporary cohesion policy landscape.

### 3. Methodology and Data

#### 3.1 Data Sources and Sample

The empirical analysis leverages a panel database built from multiple sources: Eurostat (NUTS-2, GDP/capita in SPA, employment rate, ERIS regional innovation indicator), data on commitments and payments from structural funds (DG Regio- ESIF Open Data), data on financial instruments (EIF Annual Report, EIB Group Survey on Investment), and regional institutional indicators (Becker et al., 2013; Charron et al., 2014- European Governance Quality Index). The sample includes 234 NUTS-2 regions from 27 EU Member States, over the period 2000–2023, resulting in an unsupported panel of 5,616 regional-annual observations.

#### 3.2 Econometric Specification

The basic model aims to estimate conditional beta convergence, with the inclusion of variables specific to cohesion policy:

$$\ln(y_{it}/y_{i,t-1}) = \alpha + \beta \cdot \ln(y_{i,t-1}) + \gamma \cdot SF_{it} + \delta \cdot FI_{it} + \theta \cdot X_{it} + \mu_i + \lambda_t + \varepsilon_{it}(1)$$

where  $y$  represents GDP/capita in SPA,  $SF$  denotes the intensity of structural subsidies (% of regional GDP),  $FI$  represents the volume of repayable financial instruments (% of regional GDP),  $X$  is the vector of control variables (human capital, population density, accessibility, quality of governance),  $\mu_i$  are the regional fixed effects,  $\lambda_t$  are the temporal fixed effects, and  $\varepsilon$  is the error term. The parameter of central interest is  $\delta$ , which captures the specific marginal effect of financial instruments compared to that of classical subsidies ( $\gamma$ ).

To control for potential endogeneity, with poorer regions systematically receiving more funds, we use the GMM-Arellano-Bond (1991) estimator with lags of endogenous variables, complemented by Sargan/Hansen tests for over identification and AR(1)/AR(2) tests for autocorrelation of residuals. The robustness of the results is checked by alternative specifications with Within-Groups, random effects (Hausman test) and panel heteroskedasticity-corrected (PCSE) estimators.

#### 3.3 Construction of the Territorial Vulnerability Index (TVI)

As a complementary analytical tool, we construct a composite Territorial Vulnerability Index (TVI), aggregating ten dimensions: (1) demographic decline, (2) structural unemployment rate, (3) dependence on traditional sectors, (4) low level of tertiary education, (5) weak institutional capacity, (6) low accessibility to infrastructure, (7) fragility of the innovation ecosystem, (8) exposure to green transition risks, (9) dependence on public transfers and (10) level of social capital. The aggregation uses Principal Component Analysis (PCA) weighting, avoiding the arbitrariness of exogenous weightings.

## 4. Empirical Results

### 4.1 Regional Convergence and the Effect of Cohesion Policy: Baseline Estimates

Fixed-effects OLS estimates for model (1) confirm the existence of beta conditional convergence ( $\beta = -0.042$ ,  $p < 0.001$ ), corresponding to a convergence speed of approximately 2.1% per year — a result consistent

with previous literature (Arbia et al., 2005). The introduction of policy variables substantially modifies the magnitude of the coefficients, without invalidating the conclusion of convergence.

Table 1 presents a summary of the main estimates.

**Table 1. Estimates of conditional convergence and the effect of cohesion instruments**  
(dependent variable: GDP/capita growth rate)

Explanatory variable	OLS-EF coefficient (1)	GMM-AB coefficient (2)	Coef. GMM-AB+Institutional Control (3)
ln(GDP/cap.) initial	-0.042***	-0.038***	-0.035***
SF subsidy intensity (% GDP)	0.089***	0.076**	0.071**
Financial instruments FI (% GDP)	0.147***	0.131***	0.124***
Human capital (% pop. tertiary education)	0.063***	0.058***	0.061***
Governance Quality (EQI)	—	—	0.044**
R <sup>2</sup> / Hansen p-value	0.61	0.58 / 0.43	0.63 / 0.47
Observations	5,616	5,382	5,382

Note: \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ ; \*  $p < 0.10$ . Robust standard errors (clustered at regional level). Regional and temporal fixed effects included in all specifications.

The results in column (3), the full GMM specification with institutional control, highlight that repayable financial instruments ( $\delta = 0.124$ ) generate a significantly higher growth effect than traditional grants ( $\gamma = 0.071$ ), the difference of 0.053 percentage points per unit of financial intensity being robust to multiple alternative specifications. This differentiation confirms the main hypothesis of the study: financial innovations amplify the effectiveness of cohesion policy through leverage effects and the selection of projects with demonstrable economic profitability.

## 4.2. Regional Heterogeneity and Conditional Effects

The analysis of sub-samples reveals significant heterogeneity of effects. Regions in the “less developed” category (GDP/person  $< 75\%$  of the EU average) benefit most from classical subsidies ( $\gamma = 0.091$ ), probably due to acute needs for investment in basic infrastructure. In contrast, transition regions (75%–90% of the EU average) show a higher sensitivity to financial instruments ( $\delta = 0.158$ ), suggesting that they are at the optimal point for using market-based mechanisms. More developed regions ( $>90\%$ ) show modest effects of both categories of instruments, consistent with the literature on diminishing marginal returns to cohesion policy in prosperous regions.

A particularly relevant result concerns the moderating role of governance quality. The effect of financial instruments is 2.3 times higher in regions with an EQI above the median compared to regions below the median ( $\delta = 0.187$  vs.  $\delta = 0.081$ ), confirming the thesis that financial innovations require a favourable institutional environment to manifest their multiplier potential. This finding has direct implications for the design of post-2027 cohesion policy.

## 4.3. Multiplier Effects and Financial Leverage

The calculation of the multiplier effects estimates that each euro invested through repayable financial instruments generates, on average, 3.2 euros in total investment (public and private combined), compared to 1.9 euros for classic grants. The leverage effect varies significantly depending on the type of instrument: public guarantees show the highest multiplier (4.7x), followed by equity instruments (3.8x) and subsidized loans (2.6x). These estimates are consistently higher than the average reported by the OECD for public financing instruments

in other geographical contexts, suggesting that the specific context of European cohesion policy, with its strong regulatory framework and rigorous monitoring, creates favourable conditions for leverage effects.

## **5. Integrated Dynamic Allocation Model (IDAM)**

### **5.1. Conceptual Architecture of the Model**

Based on empirical evidence and an integrated theoretical framework, we propose the Integrated Dynamic Allocation Model (IDAM) as a conceptual tool for optimizing the mix of cohesion instruments at regional level. IAM operationalizes three fundamental principles: (i) The principle of contextual differentiation, the optimal mix of instruments varies depending on the level of development, institutional capacity and regional economic structure; (ii) The principle of dynamic complementarity, classical subsidies and financial instruments are not perfect substitutes, but complementary in different phases of the policy cycle; and (iii) The principle of adaptability, the allocation of instruments should be periodically recalibrated based on performance indicators and changes in context.

### **5.2 Instrumental Allocation Matrix**

Based on the IVT constructed in section 3.3 and the differential effectiveness estimates in section 4, MIAD proposes a four-quadrant instrumental allocation matrix (Figure 1):

Quadrant I (high IVT, low institutional capacity): Predominant allocation in classic grants for basic infrastructure and human capital, with a small share (10–15%) reserved for simple financial instruments (microcredit guarantees). Prioritizing institutional capacity building as a precondition for the transition to more complex instruments.

Quadrant II (high IVT, high institutional capacity): balanced mix of grants/financial instruments (60/40), with an emphasis on SIB-type instruments for acute social challenges and on venture capital funds for emerging strategic sectors.

Quadrant III (low IVT, low institutional capacity): selective approach, concentrating resources in subsidies for projects with local "big push" structuring potential, avoiding wasting resources on small projects with limited impact.

Quadrant IV (low IVT, high institutional capacity): preponderance of financial instruments (70–80%), with the use of EIB/EIF investment platforms, green bonds and co-investment instruments with the private sector, reducing dependence on EU subsidies.

The implementation of MIAD requires a three-level governance architecture: strategic (European Commission), programmatic (national managing authorities) and operational (regional development agencies and financial intermediaries). Vertical and horizontal coordination between these levels is essential for the effectiveness of the model.

## **6. Discussions and Policy Implications**

The results presented have direct implications for the architecture of post-2027 cohesion policy. First, the finding that financial innovations generate higher multiplier effects than classic subsidies argues for a significant increase in the minimum mandatory allocation quota for financial instruments, from the current level of non-binding recommendation to a minimum binding threshold of at least 25% of structural funds, differentiated according to regional typology according to MIAD.

Second, the crucial moderating role of governance quality requires the systematic integration of institutional conditionality into access to complex financial instruments. Regional administrative capacity-building programs should precede, not run parallel to, the allocation of advanced instruments. The Polish model of gradual capacity building (2007–2013 → 2014–2020) provides a relevant example (Bachtler et al., 2019).

Third, the green and digital transitions open up new horizons for financial innovation in cohesion policy. Regional sovereign green bonds, energy transition financing mechanisms and digital investment platforms are

instruments with high potential to catalyse private investment, but which require a legal and supervisory framework adapted to European regional specificities.

Limitations of the study include: (i) methodological difficulties in fully isolating the causal effects of cohesion policy from other determinants of regional growth; (ii) limited availability of granular data on financial instruments at NUTS-2 level for the period before 2014; and (iii) the need to consider general equilibrium effects, which can redistribute growth across regions, rather than just generating it across the European economy as a whole. Future research should address these limitations by using detailed administrative data and quasi-experimental (difference-in-differences, RDD) methodologies.

## 7. Conclusions

This study is consistent with the presence of conditional convergence, contingent upon the type of policy instrument deployed, and support the view that financial instruments are more closely aligned with market-based adjustment processes and regional innovation dynamics. Beyond the empirical contribution, the study advances an integrated analytical framework that links convergence processes, institutional capacity, and financial innovation, offering a more nuanced understanding of cohesion policy effectiveness in heterogeneous territorial contexts. Collectively, these insights underscore the need to rethink the design of cohesion policy instruments in light of evolving regional disparities and the increasing importance of institutional constraints. (1) Main empirical findings

This study has demonstrated, based on robust econometric analyses of an extended panel comprising 234 NUTS-2 regions across 27 EU Member States, that financial innovations within European cohesion policy are associated with stronger regional convergence effects compared to traditional non-reimbursable grant-based instruments. The results indicate a significantly higher elasticity for reimbursable financial instruments (0.124) relative to classic grants (0.071), thereby providing empirical support for the hypothesis that financial instruments are more effectively aligned with market mechanisms and regional innovation dynamics. These findings further suggest the presence of conditional convergence, contingent upon the type of policy instrument employed.

### (2) Theoretical contribution

The main theoretical contribution of the article lies in the development of the Integrated Dynamic Allocation Model (IDAM), which operationalises an integrated framework linking convergence dynamics, institutional capacity, and financial innovation in cohesion policy design. IDAM extends existing approaches by explicitly modelling the heterogeneity of territorial conditions and institutional constraints, thereby moving beyond static and uniform policy prescriptions. In doing so, it provides a structured analytical bridge between regional development theory, institutional economics, and the emerging literature on innovative financial instruments.

### (3) Policy implications

The implications for post-2027 cohesion policy are threefold. First, policy design should progressively shift towards a more balanced portfolio combining innovative financial instruments and traditional grants, calibrated to regional characteristics. Second, strengthening regional administrative and institutional capacity emerges as a prerequisite for the effective deployment of advanced financial instruments, particularly in less developed regions. Third, cohesion policy should more systematically exploit synergies with the green transition, digital transformation, and resilience agendas through tailored financial mechanisms that reflect differentiated territorial needs.

### (4) Limitations and future research

Despite its contributions, the study is subject to several limitations. First, the analysis is constrained by data availability and aggregation at the NUTS-2 level, which may mask intra-regional heterogeneity. Second, while the econometric strategy addresses endogeneity concerns, residual identification challenges may persist. Future research could extend the framework by incorporating micro-level data, exploring dynamic treatment effects over longer time horizons, and further investigating the sequencing mechanisms through which institutional capacity conditions the effectiveness of financial instruments. In particular, a more granular analysis of how regions transition from grant dependency to financial instrument adoption would represent a promising avenue for further inquiry.

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