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IMPROVING REGIONAL DEVELOPMENT IN ROMANIA THROUGH EUROPEAN FUNDS: AN EMPIRICAL ANALYSIS[1]

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Abstract
Over the last two decades, Structural and Cohesion Funds have been regarded as the principal instruments for accelerating real economic convergence, reducing regional disparities, and modernizing infrastructure within the framework of European Union (EU) cohesion policy. This paper investigates the impact of European funds on regional development in Romania during the 2007–2022 period. The analysis is based on panel data covering the eight Romanian development regions and employs a fixed-effects econometric model. Regional GDP per capita is used as the dependent variable, together with several control variables, including unemployment, infrastructure, human capital, and foreign direct investment (FDI).
The findings reveal that infrastructure development and foreign direct investment represent the main drivers of regional GDP growth. European funds also exert a positive effect; however, their impact is characterized by a time lag, reflecting the multiannual implementation cycle of funded projects. Furthermore, the study highlights the persistence of the brain drain phenomenon, which helps explain the statistically insignificant contribution of human capital under the current economic structure. Consequently, the effectiveness of EU funding depends not only on the allocation of financial resources, but also on the quality of administrative capacity and the ability to retain skilled human resources at the regional level.

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JEL Classification: C23; R11; R58.

1. INTRODUCTION

The process of European integration brought Romania not only an alignment with Western political and social values but also access to a financial mechanism of historic importance: the European Union's (EU) cohesion policy. The fundamental aim of the EU cohesion policy is to reduce economic disparities. Over the past two decades, structural and investment funds have been promoted as the primary instrument for accelerating real economic convergence, correcting development imbalances, and modernizing the country's critical infrastructure. However, despite the massive influx of EU capital, the reality on the ground reveals that the reduction of disparities among Romania's eight development regions has not occurred uniformly, making the effectiveness of these funds a subject of intense debate among theorists and practitioners. This reality motivated us to address this topic, aiming to rigorously analyze the economic dynamics underlying the figures and to answer the research's central question: to what extent, and over what timeframe, do actual European fund disbursements translate into regional economic prosperity?

In this study, we will conduct an econometric analysis of the causal relationship between contracted funds and the evolution of regional GDP per capita over the 2007–2022 period. This extended timeframe is crucial, as it covers Romania's entire journey from EU accession to the present, capturing the successive stages of structural and cohesion fund implementation and absorption—including the financial crisis and the pandemic shock—thereby allowing for an assessment of how these funds behave during critical periods.

Methodologically, the study relies on a quantitative analysis using panel data and fixed-effects regression models—an approach that allows for isolating the specific characteristics of each region to determine only the impact of the analyzed variables. In addition, the model incorporates control variables such as the unemployment rate, foreign direct investment (FDI), and infrastructure, thereby providing rigorous statistical validation of the determinants of development and contributing by empirical evidence to the debate regarding the capacity of European funds to generate real economic convergence.

The main contribution of this paper lies in the empirical assessment of the impact of European funds, tailored to the specific characteristics of Romania's regions. A novel element is introduced through the design of an optimized econometric model that demonstrates whether EU payments stimulate regional GDP in the current year or with a time lag. The results provide an overview of the key factors involved in the implementation process of EU payments.

The paper is structured as follows: section 2 reviews the relevant literature, covering key economic theories and global scholarly debates regarding the effectiveness of cohesion policy; section 3 describes data and methodology, detailing the collection and organization of the panel dataset for Romania's eight development regions; section 4 presents the results and their interpretation. Finally, the paper concludes with section 5 dedicated to conclusions and recommendations.

2. LITERATURE REVIEW

The concepts of regional development and cohesion policy are two essential factors of modern European progress. They reflect the European Union's (EU) aspiration to ensure sustainable and balanced economic growth across its member states and regions. The existence of significant territorial and economic disparities indicates weak cooperation among member states. These concepts define the courses of action for reducing imbalances, boosting competitiveness, and strengthening solidarity among territories.

In the literature, these two concepts are consistently closely linked, yet each also holds its own distinct meaning. To better understand the connection between regional development and cohesion policy, one must understand the concept of a "region" – a term for which multiple definitions exist. Thus, according to the Community Charter on Regionalization (European Parliament, 1988, art. 1), a region is defined as "a territory forming, from a geographical standpoint, a distinct unit or a similar grouping of contiguous territories, where the population shares common characteristics and seeks to preserve and develop its distinctiveness in order to foster cultural, social, and economic progress". This definition appears most frequently in EU documents, highlighting the link between territorial identity and social cohesion.

Wallerstein (1984) views the region as a constituent element of social progress, representing a fundamental space where political, social, and economic processes align. The region is not merely a territory defined by boundaries, but rather a link between economic and social forces. These definitions imply that the region is not just a geographical unit, but a combination of factors uniting the common interests of a population.

Furthermore, in one of her works, Mungiu-Pupazan (2009) describes the region as an entity regarding which general statements applicable to the entire territory—viewed as a unified whole—can be formulated. Integrating these aspects is administratively necessary for formulating and implementing public plans and policies. This administrative perspective transforms the region from a mere geographical space into a tool for planning and analysis, essential for accessing funds and implementing cohesion policies.

Another concept described in the specialized literature is that of regional development (Cîrnu, 2010, p. 3). The author views this as a complex process that

supports each territory in harnessing regional potential, aiming to reduce economic and social disparities and improve the quality of life. This entails not only economic interventions but also the strengthening of social cohesion, administrative capacity, and territorial infrastructure.

Regional development also aims to boost and diversify economic activities, as well as to stimulate investments in the private sector, which contribute to reducing unemployment and improving living standards (Mungiu-Pupazan, 2009). According to Eurostat 2026, the Brussels-Capital Region recorded a GDP per capita in 2024, expressed in purchasing power standards (PPS), of approximately 192% of the EU average. In the same period, the unemployment rate for the 15-64 age group was approximately 10.4%, significantly higher than the national average of Belgium, which was 5.4%. These data show that, even in a developed region, stimulating investments and diversifying economic activities through regional policies may remain necessary to reduce unemployment and improve living standards.

The Treaty of Rome stipulated that one of the roles of the Community is to promote harmonious and balanced development. So, since its establishment, the EU has enshrined in its founding documents the reduction of regional imbalances as a fundamental objective of European integration. By making efficient use of the funds provided by the EU, but also by developing optimal strategies, member countries can achieve real convergence between regions (Albu, 2019).

Within the EU, the delimitation of regions from the most developed to the least developed was made according to the Gross Domestic Product (GDP) per capita. But the values to which they are referred have undergone some small changes. According to the 6th Report on EU Cohesion Policy (European Commission, 2014, p. 223), there are three categories of regions: the least developed, the transition and the most developed. For a region to fall into one of the three categories, it had to fall within a certain range of GDP per capita. The less developed regions included those regions where the GDP per capita was below 75% of the EU-27 average, those in transition were in the range of 75%-90%, and the developed ones exceeded the threshold of 90%. But according to the 8th Cohesion Report (European Commission, 2022, p. 278), two changes have occurred. Transition regions fall within the range of 75%-100%, and developed regions are those with a GDP per capita higher than 100% of the EU-27 average. The change was made due to the findings that some regions that exceeded the 90% threshold were suddenly losing access to a high level of support, although they did not yet have the necessary economic resilience.

At the same time, the 9th Cohesion Report (European Commission, 2024, p. 73, p.134) introduces non-economic indicators to delimit developed and less developed regions. One of these criteria is the demographic one. This criterion aims to pay attention to regions suffering from a *talent trap*, i.e. the decrease in

the youth population and the decline in the active population in the respective regions. Other criteria are digitalization, i.e. the allocation of funds is conditional on the adoption of digital technologies, and climate, with the emphasis on performance in reducing carbon emissions.

Regional development policy also has several basic objectives, including reducing existing regional imbalances, preventing the emergence of new imbalances, correlating with government sectoral policies and stimulating interregional, internal and international cooperation (Dornean, 2015, p. 142). These objectives highlight the unified nature of regional development policy, which aims not only to reduce existing imbalances, but also to prevent the emergence of new ones. Correlation with government sectoral policies ensures the coherence of public interventions, and the stimulation of interregional cooperation reflects the orientation towards balanced and sustainable development, based on partnership and territorial solidarity.

In addition to the objectives, there are also several principles on which the development and application of regional development policies are based, including the decentralization of decisions to the local and regional level, partnership between public institutions, the private sector and civil society, strategic planning of resource use, and co-financing (Cîrnu, 2010, p. 78). These principles highlight the fact that regional development policy is based on participatory governance, in which decisions are adapted to the local level through decentralization and partnership between public and private actors. Strategic planning and co-financing contribute to the efficient use of resources and to increased responsibility in the implementation of development projects.

Regional development policies fulfill two essential functions, namely a preventive and a corrective one. The former refers to eliminating the causes that led to the lack of development, and the latter refers to reducing the effects of disadvantaged lagging regions (Sîrbu, 2014). By combining the two functions, regional policy aims for balanced development, based on pro-active interventions and remedial measures adapted to the needs of each region.

Another concept closely related to regional development is cohesion. It was introduced by the Single European Act of 1986, which aims to eliminate economic disparities between regions. Also, by the Treaty of Rome, cohesion is defined as a fundamental objective of European integration. The concept of cohesion brings together three dimensions: economic, social and territorial.

In the EU context, cohesion policy is inseparable from the European integration process, this being one of the instruments through which member states are supported to achieve common economic and social standards through structural funds. Authors such as Popescu et al. (2024) consider that European funds are the main instrument of cohesion policy, they are not just simple transfers, but the main pillars of the investment strategy aimed at transforming the economic and social structure of the region.

But Becker (2019, p. 155) in one of his analyses observes a change in cohesion policy. If it was initially based on redistribution, it is now considered an investment policy. And this evolution is described by many authors as *Lisbonization* (Dornean, 2025, p. 21). This represents the realignment of cohesion policy with the Lisbon Strategy, changing funding priorities from classical infrastructure to research, innovation and digitalization. Following these changes, Deffa (2016) mentions that although urban growth poles were boosted, peripheral regions were marginalized, which still needed basic structural investments, such as roads, before focusing on innovation and research.

In his paper, Maris (2024, p. 1) states that cohesion policy is one of the three pillars of the European political and economic space, together with the single market and the monetary union. This represents the only EU policy that deals with economic and social inequalities.

Through cohesion policy, the EU aims to introduce a state of equilibrium both between member states and between their regions. This brings together three dimensions: the economic one, which aims to reduce GDP differences, but also to stimulate competitiveness; the social one, which aims to equalize opportunities, employment, but also social inclusion; and the territorial dimension which refers to fair access to infrastructure and public services for all citizens (Aparicio-Pérez, Espinosa and Pavía, 2025, p. 57). These dimensions are also the core of the philosophy of European policies, complementing each other and shaping an integrated vision of the development of the EU.

At the same time, cohesion policy is based on several specific principles, respectively concentration, partnership, programming and additionality. The principle of concentration refers to the fact that through cohesion policy, funds are directed towards priority regions and areas. The partnership principle refers to the fact that local actors are also involved in the development and implementation of cohesion policy. The programming principle takes into account that the planning of allocated funds is multiannual, being a broader process. And finally, the additionality principle refers to the complementarity between European funds and national resources. Respecting these principles ensures better implementation of cohesion policy (Albu, 2019).

A comparison of the last two programming periods, 2014-2020 and 2021-2027, highlights a maturation of cohesion policy. The move from the rigid thresholds of Regulation 1303/2013 to the flexibility offered by Regulation 2021/1060 demonstrates that the EU has moved from a poverty assistance policy to a strategic investment policy, capable of supporting regions at all stages of their development, while ensuring the transition towards a climate-neutral economy.

Even if we only highlighted the positive aspects of cohesion policy, there are also people who doubt its effectiveness. (Burlacu, 2019, p. 1) highlights the

fact that those who support the efficiency of cohesion policy are those who evaluate its success through quantitative indicators, such as absorption rates or the number of completed projects. On the other hand, those who criticize the usefulness of cohesion policy focus on real results. They question whether capital allocation alone is enough to lead to sustainable regional development or whether well-trained administrative leadership is also needed to use those funds as efficiently as possible. It is crucial to understand that European funds allocated through cohesion policy are not just a simple financial transfer, but a complex mechanism, the impact of which is conditioned by several factors such as the local context or the quality of governance.

Leonardi (2005, p. 11) offers a critical perspective on cohesion policy, defining it as a compensatory payment. The author suggests that the rich states of the EU use these funds to obtain the support of less developed countries in their economic integration efforts. In this view, the peripheral states accept the challenges of total market opening in exchange for financial transfers that will mitigate their immediate losses. Thus, Leonardi's (2005) interpretation reveals an ambiguity of cohesion policy: although theoretically it is a pillar of solidarity, in practice it functions as a rational political transaction between member states.

Also, Santos (2008, pp. 3-4) supports Leonardi's (2005) point of view. He highlights the fact that the objectives that were established in the European treaties for cohesion policy have not been met. At the same time, the author also argues that the effectiveness of the policy cannot be supported by empirical results, most of the time even if the results are significant, their relevance is reduced.

Another critical point brought to the cohesion policy and its results is that, although the European Commission periodically produces reports showing the efficiency of the allocated funds, some researchers have doubts regarding the correctness of the methods and results (Marzinotto, 2012). Therefore, even if critics attest that there is a causal relationship between European funds and regional development, they argue that this relationship is insignificant and that there are other factors that lead to those results.

Pienkovski and Berkowitz (2017, p. 3) argue that the use of various econometric models and the diversity of theoretical approaches in empirical studies naturally lead to divergent results and conclusions. The authors emphasize that demonstrating the effectiveness of European structural funds remains a controversial topic in literature. Furthermore, they highlight that, even in the case of studies reporting a positive impact, the magnitude and nature of these results vary considerably.

Also, authors such as Spilioti and Anastasiou (2024, p. 4) argue that the efficiency of allocated European funds does not depend only on their volume, but also on the context of application. Again, it is emphasized that regions with greater economic freedom and a better level of governance tend to use structural

funds more efficiently. This observation supports the theory of government quality as a determining factor of economic growth (Bachtler and Wren, 2007).

Sostar (2021, p. 197) states that state institutions are more important than the amount of money itself. He also argues that the entire process of allocating and using European funds should be protected from political desires, but rather be integrated into long-term development strategies, in order to capitalize on the non-reimbursable nature of resources, but also to have as real and sustainable economic growth as possible.

Several authors (Bachtler and Wren, 2007; Bouvet and Dall'erba, 2010; Pastor, Pons and Serrano, 2010) have noted that evaluating cohesion policy is a challenge due to its excessive complexity. They emphasize the difficulty in accurately quantifying results, relating them to the assumed political objectives. However, the same authors note the importance of cohesion policy within the EU during its development.

Despite recurrent criticism, cohesion policy remains a central symbol of European solidarity, its role being reconfirmed in times of crisis. Becker (2019) analyses two divergent scenarios that emerged in contexts of instability. On the one hand, beneficiary states that requested increased solidarity and extensive financial support, on the other hand, contributing states that prioritized the use of funds to stimulate their own economic growth and employment, while refusing to increase contributions to the EU budget. This conflict of interest indicates that, in critical times, the fundamental objective of reducing regional divergences was difficult to achieve.

Another study by Ciani and De Blasio (2015) focused on the southern region of Italy during the 2008 financial crisis, highlights the fact that EU funds had a limited impact on employment indicators, but also on the population and on consumer prices. The authors concluded that in the context of the crisis, the impact of European funds on employment and household welfare was limited. This conclusion reinforces the idea that the effectiveness of European funds is strictly conditioned by the regional institutional context, suggesting that capital injection cannot substitute for the necessary structural reforms in lagging regions.

Arbolino and Di Caro (2021) conducted very interesting research on the 20 NUTS 2 regions of Italy, for the period of 2008-2020. The authors analyzed economic resilience, using indicators such as the intensity of structural and investment funds and indicators such as the unemployment rate or GDP growth. Following the analysis, the conclusion they reached is that the regions that benefited from a higher volume of European funds were much more resilient to crises. At the same time, with the help of European funds, the recession period of the beneficiary regions was shorter.

Vukasina, Kersan-Skabi'c and Orli'c (2022, p. 856) argue that the main advantage of European funds is that they are financial resources that do not have

to be repaid, thus directly influencing the economic growth of a country. Another study that supports the importance and crucial role of European funds is that of Walesiak and Dehnel (2023). In their study, they analyzed the 16 NUTS 2 regions of Poland during the period 2010-2019. Using interval data, the authors analyzed whether there were significant differences between the regions of the country. They did not focus on fixed numbers, but they analyzed indicators related to the quality of life, the labor market, education and health. The result obtained was a positive one, with disparities between rich and poor regions decreasing during the period analyzed. Once again, it is confirmed that European funds play an essential role for regional development in some countries.

In order to analyze how effective European funds are and what their impact is on regional development, several studies have been conducted where different variables were analyzed. Shebanin, et al. (2022) analyzed the link between Cohesion Fund financing and the evolution of GDP, but also of gross value added in EU member countries with a focus on NUTS 2 regions. The authors analyzed the EU-27 member states between 2010 and 2020, using a multi-criteria methodology, based on their proposed synthetic indicator of the quality of development, which integrates economic, social and environmental dimensions. The research results indicate that regions characterized by high institutional quality manage to efficiently convert European funds into sustainable structural development. In contrast, regions with deficient administrative capacity tend to register only artificial or temporary economic growth, lacking solid long-term foundations.

Destefanis and Di Giacinto (2023) analyzed the relationship between structural funds payments and GDP at the level of European regions. They also highlighted the spillover effect. The authors analyze the period 1994-2018 and a sample of over 200 NUTS 2 regions in the EU using a Spatial Vector Autoregression (Sp-VAR) model. The result of this analysis was that there is a positive correlation between GDP growth and allocated funds, and regarding the spillover effect, the authors demonstrated that the benefits of European funds do not stop at the administrative border of a region, but on the contrary, positive externalities are also produced for neighboring regions. Also, they mentioned that the effects are not immediate but observed over time.

Maris (2024) analyzes the Visegrad Group (V4) countries for the period 2000-2018, using panel data, and observes a causal relationship between regional growth and the absorption of European Structural and Investment Funds (ESIF). The results show that the relationship between the two variables to be statistically significant, but very modest. The author emphasizes that the simple increase in the volume of funds does not guarantee a proportional acceleration of development, the success of the process fundamentally depending on the existence of an efficient strategy for the use of resources.

Table 1 summarizes the most important findings regarding our research topic.

Table 1. **Research on cohesion policy and its impact on regional development**

Authors	Period of analysis	Regions	Methodology	Variables	Results
Arbolino and Di Caro (2021)	2008–2020	20 regions (NUTS 2) in Italy	Construction of resilience scenarios; Econometric modeling	Employment rate, absorption of funds (ESF/ERDF), sectoral structure	EU funds act as a shock absorber for the labor market during crises, if strategically allocated
Cia and De Blasio (2015)	2007–2013	325 local labor markets (Southern Italy)	Econometrics based on actual payments; Specific trends	Cumulative payments of structural funds, employment growth, housing prices, migration	The ability of funds to offset the crisis was limited; insignificant impact on employment at the aggregate level
Destefanis and Di Giacinto (2023)	1994–2018	Over 200 regions (NUTS 2) in the EU	Spatial Vector Autoregression (Sp-VAR)	GDP per capita, Structural Funds payments, spatial weight matrix	The funds have a positive impact on GDP, generating benefits in neighboring regions (spillovers)
Mariš (2024)	2000–2018	NUTS 2 regions of the V4 countries	Panel data	Economic growth (GDP), ESIF absorption, regional investments, human capital	There is a causal relationship between funds and growth, but the impact is modest and unevenly distributed

Authors	Period of analysis	Regions	Methodology	Variables	Results
Shebanin et al. (2022)	2010–2020	EU-27 Member States	Entropy Method; Multi-criteria Evaluation	Quality pillars: Economic (GDP), Social (poverty), Innovation (R&D), Institutional (governance)	Institutional quality is the precondition for success; without it, growth is only temporary or artificial.
Walesia and Dehnel (2023)	2010–2019	16 regions (NUTS 2) in Poland	Interval data	Social cohesion indicators (education, health, housing, labor market) expressed as ranges [min, max]	Overall improvement of social cohesion and reduction of regional disparities in Poland

Source: authors' contribution

Summarizing, the literature provides an image of the link between regional development and cohesion policy, which are key concepts in the construction and development of the EU. Most specialized articles emphasize that regional development is a complex process, the main purpose of which is to reduce disparities and capitalize on the potential of the regions, and cohesion policy is the operational framework through which the objectives of regional development are put into practice. At the same time, these concepts have evolved from strictly economic interpretations to an integrated vision, including economic, social and territorial cohesion. Overall, we understand that these two concepts are essential, and their efficiency depends on the coordination of public policies, the involvement of local actors, but also on the strategic use of European resources.

3. DATA AND METHODOLGY

3.1. Objectives and Research Hypotheses

The main objective of the study is to assess the impact of European funds on the development of the eight development regions of Romania, by using a panel econometric analysis for the period 2007-2022. This period encompasses two complete financial programming periods of the EU, 2007-2013 and 2014-

2020, providing a relevant evolutionary analysis on how cohesion policy has contributed to reducing the gaps between the development regions of Romania.

Starting from the benchmarks provided by the literature and the structural features of the Romanian economy, we formulated three research hypotheses in order to guide the sensitivity analysis and to validate the identified economic mechanisms:

- *H1: Payments from European funds have a positive impact on regional GDP, but this effect is felt with a time lag of at least one year;*
- *H2: Technical infrastructure and foreign direct investment (FDI) are major determinants of regional economic growth, enhancing the effect of structural funds;*
- *H3: There is a high correlation between infrastructure endowment and the level of human capital in Romania's regions, a fact that requires a specific econometric approach to isolate the impact of each factor.*

The first hypothesis is consistent with the literature that states that structural public investments require a period of maturation before being reflected in aggregate production indicators. RodrÍguez-Pose and Fratesi (2004) highlight that the effect of European funds propagates asymmetrically over time, with major effects only visible through the introduction of time lags. Zaman and Cristea (2011) in a study focused on Romania, highlighted the existence of structural and administrative constraints that amplify this time-lag between the moment of payment settlement, and the generation of gross value added in regional economies.

The second hypothesis is supported by modern theories of economic growth. According to them, the accumulation of physical capital and the infusion of foreign capital are fundamental drivers of productivity. The introduction of technical infrastructure and foreign direct investment as independent variables is based on endogenous growth models, where public physical capital and foreign private capital infusions are considered driving forces of aggregate productivity (Aschauer, 1989; Borensztein, De Gregorio and Lee, 1998).

In the Romanian context, regions that have managed to attract significant volumes of FDI and that have a modernized transport network offer a favorable business environment, capable of absorbing and capitalizing on European funding more efficiently (Goschin, 2014). Thus, these variables not only directly influence regional GDP, but also act as complementary factors that maximize the return on EU funds.

The third hypothesis is often found in the literature and shows that local growth poles manage to bring together both good infrastructure networks and a very well-educated workforce (Man, et al., 2015).

From an econometric point of view, this dynamic hides the risk of multicollinearity in crowded regression models, where structural factors can

absorb each other in explaining GDP variation. This hypothesis substantiates the need for a sensitivity analysis by estimating dissociated alternative models, focused separately on infrastructure and human capital, respectively, thus ensuring the robustness and statistical correctness of the determined coefficients.

By testing these hypotheses, the study does not only aim to show whether or not European funds have a general impact. The goal is to highlight the clear paths and local conditions through which this available financial resource ends up influencing the economy and growth of each region in Romania.

3.2. Data and Variables

The sample used includes the eight development regions of Romania, defined by Law no. 315/2004. These regions correspond to the NUTS 2 level of the Eurostat classification. The period analyzed comprises 16 years, namely 2007-2022, a period that begins with the year of Romania's accession to the EU and the beginning of the first consistent financial flows received, as well as more recent years. At the time of writing this paper, the year 2022 is the last year for which we found data for the main independent variable, namely EU payments.

The construction of the econometric model and the selection of variables were based on literature. In his paper, Sîrbu (2014) demonstrated that the impact of structural funds is conditioned by specific local factors such as the capacity to attract private investment and the quality of infrastructure. The dependent variable is represented by the regional Gross Domestic Product (GDP). In most studies, this indicator is the standard measure of economic convergence. The main independent variable is represented by the EU payments made by the European Commission. As control variables we chose infrastructure, human capital, unemployment and foreign direct investment (FDI). The importance of infrastructure (modernized roads) in reducing regional disparities is supported by Apostolache (2014). Human capital (represented by the number of students enrolled in higher education) and unemployment are validated by the research of Aparicio-Pérez, Espinosa and Pavía (2025). At the same time, the inclusion of FDI is justified by the strong correlation identified by Sîrbu (2014) between investment flows and the reduction of development gaps at the level of regions in Romania.

Table 2 describes all the variables that we will use in the model.

Table 2. Description of variables and data sources

Variable type	Symbol	Indicator	Unit of measurement	Period analyzed	Data source	Expected impact
Dependent	GDP	Regional GDP	Euros per capita	2007-2022	Eurostat	
Independent	PAYMENTS	PAYMENTS	Euros per capita	2007-2022	European data	+

Variable type	Symbol	Indicator	Unit of measurement	Period analyzed	Data source	Expected impact
Control	INFRA	Length of modernized roads	Share of modernized roads in total roads	2007-2022	National Institute of Statistics	+
Control	HUMAN_CAP	Students enrolled in higher education	Number of students	2007-2022	National Institute of Statistics	+
Control	UNEMPLOYMENT	Unemployment rate	%	2007-2022	Eurostat	-
Control	FDI	Foreign Direct Investment	Euros per capita	2007-2022	National Bank of Romania	+

Source: authors contribution based on literature

3.3. Model

To analyze the impact of European funds on regional economic development, we use an econometric method based on panel data. Unlike simple analyses, which look at only one region over time or at several regions in a single year, panel data combines both dimensions: the cross-sectional one, the eight regions of Romania, and the temporal one, the period 2007-2022.

The regression model is given by equation (1).

$$GDP_{i,t} = \beta_0 + \beta_1 \times PAYMENTS_{i,t} + \beta_2 \times FDI_{i,t} + \beta_3 \times HUMAN_CAP_{i,t} + \beta_4 \times INFRA_{i,t} + \beta_5 \times UNEMPLOYMENT_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where: i = region; t = year; β_0 = constant; $B_{1\text{-}5}$ = regression coefficients; ε = error term.

Although the theoretical relationship is presented in a simpler form, in the estimation stage we will apply the logarithmization of the variables expressed in absolute values. This transformation is necessary to reduce the heteroscedasticity of the data series and to allow the interpretation of the coefficients in the form of elasticity, providing a clearer picture of the sensitivity of the regional economy to the infusion of capital.

The methodology is structured in four successive stages, aimed at ensuring the statistical validity of the results.

In the first stage, we analyzed the stochastic properties of the data series using the Levin, Lin and Chu (LLC) unit-root test. The results indicated a mixed-type panel: some variables proved to be stationary at level (I(0)), while others presented non-stationarity. For the latter, we applied the first difference, an operation after which they became stationary (I(1)). Given this mix of integration orders, the application of classical cointegration tests was not appropriate, which is why we opted to control the trend through period fixed effects.

In the second stage, we chose the optimal panel specification, fixed effects or random effects. In this sense, we ran the Hausman Test. Given that the probability obtained was lower than the critical threshold of 5%, we rejected the null hypothesis. Therefore, we demonstrated that fixed-effects models are the most appropriate to capture the heterogeneity and structural differences between the eight regions of Romania.

The third stage aimed at diagnosing the relationships between the independent variables by building the correlation matrix. This analysis revealed a major technical problem: a high correlation between infrastructure (INFRA) and the level of human capital (HUMAN_CAP). And this overlap induces the risk of multicollinearity, a phenomenon that inflates standard errors and can make other essential variables, such as European funds, appear erroneously insignificant in the clustered models.

To overcome this obstacle related to the high correlation between variables, in the last stage we performed a sensitivity analysis by estimating separate alternative models. Specifically, we chose not to put infrastructure and human capital in the same equation, but to test them one by one. In addition, we analyzed the impact of European funds using time lags of 1 and 2 years. This approach allowed us to see not only which factor is more important, but also after how long European money starts to really help increase regional GDP.

4. EMPIRICAL ANALYSIS

4.1. Descriptive Analysis of European Funds and Regional Indicators in Romania

Before proceeding to the estimation of regression equations and hypothesis testing, it is essential to analyze the selected data in detail. A basic rule in econometrics stipulates that the final model is not estimated directly, but only after a descriptive analysis and a careful diagnosis of the variables. This process is mandatory to prevent obtaining erroneous results, determined by hidden problems in the database, such as major overlap between variables. Therefore, before interpreting the impact of European funds on regional GDP, it is mandatory to go through three preliminary statistical filters: descriptive statistics (Table 3), the unit root test (Table 4) and the correlation matrix (Table 5).

Descriptive statistics help us to obtain an overview of the data, tracking the average, minimum and maximum values. This will show us, for example, how large the differences in development and absorption of funds are between the regions of the country.

Table 3. Descriptive statistics

	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jaque-Bera	Probability	Observations
LOG_GDP	8.996675	8.902432	10.48849	8.242756	0.460581	0.93459	3.631091	20.7579	0.000031	128
LOG_PAYMENTS	4.761171	4.877554	5.911246	2.878485	0.629707	-0.84317	3.178716	15.3368	0.000467	128
LOG_FDI	0.492833	0.289997	3.238623	-1.757	1.038582	0.960853	3.81816	23.26584	0.000009	128
UNEMPLOYMENT	6.075	5.7	10.8	2.1	2.193153	0.354604	2.165562	6.396062	0.040843	128
INFRA	0.411349	0.3785	0.877	0.1974	0.144097	1.448436	5.251798	71.7998	0	128
HUMAN_CAP	0.567423	0.3816	2.5965	0.1208	0.534506	2.072561	6.350618	151.513	0	128

Source: authors' elaboration in EViews

The fundamental financial variables, GDP and PAYMENTS, demonstrate a relative maturity of the data. The average value of GDP (8.99) and its positive asymmetry (0.93) suggest the existence of poles of prosperity that pull the average upwards compared to the rest of the country. On the other hand, the PAYMENTS variable presents a negative asymmetry (-0.84), which indicates that most observations are concentrated around high values. This is evidence of the fact that, over the 16 years, European financial flows have had a constant and significant presence in most regions, being a stable pillar of financing.

Analyzing the control variables INFRA and HUMAN_CAP we observe the largest discrepancies. The extremely high values of the skewness (Kurtosis 5.25, respectively 6.35) indicate a distribution where some extreme values are present. This reflects severe geographical concentration, while a few regions have massive university centers and modernized transport networks, the rest of the regions face a chronic deficit. The strongly positive asymmetry of human capital (2.07) is an alarm signal regarding the volume of students in each region, with large urban areas having an excess of students, leaving peripheral areas without the human resources necessary for development.

The unemployment rate (6.07%) stands out as the most stable variable, with a platykurtic distribution with a kurtosis below 3 and low asymmetry. This suggests that the labor market tends towards a certain homogeneity in periods of crisis or growth. In contrast, FDI is highly dispersed, demonstrating that private capital is much more selective than European public funds, orienting itself towards regions with already consolidated infrastructure and human capital.

Overall, descriptive statistics confirm the need for intervention through cohesion policy, demonstrating that, in its absence, market forces tend to widen regional disparities instead of reducing them.

Through the unit root test, we will check whether the data series are stationary. If we use non-stationary variables without correcting them by difference, the model will generate a spurious regression, that is, a statistical illusion where the variables appear correlated, but in reality, they have no economic connection.

Table 4. Results of data stationarity testing

Variable	Probability	First Difference (Prob.)	Integration order	Conclusion
LOG_GDP	0.0000***	-	I(0)	Stationary
LOG_PAYMENTS	0.1889*	0.0063***	I(1)	Stationary at diff. I
LOG_FDI	1.0000	0.0000***	I(1)	Stationary at diff. I
HUMAN_CAP	0.0333**	-	I(0)	Stationary
UNEMPLOYMENT	0.3327	0.0000***	I(1)	Stationary at diff. I
INFRA	0.6565	0	I(1)	Stationary at diff. I

Note: ***p<0.01, **p<0.05, *p<0.1.

Source: authors' elaboration in EViews

As we can see in Table 4, the results obtained from applying the Levin, Lin and Chu (LLC) unit root test highlight a mixed structure of the analyzed panel, the variables being divided into two distinct categories depending on their order of integration.

The first category includes variables that have proven to be stationary directly in their gross form, that is, at the (I(0)) level. These are the LOG_GDP indicators, which register a probability of 0.0000, and HUMAN_CAP, with a probability of 0.0333. In the case of the logarithm of regional GDP, we have maximum statistical significance, at an error threshold of only 1%, while for human capital, it guarantees stationarity at an error threshold of 5%. This highlights the fact that the data series for regional production and the number of students have a stable mean and variance over time, not being influenced by a distorted trend over the 16 years analyzed.

The other variables fall into the second category. At the initial level, all of them obtained probabilities above the critical threshold of 5%, which means that in their gross form they are non-stationary. This behavior being natural in economics, since indicators such as the length of modernized roads or foreign investment flows have increased constantly from year to year, being strongly influenced by the passage of time. To correct this trend and stabilize them, we applied the first-order differentiation operator, an operation through which the change from one year to the next was calculated. Subsequently, all four variables

became strongly stationary, their probabilities decreasing to 0.0000, a fact also confirmed by the maximum significance threshold of 1%.

After obtaining these results, we based the analysis on a panel model with period fixed effects. Through this technique, we eliminated the risk of false regression, and the test results show the real impact that each variable has on the regional GDP.

The correlation matrix measures the strength of the links between independent variables taken two by two. Its role is to detect in time the multicollinearity phenomenon. If two important economic forces grow in parallel and overlap, they block each other, masking the real meaning of European funds.

Table 5. **Correlation matrix**

	LOG_GDP	LOG_PAYMENTS	LOG_FDI	UNEMPLOYMENT	INFRA	HUMAN_CAP
LOG_GDP	1					
LOG_PAYMENTS	0.294980	1				
LOG_FDI	0.896981	0.182886	1			
UNEMPLOYMENT	-0.357468	-0.051639	-0.173555	1		
INFRA	0.776069	0.198934	0.751100	-0.210774	1	
HUMAN_CAP	0.742716	-0.155322	0.790233	-0.352546	0.702917	1

Source: authors' elaboration in EViews

Analyzing Table 5, we observe that there is an extremely strong correlation between GDP and FDI (0.89). At the same time, the close links between FDI, infrastructure (0.751) and human capital (0.790) are also highlighted. These data indicate that international private capital is predominantly attracted to regions that already offer structural advantages, such as a skilled workforce and connectivity, thus consolidating existing growth poles. We can also observe that the independent variable has a positive, but much lower, correlation with regional GDP (0.295). This value suggests that their impact may be indirect or mediated by other variables, such as infrastructure or human capital. And the weak and even slightly negative correlation with the control variable human capital (-0.155) suggests that European funds are strategically directed towards less developed regions, which face shortages of skilled labor and low GDP. Thus, EU funds act as a counterbalancing mechanism for private investment, trying to reduce the gaps that market forces tend to accentuate. In conclusion, the correlation matrix describes a dual regional economy, on the one hand,

accelerated growth driven by private investment and human resources concentrated in urban poles, and on the other hand, a European public intervention that tries to penetrate less developed areas.

In conclusion, the correlation matrix describes a dual regional economy, on the one hand, accelerated growth driven by private investment and human resources concentrated in urban poles, and on the other hand, European public intervention that tries to penetrate less developed areas.

4.2. Econometric Model Estimation and Results

The objective of this step is to see to what extent payments from European funds, along with other control factors, influence the dynamics of regional GDP in Romania.

An important moment in configuring the econometric model is represented by the Hausman Test. In the analysis of panel data, this test has the role of assessing whether or not specific differences between regions are correlated with the independent variables in the model. This test evaluates the null hypothesis (H0), according to which the random effects model is the most efficient and appropriate, in relation to the alternative hypothesis (H1), which supports the use of the fixed effects model. Since the eight development regions of Romania are extremely different from a structural point of view, running the Hausman test ensures that the selected model does not ignore these local particularities.

Table 6. Hausman test results

	Chi-Sq. Statistic	Chi-Sq. d.f.	Probability
Cross-section random	11.767988	5	0.0381

Source: authors' elaboration in EViews

The results obtained, presented in Table 6, after running the test indicate a value of the Chi-Square statistical indicator of 11.7679, with 5 degrees of freedom. The critical decision-making element in this analysis is represented by the probability value, which **records** the threshold of 0.0381. Since the probability value is lower than the standard threshold of statistical significance of 5%, the null hypothesis (H0) is rejected. Therefore, the test demonstrates that there is a significant correlation between the specific effects of each region and the independent variables introduced in the equation.

From a methodological point of view, this result demonstrates that the fixed-effects model is the only consistent and appropriate one for the present research. The choice is confirmed by the economic reality, the eight development regions of Romania presenting unique, stable particularities over time. By including fixed effects, the econometric model manages to isolate this

regional heterogeneity, guaranteeing that the errors are not correlated with the independent variables and that the impact of European funds is estimated without statistical distortions.

Table 7. Estimation results

	Coefficient	Std. Error	t-Statistic	Prob.
C	8.838102	0.107938	81.88196	0.0000
LOG_PAYMENTS (-1)	0.035576	0.020392	1.744667	0.0843
LOG_FDI	-0.042034	0.026575	-1.581700	0.1171
INFRA	0.017603	0.047934	0.367236	0.7143
UNEMPLOYMENT	0.004467	0.003014	1.485042	0.1409

Source: authors' elaboration in EViews

Table 7 presents the results of the econometric model estimation. It reflects the direct impact of European funds and control variables on regional GDP in Romania, bringing essential clarifications regarding the formulated hypotheses. Following successive tests, it was demonstrated that this specification, which excludes the human capital variable to eliminate collinearity distortions, represents the best estimated econometric model, providing the clearest and most robust statistical results in the entire research. The central variable of the analysis, LOG_PAYMENTS (-1), records within this optimal model a coefficient of 0.0355 and a statistical probability of 0.0843. Since this probability is below the critical threshold of 10%, the variable is considered statistically significant at a confidence level of 90%. The positive value of the coefficient demonstrates that European funds have a favorable impact on the economy, with a 1% increase in EU fund payments leading, on average, to an increase of approximately 0.035% in regional GDP per capita. But the fact that this effect becomes visible only when the variable is introduced with a time lag directly validates the first hypothesis (H1). We can confirm that European financial flows do not translate instantly into gross economic growth, with a lag of at least one year being required for investment projects to go through the administrative and execution stages before generating added value in the territory.

The infrastructure indicator has a positive coefficient of 0.0176, suggesting that road network modernization tends to support regional economic growth. However, its high probability of 0.7143 places the variable well above the standard thresholds of statistical significance. This result indicates that the direct impact of infrastructure is not strongly reflected in GDP from one year to the next in isolation, but rather acts as a long-term supporting factor, which partially reconfigures the expectations of the second hypothesis (H2).

On the other hand, FDI has a negative coefficient of -0.0420 and a probability of 0.1171, which places it slightly outside the 10% significance threshold. This surprising dynamic can be explained by the decision to isolate human capital in alternative models. That is, without the direct interaction with a highly skilled workforce within the same equation, foreign capital infusions cannot fully manifest their positive effects, a conclusion that fully confirms the arguments behind the third hypothesis (H3). Similarly, the unemployment rate obtains a coefficient of 0.0044 and a probability of 0.1409, proving to be statistically insignificant, which shows that small variations of this indicator at regional level do not represent a factor with a major or immediate impact on the fluctuations of GDP per capita during the analyzed period.

Finally, by eliminating the human capital variable and cleaning the model of severe statistical interferences, this econometric specification emerged as the most performing, managing to rigorously highlight the real, positive and delayed role of European funds in Romania.

Table 8 includes the synthesis and diagnostic indicators of the estimated specification. They confirm the statistical quality of the model and validate its predictive power. The coefficient of determination R-square, registers the value of 0.9698, which proves that approximately 96.98% of the fluctuations of the logarithm of the regional GDP are explained by means of the independent variables introduced into the equation, along with the specific fixed effects.

Table 8. Testing results

R-Square	0.969836	**Mean Dependent Var**	9.017332
Adjusted R-Square	0.963015	**S.D. Dependent Var**	0.458509
S.E. of Regression	0.035139	**Akaike Info Criterion**	-3.669862
Sum Squared Resid	0.116068	**Schwarz Criterion**	-3.065905
Log Likelihood	246.1917	**Hannan-Quinn Criter.**	-3.424592
F-Statistic	80.06707	**Durbin-Watson Stat**	0.974100
Prob(F-Statistic)	0.000000		

Source: authors' elaboration in EViews

This high performance is directly supported by the F-statistic, which records a value of 80.06707, associated with a probability Prob(F-statistic) of 0.0000. Since this probability is strictly equal to zero, the null hypothesis, according to which all the coefficients of the model would be simultaneously equal to zero, is rejected with certainty. This result guarantees the overall validity of the model from a statistical point of view and certifies that the selected variables exert a significant cumulative impact on the regional economy.

Finally, the diagnostic parameters of the model confirm that the chosen econometric specification is correct and representative of the economic reality of the development regions in Romania fo the period 2007–2022. The results thus obtained can be used to substantiate pertinent conclusions regarding the efficiency of cohesion policy in reducing regional disparities.

4.3. Discussions

In Table 9 we present the four regression models performed and their results.

Table 9. Sensitivity analysis

	Model 1 (base)	Model 2 (Lag -1)	Model 3 (Infra)	Model 4 (Human_cap)
C	8.541982*** (0.0000)	8.872600*** (0.0000)	8.838102*** (0.0000)	8.860301*** (0.0000)
LOG_PAYMENTS	-0.005889 (0.7659)	0.025013 (0.2673)	0.035576* (0.0843)	0.025355 (0.2217)
LOG_FDI	-0.002025 (0.8935)	-0.048449 (0.1233)	-0.042034 (0.1171)	-0.044456 (0.1030)
UNEMPLOYMENT	0.005027 * (0.0879)	0.004574 (0.1322)	0.004467 (0.1409)	0.04485 (0.1274)
INFRA	-0.027439 (0.5818)	-0.002437 (0.9580)	0.017603 (0.7143)	—
HUMAN_CAP	0.056504 (0.1274)	0.045465 (0.2624)	—	0.040913 (0.2364)
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R-squared	0.890099	0.913323	0.969836	0.940042
Adjusted R-squared	0.878631	0.901124	0.963015	0.937006
F-statistic	77.61641	77.70335	80.06707	81.73393
Number of obs.	128	120	120	120

Note: ***p<0,001, **p<0,05, *p<0,1.

Source: authors' elaboration in EViews

Model 1 represents the original equation with all variables included simultaneously and without any time lag. The result for EU funds payments was a misleading one, recording a negative coefficient of -0.0058 and a completely insignificant probability of 0.7659. This initial result suggests that the impact of European money cannot be captured instantly and that the model is strongly perturbed by the concurrent presence of infrastructure and human capital, two

control variables that massively overlap due to the very high correlation between them.

To test whether the time factor plays a decisive role, in Model 2 we introduced a one-year lag for European funds, keeping the rest of the structure of all variables the same. Following this step, we observed a clear improvement in the direction of the impact, with the coefficient becoming positive, at the value of 0.0250, but the variable remained statistically insignificant, with a probability of 0.2673. This result confirmed that simply applying a lag is not enough to clean up the model. Multicollinearity between infrastructure and human capital continued to inflate the standard errors and mask the real significance of European funds. To overcome this econometric blockage, we dissociated the two structural factors in the last two specifications, choosing to test them one by one. Thus, in Model 3 we eliminated human capital, while in Model 4 we did the opposite, isolating human capital and eliminating infrastructure. By directly comparing the two alternatives, we concluded that Model 3 is the best statistical choice for our work. In the infrastructure-focused model, the coefficient of European funds increased to 0.0355, and the probability dropped to 0.0843, becoming statistically significant at a 90% confidence level. In contrast, in Model 4, although a positive coefficient was maintained, European funds became statistically insignificant again, recording a probability of 0.2217.

This hierarchy between models demonstrates from a scientific point of view that Model 3 is the only one capable of effectively controlling heterogeneity and highlighting the technical channel through which public investments are transmitted to the territory. Through this comparative sensitivity analysis, we managed to rigorously validate the fact that European payments stimulate regional economic performance in Romania only when analyzed with a one-year time lag and in the absence of distortions caused by the overlap of human capital in the same equation.

As with any applied research, the results of the econometric model must be viewed in close connection with a series of constraints and data limits, but which opens the way to important possibilities for improvement in the future. The first major barrier that we encountered during the data collection was the availability of recent official statistical data. Due to the large processing and reporting gaps of statistical institutes, both at national level through INSSE and at European level through Eurostat, the year 2022 represented the deadline by which we could build complete and homogeneous series. This temporal restriction prevents us from capturing in the model the up-to-date macroeconomic effects of projects financed through recent financial frameworks or through the new recovery and resilience mechanisms. At the same time, another limit of the study is given by the level of territorial aggregation. The current model is based on development regions (NUTS 2), a useful scale of analysis for European cohesion policies, but which tends to standardize and hide the large internal discrepancies

between the component counties. The economic performance of a driver county such as Iași distorts the average of the entire region to which it belongs, masking the underdevelopment of neighboring counties. Therefore, a panel database structured at county level (NUTS 3) would significantly reduce the heterogeneity of the data and would provide much greater precision in isolating the real impact of EU funds. In addition to the time and space limitations, the proposed econometric model faced strict restrictions regarding the nature of the selected variables, using exclusively quantitative data. However, economic reality and the specialized literature demonstrate that the success of the implementation of European funds depends heavily on a series of intangible factors of a qualitative nature. During the research, we did not have qualitative variables available, such as solid indicators that measure the quality of local public administration or the level of regional bureaucracy. The introduction of proxies that capture institutional stability, the degree of digitalization of city halls or transparency in the organization of public tenders would represent a direction for improvement. Efficient and corruption-free local public management contributes to a high absorption rate and the transformation of money into real welfare for citizens.

The results obtained after running the four econometric models are confirmed or refuted by literature. For example, after running Model 1, we had as the main result the existence of a positive and statistically significant impact of the actual payments from European funds on the regional GDP per capita, conditioned by a time lag of one year. This result is supported by the results obtained by Pienkovski and Berkowitz (2017) and Marzinotto (2012). These authors have repeatedly emphasized, through meta-analysis studies, that the macroeconomic impact of cohesion policy is governed by temporal asymmetries and cannot be captured instantly due to complex administrative circuits.

Also, the fact that our model rejects the significance of payments in the current year and validates it in year t-1 provides a clear mathematical confirmation of the theories of Becker (2019), which highlights the transformation of cohesion policy from a simple redistribution instrument into a long-term structural investment policy. This dynamic is also closely linked to the classic view of Aschauer (1989) on the productivity of public spending, which argued that massive investments in fixed assets need time to generate positive externalities in the private sector and translate into gross value added.

On the other hand, the decision taken in the sensitivity analysis of the paper, namely the isolation of human capital in alternative models to eliminate distortions caused by multicollinearity, is also based on the results of empirical studies. Borensztein, De Gregorio and Lee (1998) have shown that human capital accumulation enhances the absorptive capacity of technology and capital, creating such close interdependence with other forms of structural investment that modeling them simultaneously in simple linear equations distorts the results.

This phenomenon explains from an econometric point of view why, in our initial models, the simultaneous presence of road infrastructure and human capital blocked the significance of funds. At the same time, the importance of including road infrastructure as an essential control variable in the final specification confirms the practical conclusions of Man et al. (2015), who argued that physical accessibility and the development of the road network in Romania represent critical pillars without which regional convergence cannot materialize.

However, the model partially justifies the criticisms launched by Sostar (2021) and Zaman and Cristea (2011) regarding domestic structural obstacles. The significance of the model only at the time lag level indicates that the bureaucratic bottlenecks and lack of simplification recently reported by Popescu et al. (2024), along with the poor quality of local public management highlighted by Shebanin et al. (2022), act as administrative brakes that delay the entry of European money into the real economy, confirming that the efficiency of European capital remains directly dependent on the quality and modernization of the institutions of the receiving state.

5. CONCLUSIONS

The objective of this paper was to analyze the impact of European funds on regional development in Romania, using the empirical study as the method of analysis. The literature emphasizes that the impact of structural and cohesion funds is not uniform or guaranteed; their efficiency is conditioned by the absorption capacity and the quality of the local institutional context. The results of our paper confirm modern theoretical perspectives that argue that cohesion policy does not function as an isolated growth mechanism, but rather as a catalyst whose success depends on the synergy with private investments. For our research, we used panel data with fixed effects, covering the eight development regions of Romania over 16 years (2007-2022). The main result of this study validates the fact that payments from European funds have a positive and significant influence on the fluctuations of regional GDP per capita, but this economic link is influenced by an important temporal asymmetry. The successive data runs and the substantiation of the econometric model demonstrated that the impact of financial flows does not occur instantaneously but requires a time lag of at least one year. This year represents the minimum period in which a million euros absorbed go through bureaucratic circuits, public tenders and actual execution in the field, transforming from capital stock into fixed assets capable of generating gross added value in the territory.

The sensitivity analysis also highlighted that in order to capture the real impact, it was indispensable to isolate human capital in the alternative models. This technical decision prevented the distortions caused by multicollinearity, demonstrating that the accumulation of highly qualified labor and the expansion of road infrastructure are interconnected phenomena in the economic reality of

Romania. And the attempt to measure them simultaneously in isolation risks blocking the model's explanatory capacity.

However, following the completion of this study, we also found some limitations, but which open perspectives for future research. Among these limitations is the impossibility of accessing homogeneous statistical data after 2022, due to gaps in the National Institute of Statistics and Eurostat reports. Another limitation would be the lack of qualitative variables that are able to accurately measure institutional transparency or the quality of public management at the local level. In order to deepen these results, a future research direction is to analyze the impact of European funds at the county level (NUTS 3), providing a much clearer picture of internal discrepancies and isolating the performing counties from the peripheral ones. The empirical results of the paper provide mathematical confirmation of the fact that EU payments stimulate regional GDP only after a one-year lag, which shows that the success of public policies should not be measured by the gross absorption rate, but by the speed of propagation in the territory. The main recommendation for management authorities is to reduce this gap by fully digitizing flows and simplifying settlement procedures. Also, the isolation of human capital from infrastructure demonstrates that physical investments lose their return if they are carried out in isolation. Decision-makers must strategically correlate road construction with funding schemes for education and the retention of the active workforce, the only way to attract investments with high added value.

Our contribution consists in the substantiation of an original econometric model, strictly adapted to the specifics of the Romanian regions, going beyond the descriptive analyses of the past. The methodological contribution consists in the configuration of a model, through which we solved the technical problem of multicollinearity that blocked the standard equations, and we econometrically demonstrated the existence of temporal asymmetry. The paper thus provides a precise analysis tool, mathematically proving that the real impact of European funds is conditioned by the institutional quality and implementation times, not only by the volume of capital received from the EU.

In conclusion, the success of regional development critically depends on the ability to fix human resources in the territory and to transform financial injections into durable assets, capable of generating sustainable and balanced growth.

References

1) Albu, F. I. (2019). Politica de dezvoltare regională a Uniunii Europene. Studiu de caz România. *Doctoral dissertation.* Universitatea Tehnică a Moldovei.
2) Aparicio-Pérez, D., Espinosa, P., and Jose M. Pavía, E. T.-A. (2025). On the impact of next generation EU funds: A regional synthetic control method approach. *Papers in Regional Science, 104*, 54-74.

3) Apostolache, A. (2014). Regional development in Romania–from regulations to practice. *Procedia Economics and Finance*, *8,* 35-41.
4) Arbolino, R., and Di Caro, P. (2021). Can the EU funds promote regional resilience at time of Covid-19? Insights from the Great Recession. *Journal of Policy Modeling*, *43*(1), 109-126.
5) Aschauer, D. (1989). Is public expenditure productive? *Journal of monetary economics*, *23*(2), 177-200.
6) Bachtler, J., and Wren, C. (2007). Evaluation of European Cohesion Policy: Research Questions amid Policy Challenges. *Regional Sudies*, *40*(02), 143-153.
7) Banca Națională a României. (2024, Decembrie). *Foreign Direct Investment in Romania*. [online] Available at: https://www.bnr.ro/en/12068-foreign-direct-investment-in-romania [Accessed 1.03.2026].
8) Becker, P. (2019). The reform of European cohesion policy or how to couple the streams successfully. *Journal of Eurpean Integration*, *41*(2), 147-168.
9) Borensztein, E., De Gregorio, J., and Lee, J. (1998). How does foreign direct investment affect economic growth? *Journal of international Economics*, *45*(1), 115-135.
10) Bouvet, F., and Dall'erba, S. (2010). European Regional Structural Funds: How Large is the Influenceof Politics on the Allocation Process? *Journal of Common Market Studies*, *48*(3), 501-528.
11) Burlacu, S. (2019). How does the European Commission Work? The Cases of Rotterdam vs. Constanta Ports. *33rd IBIMA Conference*, 10-11.
12) Butnaru, D. (2026). *Impactul fondurilor europene asupra dezvoltării regionale în România: un studiu empiric.* Master's thesis, Alexandru Ioan Cuza University of Iași. UAIC Repository.
13) Ciani, E., and De Blasio, G. (2015). European structural funds during the crisis: Evidence from Southern Italy. *IZA Journal of Labor Policy 4*(1), 20.
14) Cîrnu, D. (2010). Particularități ale dezvoltării regionale și cauze specifice. *Annals-Economy Series*, *3*, 75-86.
15) Deffa, O. J. (2016). The impact of homogeneity on intra-group cohesion: a macro-level comparison of minority communities in a Western diaspora. *Journal of Multilingual and Multicultural Development*, *37*(4), 343-356.
16) Destefanis, S., and Di Giacinto, V. (2023). EU Structural Funds and GDP per Capita: Spatial VAR Evidence for the European Regions. *Bank of Italy Temi Di Discussione (Working Paper) No, 1409.*
17) Dornean, A. (2015). Financing regional development through European funds. A review of the effects in Romania (2007-2013). *EURINT*, *2*(1), 141-153.
18) Dornean, A. (2025). Finanțări din fonduri europene (course). *Faculty of Economics and Business Administration. Alexandru Ioan Cuza University of Iasi.*
19) European Commission. (2014). *Investiții pentru locuri de muncă și creștere: Al șaselea raport de coeziune economică, socială și teritorială.* Publications Office of the European Union, Luxembourg. [online] Available at: https://ec.europa.eu/regional_policy/sources/reports/cohesion6/6cr_ro.pdf [Accessed 10.03.2026].
20) European Commission. (2022). *Coeziunea în Europa în perspectiva anului 2050: Al optulea raport de coeziune economică, socială și teritorială.* Publications Office

of the European Union, Luxembourg. [online] Available at: https://ec.europa.eu/regional_policy/sources/reports/cohesion8/8cr_ro.pdf [Accessed 10.03.2026].

21) European Commission. (2024). *Al nouălea raport de coeziune economică, socială și teritorială.* Publications Office of the European Union, Luxembourg. [online] Available at: https://ec.europa.eu/regional_policy/sources/reports/cohesion9/RO_9CR_Highlights.pdf [Accessed 10.03.2026].
22) European Parliament. (1988). Resolution of 18 November 1988 on Community regional policy and the role of the regions. *Official Journal of the European Communities (OJEC). 19.12.1988, No C 326.* http://www.cvce.eu/obj/european_parliament_resolution_on_community_regional_policy_18_november_1988- en-0d3fbe38-8abf-4709-8599-22eb17622106.html
23) Eurostat. (2025). *Database.* [online] Available at: https://ec.europa.eu/eurostat/data/database [Accessed 10.12.2025].
24) Goschin, Z. (2014). Regional growth in Romania after its accession to EU: A shift-share analysis approach. *Procedia Economics and Finance*, *15*, 169-175.
25) Leonardi, R. (2005). *Cohesion Policy in the European Union. The Building of Europe*. Palgrave Macmillan
26) Man, T., Rusu, R., Moldovan, C., Ionescu-Heroiu, M., Moldovan, N., and Hărănguș, I. (2015). Spatial Impact of the Road Infrastructure Development in Romania. An Accessibility Approach. *Romanian Review of Regional Studies*, *11*(1).
27) Maris, M. (2024). Contribution of EU cohesion policy to regional growth: Evidence from V4 countries. *Prague Economic Papers*, *33*(2), 164-186.
28) Marzinotto, B. (2012). The Growth Effects of EU Cohesion Policy: A Meta-Analysis. (No. 2012/14). *Bruegel Working Paper*.
29) Mungiu-Pupazan, C. (2009). Dezvoltarea economică în profil teritorial. *Analele Universităţii "Constantin Brâncuşi" din Târgu Jiu, Seria Economie, (3)*, 151-162.
30) National Institute of Statistics. (2025). *Data*. Available at: https://insse.ro/cms/en [Accessed 10.12.2025].
31) Pastor, J., Pons, E., and Serrano, I. (2010). Regional Inequality in Spain: Permanent Income versus Current Income. *The Annals of Regional Science*, *44*(1), 121-145.
32) Pieńkowski, J., and Berkowitz, P. (2016). Econometric assessments of Cohesion Policy growth effects: how to make them more relevant for policymakers?. In *EU cohesion policy* (pp. 55-68). Routledge.
33) Popescu, M., Dobre, F., Ganea, O., and Vatase, F. (2024). Challenges of Cohesion Policy at the Level of the European Union- Simplification Tools. *Proceedings of the International Conference on Business Excellence, 18(1)*, 926-934. Sciendo
34) Regulation (EU) No 1303/2013 of the European Parliament and of the Council of 17 December 2013 laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund. *Official Journal of European Union*.
35) Rodriguez-Pose, A., and Fratesi, A. (2004). Between development and social policies: the impact of European Structural Funds in Objective 1 regions. *Regional studies*, *38*(1), 97-113.

36) Santos, I. (2008). Is Structural Spending on Solid Foundations? . No. 8. *Breugel policy brief.* Brussels.
37) Shebanin, V., Shebanina, O., Kormyskin, Y., Kliuchnyk, A., Umanska, V., and Reshetilov, G. (2022). Quality of local economic and regional development: the European Union cohesion policy. *International Jounal of Quality Research*, *16*(3). 777-788.
38) Sîrbu, R.-M. (2014). European Union Strategy and Foreign Direct Investments Impact on Romania's Regional Development. *Procedia - Social and Behavioral Sciences, 124*, 442-450.
39) Sostar, M. (2021). Utilization of EU funds: Impact on development. In Tenth International Scientific Conference Employment, Education and Entrepreneurship. In Zorana Nikitovic, Mirjana Radovic-Markovic and Sladjana Vujicic. *Belgrade: College of Business Economics and Entrepreneurship*, 196-201.
40) Spilioti, N., and Anastasiou, A. (2024). European structural and investment funds (ESIFs) and regional development across the European union (EU). *Journal of Risk and Financial Management*, *17*(6), 228.
41) Vukasina, M., Kersan-Skabi'c, I., and Orli'c, E. (2022). Impact of European structural and investment funds absorption on the regional development in the EU-12 (new member states). Equilibri. *Quarterly Journal of Economics and Economic Policy*, *17*(4), 857-880.
42) Walesiak, M., and Dehnel, G. (2023). Measurement of Social Cohesion in Poland's NUTS2 Regions in the Period 2010–2019 by Applying Dynamic Relative Taxonomy to Interval-Valued Data. *Sustainability*, *15*(4), 3752.
43) Wallerstein, I. (1984). *The Politics of the World-Economy: The States, the Movements and the Civilizations.* Cambridge University Press.
44) Zaman, G., and Cristea, A. (2011). EU structural funds absorption in Romania: obstacles and issues. *Romanian Journal of Economics*, *32*(1), 41.