

# ASSESSING THE IMPACT OF ECONOMIC AND SOCIAL FACTORS ON SUSTAINABLE ECONOMIC DEVELOPMENT AT THE LEVEL OF EU COUNTRIES

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## Abstract:

*Sustainable economic development is an important objective for EU Member States, given the need to balance economic growth with environmental protection and social equity. We aim to analyze the impact of economic and social factors on sustainable economic development in five EU Member States in Central and Eastern Europe: Romania, Bulgaria, Czech Republic, Hungary, Poland, Romania and the Czech Republic. The methods used consist of literature review, database consolidation and econometric modeling to assess the impact of economic and social factors on sustainable economic development in the five EU countries. At the same time, public policies for economic development will be formulated, mainly aimed at integrating young people into the labor market and promoting innovation, all of which are essential for achieving sustainable economic development in the region.*

**Key words:** economic development, sustainability, econometric model, econometric model, public policy

**JEL classification:** O11

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## 1. INTRODUCTION

Sustainable economic development is a fundamental objective for the Member States of the European Union, given the need to harmonize economic growth with environmental protection and social equity. In this context, assessing the impact of economic and social factors on sustainable economic development becomes important to understand how different policies and measures influence the sustainable progress of an economy. This is important for raising living standards, reducing unemployment and maintaining global economic competitiveness. From the perspective of socio-economic indicators, economic growth in the European Union needs to be analysed in terms of key factors such as employment, education, poverty and social exclusion, innovation and research, and the sustainability of resource use. The educational attainment of the population is an important determinant of long-term economic growth and investment in education and training is essential for developing the skills needed in the labor market and promoting innovation (Grosu et al., 2023; Dragomir et al., 2019). In the context of the European Union, efforts to reduce school drop-out rates and promote lifelong learning are essential strategies to sustain economic growth.

Other important factors are the fight against poverty and social exclusion, which are key objectives of the EU and are closely linked to economic growth, boosting domestic demand and productivity. In addition, investment in research and development is crucial for stimulating innovation, creating new jobs and increasing economic productivity, and the integration of artificial intelligence techniques and advanced cyber security solutions (Dragomir, 2017) plays an increasingly important role in ensuring the sustainability of these processes and safeguarding the digital infrastructure needed for modern economic development. In the EU, cohesion policy and other funding initiatives, such as Horizon Europe, aim to increase investment in research and development and encourage trans-national research cooperation. Another important aspect of economic growth in the EU is the sustainability of resource use. Sustainable economic growth requires efficient use of natural resources and reduced environmental impacts (Socoliuc et al., 2020). European public policies promote the transition to a circular economy and the reduction of carbon emissions to decouple economic growth from environmental degradation.

We aim to analyse the impact of economic and social factors on sustainable economic development in five EU Member States in Central and Eastern Europe: Romania, Bulgaria, the Czech Republic, Hungary, Poland, Romania and the Czech Republic. These countries, although they share a common post-communist history and have gone through similar economic and social transitions, nevertheless exhibit distinct particularities that influence their sustainable development trajectories. Romania and Bulgaria, the most recent EU members, face challenges related to economic and social infrastructure, but also opportunities for development through European funds and foreign investment. The Czech Republic and Hungary, with more consolidated economies, offer interesting insights into how economic and social policies can support or hinder sustainable development. Poland, the largest country in the region and one of the most dynamic European economies, serves as a case study for the positive effects of European integration on sustainable development. Through this analysis, we will identify the key factors influencing sustainable economic development in these states and how national and European policies can be optimized to support equitable and environmentally sound economic progress.

The main research objectives are:

O1: Literature review by analysing econometric models on sustainable economic development in the European Union;

O2: Consolidating a database of socio-economic indicators using the Eurostat platform;

O3: model design on the assessment of the impact of economic and social factors on sustainable economic development in 5 EU countries;

O4: Disseminating results and formulating public policies for sustainable growth at EU level.

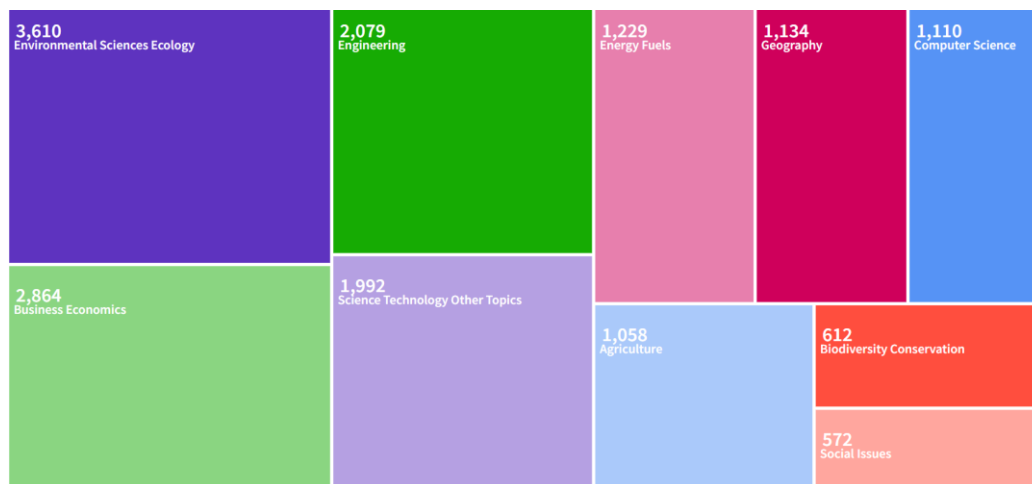
The article continues with the presentation of the literature on econometric models of sustainable economic growth in the European Union, the research methodology and model design, the dissemination of results and in the conclusions section will be formulated public policies from the perspective of sustainable economic growth in the European Union.

## 2. LITERATURE REVIEW

In the current context of global economic development, the concept of sustainable economic development has become a topic of major interest for researchers and policy makers, while involving the use of advanced methods for modeling decision problems to address the complexity of interactions between economic, social and environmental dimensions (Dragomir, 2017). The literature on economic sustainability reflects a significant increase in the interest of researchers in integrating sustainability principles into various fields, from economics and engineering to environmental and social sciences. This increased attention is fuelled by the global need to address contemporary economic challenges through the prism of sustainable development, balancing economic requirements with the need to protect the environment and ensure social equity.

Figure 1 shows that the highest volume of publications is found in the field of "Environmental Sciences Ecology", with a number of 3,610 papers, i.e. 48.23% of the total number of publications, emphasizing the interconnection between economic sustainability and ecological concerns. Business Economics follows as the second largest field with 2,864 publications or 38.26% of total publications, indicating a major interest in incorporating sustainability principles into traditional economic models and business strategies. Engineering also contributed 2,079 papers (27.77%), indicating a significant interest in the development of sustainable technologies and infrastructure to sustain the economy. Other important areas, such as "Science Technology Other Topics" and "Energy Fuels", with 1,992 and 1,229 publications respectively, show how economic sustainability is also being addressed from the perspective of technology and energy sources, being for a transition towards a greener future. Fields such as 'Geography', 'Computer Science' and 'Agriculture', each with over 1,000 papers, demonstrate the disciplinary diversity in addressing economic sustainability, including land use, digitization and sustainable agriculture. Similarly, "Biodiversity Conservation" and "Social Issues", although with a smaller number of publications

(612 and 572 respectively), reflect an increased attention to biodiversity conservation and social issues in the context of economic sustainability. This report emphasizes the complexity and multidimensionality of the concept of economic sustainability, highlighting an integrated and interlinked approach to research in various scientific fields. Sustainable economic development is a concept that has evolved significantly in recent decades, reflecting the international community's growing concerns about the need to balance economic growth, environmental protection and social equity. In various studies this concept has often been defined as the ability of an economy to continue its long-term economic growth without compromising natural resources and without generating major social inequalities (Hariram et al., 2023; Holden et al., 2014; Mensah, 2019).



**Figure 1. Analysis of Web of Science publications by keyword "economic sustainability" in the year 2024**

The concept of sustainable development was first introduced into international discourse through the 1987 Brundtland Report (United Nations, 1987), also known as "Our Common Future". This report, produced by the World Commission on Environment and Development, defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". This definition emphasized the interdependence between economic growth and environmental protection, stressing the need for responsible management of natural resources (Macovei et al., 2024). As the concept has evolved, it has been increasingly recognized that sustainability is not just an environmental issue, but also a social and economic one (Hopwood et al., 2005; Kuhlman & Farrington, 2010; Mebratu, 1998; Purvis et al., 2019). This has led to a broadening of the definition to include social equity and economic justice as fundamental pillars of sustainable development. Numerous studies have emphasized that sustainable development must integrate the concept of "intra- and intergenerational justice," stressing that this is not limited to environmental protection, but also includes an equitable distribution of resources and opportunities across all segments of society (Clark, 2021; Fredericks, 2012; Knappe & Renn, 2022; Sánchez Galera, 2020).

Sustainable economic development has increasingly been approached from a green economy perspective (D'Amato & Korhonen, 2021; Gunay et al., 2023; Söderholm, 2020; Verma & Kandpal, 2021), and in recent decades, some studies have proposed circular economy models with closed-loop material flows, highlighting the need to integrate environmental considerations into traditional economic models in order to reduce negative environmental impacts and redefine contemporary economic strategies (Awan & Sroufe, 2022; Barros et al., 2021; European Parliament, 2023; Kirchherr et al., 2023).

The analysis of sustainable economic development in the specific context of the EU Member States, particularly in Central and Eastern Europe, is of interest due to their common history and socio-economic particularities that differentiate them from other regions of Europe. These countries, which have gone through profound economic and political transitions after the fall of

communist regimes, face unique challenges in the process of sustainable development, and studying them can provide valuable insights for the formulation of effective economic and social policies. After 1989, countries in Central and Eastern Europe underwent rapid transitions from centralized to market economies, marked by privatization, industrial restructuring and trade liberalization, which generated significant economic and social fluctuations (Hare, 2020; Szanyi, 2022). Integration into the European Union has brought both challenges and opportunities, including access to structural funds essential for modernizing infrastructure and promoting economic and social cohesion (Berkowitz et al., 2020; Domorenok et al., 2021). However, the socio-economic particularities of these countries, such as regional inequalities and dependence on resource-intensive industries, raise questions about the long-term sustainability of economic growth (Bărbulescu et al., 2021; Fortea et al., 2024; Kouskoura et al., 2024; Kowalska-Styczeń et al., 2023; Zavorská et al., 2023). Various studies emphasize the need to adapt sustainable development strategies to the specific context of the region, in view of the transition towards a green economy and the challenges imposed by European policy (Adamowicz, 2022; Belmonte-Ureña et al., 2021; T.-L. Chen et al., 2020; Filipović et al., 2022; Loewen, 2022).

Economic factors such as economic growth, employment, innovation and resource consumption play a significant role in sustainable development. Economic growth, although traditionally measured by GDP per capita, is increasingly being examined through the sustainability lens, emphasizing the need for indicators that include environmental impact and social equity (Hariram et al., 2023; Rehman et al., 2024; Saud et al., 2024; Tsara et al., 2024; Ulman et al., 2021). Employment is essential for sustainability, with policies aimed at reducing unemployment and integrating young people (NEETs) critical for long-term sustainable growth (Cieslik et al., 2022; Gavriluță et al., 2022; Sulich et al., 2020). Innovation and investment in research and development (R&D) are identified as drivers of sustainable economic growth, supporting the transition to a green economy through technology transfer and innovation support (Fang et al., 2022; Fernandes et al., 2021; Lei et al., 2024). At the same time, economic efficiency and responsible consumption of resources are vital for minimizing environmental impacts, promoting an economic model that decouples growth from the degradation of natural resources (Arora & Mishra, 2023; Scheel et al., 2020; Voulvoulis, 2022).

Social factors such as education, poverty, income inequality and social mobility have a significant impact on sustainable economic development. Education and training are considered essential for the creation of a sustainable economy as they contribute to human capital development and productivity growth, with education policies and lifelong learning playing a major role in adapting the workforce to the demands of the green economy (Cheng et al., 2023; Klimovskikh et al., 2023; Li, 2022; Piwowar-Sulej, 2021). Poverty and social exclusion are major obstacles to economic sustainability, and effective poverty reduction strategies are essential for long-term economic growth and social inclusion (Ipinnaiye & Olaniyan, 2023; P. K. Singh & Chudasama, 2020; von Schönfeld & Ferreira, 2021). Income inequality can undermine sustainable economic growth, with numerous studies highlighting the need for policies to address these disparities to ensure equitable and sustainable development (Belmonte-Ureña et al., 2021; Betts-Davies et al., 2024). Social mobility is seen as an indicator of an equitable society, and high social mobility is associated with sustainable economic growth as it ensures equal access to opportunities and resources (García & Heckman, 2023; H. I. Hussain et al., 2023).

Environmental policies also have an important role to play in promoting sustainable development, and expert studies underline the importance of the transition to a green economy, particularly in the EU Member States in Central and Eastern Europe (Cansino et al., 2022; Y. Chen et al., 2023; Saud et al., 2024). The transition to a green economy, including the adoption of the circular economy and the promotion of renewable energy, is seen as an essential pillar for ensuring long-term economic and environmental sustainability (Kandpal et al., 2024; Ogunmakinde et al., 2022). Policies to reduce carbon emissions were intensively analyzed, highlighting their positive impact on sustainable development by creating new economic opportunities and reducing dependence on fossil fuels (M. Hussain et al., 2022; Madaleno & Nogueira, 2023; Wang et al.,

2023). Efficient management of natural resources is also essential for conserving biodiversity and sustaining economies in the long term, with numerous studies underlining the importance of policies that promote the sustainable use of these resources (Ahmed et al., 2022; Peterson St-Laurent et al., 2022).

Sustainable economic development has evolved from a concept that initially focused on environmental protection to one that fundamentally integrates economic and social dimensions. The literature has emphasized the importance of an integrated approach, ensuring that economic development not only stimulates long-term growth, but also promotes social equity and protects the environment for future generations. This balance between economic growth, social justice and environmental sustainability is fundamental to achieving genuine and sustainable economic development.

### 3. METHODOLOGY

In order to achieve the aim of the research, respectively. to evaluate the impact of economic and social factors on sustainable economic development in 5 countries of the European Union, we developed an econometric model with the help of SPSS version 26 using the multiple linear regression method. The data were collected from the Eurostat platform for the 5 analysed countries Romania, Bulgaria, Czech Republic, Hungary and Poland, the period of analysis being 2011-2022 for the indicators presented in Table 1 below.

**Table 1. Presentation of indicators**

Indicators	Symbol	Unit of measurement	Source
Real GDP per capita	RGDPcap	%	Eurostat (Eurostat, 2024g)
Young people neither in employment nor in education and training (NEET)	NEET	%	Eurostat (Eurostat, 2024h)
Employment rate	EMPLrate	%	Eurostat (Eurostat, 2024a)
In work at-risk-of-poverty rate	RISCpov	%	Eurostat (Eurostat, 2024c)
Raw material consumption (RMC)	RMC		Eurostat (Eurostat, 2024f)
Patent applications to the European Patent Office by applicants' / inventors' country of residence	PATENT	number	Eurostat(Eurostat, 2024d)
R&D personnel	RDp	%	Eurostat (Eurostat, 2024e)
Gross domestic expenditure on R&D	GDerd	%	Eurostat (Eurostat, 2024b)

Source: Elaborated by the author

The selected indicators have been deliberately chosen to ensure a comprehensive coverage of the relevant economic and social dimensions, while being accessible and comparable across the five countries analyzed.

In this sense, the following working hypotheses have been formulated:

*H1: The increase in the number of young people not in employment or not in any form of education has a negative impact on economic development.*

*H2: Higher employment rates have a positive impact on economic growth.*

*H3: Increasing the number of patents and R&D spending contribute significantly to economic growth.*

The model equations for assessing the impact of economic and social factors on sustainable economic development in 5 European Union countries (Romania, Bulgaria, Czech Republic, Hungary, Poland, Czech Republic and Romania) are presented below:

$$\begin{aligned}
 &RGDPcap(Romania) \\
 &= -83.856 * NEET + 237.064 * EMPLrate - 42.234 * RISCpov + 0.001 \\
 &\quad * RMC + 1.739 * PATENT + 1782.049 * RDp + 198.616 * GDErd \\
 &\quad - 6483.639
 \end{aligned} \tag{1}$$

$$\begin{aligned}
 &RGDPcap(Bulgaria) \\
 &= -59.046 * NEET + 86.146 * EMPLrate - 1.410 * RISCpov + 0.017 * RMC \\
 &\quad + 2.167 * PATENT + 1546.153 * RDp - 1230.721 * GDErd - 3678.884
 \end{aligned} \tag{2}$$

$$\begin{aligned}
 &RGDPcap(Czech Republic) \\
 &= -401.284 * NEET + 109.762 * EMPLrate - 363.313 * RISCpov + 0.017 \\
 &\quad * RMC - 1.275 * PATENT + 2711.350 * RDp - 776.665 * GDErd \\
 &\quad - 6535.611
 \end{aligned} \tag{3}$$

$$\begin{aligned}
 &RGDPcap(Hungary) \\
 &= -288.522 * NEET + 183.887 * EMPLrate - 349.965 * RISCpov - 0.012 \\
 &\quad * RMC - 23.512 * PATENT - 65.633 * RDp - 1966.752 * GDErd - 6405.231
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 &RGDPcap(Poland) \\
 &= -60.413 * NEET + 196.452 * EMPLrate - 181.426 * RISCpov + 0.002 \\
 &\quad * RMC + 0.628 * PATENT - 1398.447 * RDp + 2404.503 * GDErd \\
 &\quad - 2353.219
 \end{aligned} \tag{5}$$

The 5 equations presented show the complex relationships between real GDP per capita and a number of specific socio-economic indicators for five Central and Eastern European countries, namely Romania, Bulgaria, the Czech Republic, Hungary, Bulgaria, Romania, the Czech Republic, Hungary and Poland. Each equation highlights how independent variables such as the rate of young people neither in employment nor in education or training (NEET), the employment rate (EMPLrate), the at-risk-of-work poverty rate (RISCpov), the consumption of raw materials (RMC), the number of patent applications (PATENT), the number of personnel involved in research and development (RDp), and the expenditure on research and development (GDErd) influence each country's level of economic well-being, as expressed by the GDP per capita indicator.

#### 4. RESULTS AND DISCUSSIONS

Romania shows a negative relationship between the NEET rate and real GDP per capita, indicating that an increase in the number of young people not employed or not engaged in education has a negative impact on the economy, which underlines the need to integrate them into the labor market or the education system (thus proving working hypothesis 1). The employment rate (EMPLrate) has a positive impact, suggesting that improving employability contributes significantly to economic growth (thus proving working hypothesis 2). Innovation, as measured by the number of patent applications (PATENT), has a positive effect on GDP, underlining the crucial role of R&D in economic growth (thus demonstrating working hypothesis 3). R&D expenditure (GERD) is the factor that boosts the economy through the efficient management of R&D investment. In the case of Bulgaria, the NEET rate (-59,046) has a negative impact on real GDP per capita, which shows that the reduction in the number of young people not employed and not involved in education leads to the economic development of this country, thus proving hypothesis 1. The employment rate (EMPLrate) has a positive impact (+86.146), but lower than in the case of Romania, indicating a relatively lower importance of this factor for Bulgaria's economic growth. In terms of innovation, measured by the number of patent applications (PATENT), it contributes moderately and positively to economic growth. In contrast, R&D expenditures (GDErd) in the case of Bulgaria have a significant negative effect suggesting an inefficient use of funds or a lack of immediate impact of these investments on the economy. In the Czech Republic, the NEET employment rate has a negative impact on real GDP per capita suggesting that an increase in the NEET rate leads to a shrinking economy (working hypothesis 1 is demonstrated). The employment rate (EMPLrate) has a positive effect, suggesting that higher employment contributes to GDP growth, working hypothesis 2 is demonstrated. However, there are negative effects of innovation,

reflected by negative coefficients on the number of patent applications (PATENT) and direct research expenditure indicators suggesting difficulties in reaping the benefits of research. Thus, in the case of the Czech Republic working hypothesis 3 was not validated. In Hungary, the NEET rate has a significant negative impact on GDP per capita suggesting that a high proportion of young people not engaged and not engaged in education affects the economy of this country. The employment rate has a positive impact, indicating that improving employability is important for economic growth (working hypothesis 2 is demonstrated). Patent applications (PATENT) and RDp staffing also have a negative impact on GDP which suggests challenges in efficient utilization of human and technological resources. In the case of Poland, the NEET rate has a negative impact on real GDP per capita indicating that young people not engaged and not involved in education are a challenge for the country's economy (working hypothesis 1 is demonstrated). The employment rate contributes positively and significantly to economic growth indicating that improving employability is essential for economic prosperity (working hypothesis 2 is demonstrated). Innovation as reflected by patent applications contributes positively to economic growth (working hypothesis 3 is demonstrated). Spending on R&D has a significant positive impact suggesting a more efficient management of R&D investment compared to other countries. The model results on the relationship between real GDP per capita and various socio-economic indicators in five Central and Eastern European countries: Bulgaria, Czech Republic, Hungary, Poland, Romania and the Czech Republic are presented in Table 2.

**Table 2. Model Summary**

Model <sup>b,c</sup>	R		R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson Statistic	
	Location selected	Location unselected)				R Square Change	F Change	df1	df2	Sig. F Change	Country = BG, Cz, HU,PL,RO (Selected)	Country ~= BG, Cz, HU,PL,RO (Unselected)
Bulgaria	0.977 <sup>a</sup>	0.543	0.954	0.875	210.02147	0.954	11.968	7	4	0.015	2.023	0.087
Czech Republic	0.995 <sup>a</sup>	0.630	0.990	0.972	217.22355	0.990	55.223	7	4	0.001	2.812	0.041
Hungary	0.993 <sup>a</sup>	0.323	0.985	0.959	265.61976	0.985	38.156	7	4	0.002	3.036	0.071
Poland	0.998 <sup>a</sup>	0.865	0.997	0.992	135.12304	0.997	185.768	7	4	0.000	3.090	0.247
Romania	0.995 <sup>a</sup>	0.839	0.989	0.974	185.87113	0.989	64.950	7	5	0.000	2.031	0.252
a. Predictors: (Constant), GDp, RDp, NEET, PATENT, EMPLrate, RMC, RISCpov												
b. Statistics are based only on cases for each Country												
c. Dependent Variable: RGDPcap												

Source: Elaborated by the author

The model summary presented in Table 2 shows a general performance of the econometric models in explaining the change in real GDP per capita for the countries analysed. The models show a statistically significant correlation in all the five countries analysed: Bulgaria, Czech Republic, Hungary, Poland and Romania, with a coefficient of determination (R<sup>2</sup>) exceeding 80% in most cases. This indicates that the models explain a large part of the variation in GDP per capita, thus reflecting economic relationships between the independent variables and the dependent variable. A number of four highly statistically significant correlations, with indices of determination (adjusted R<sup>2</sup>) above 98%, were recorded for the Czech Republic, Poland, Romania and Hungary indicating that the models are highly effective in explaining the change in GDP per capita in these countries. In the case of Bulgaria, the coefficient of detrending (adjusted R<sup>2</sup>) recorded a value of 87.5% being statistically significant.

Table 3 presents the results of the Anova test for the 5 EU Member States analysed.

Table 3 presents the results of the ANOVA test for the five econometric models confirming their validity by the appropriate distribution of degrees of freedom and by the significant values of the Sig coefficients associated with the F function. In all cases analysed, the value of the Sig coefficient is less than the significance threshold (0.05), which allows rejecting the null hypothesis



and accepting the alternative hypothesis. This suggests that the models are representative of the economic phenomenon studied and that the selected independent variables have a significant impact on real GDP per capita in each of the countries analysed.

**Table 3. ANOVA <sup>a,b</sup>**

Model	Sum of Squares		df	Mean Square		F	Sig.
	Regression	Residual		Regression	Residual		
Bulgaria	3695255.604	176436.063	7	527893.658	44109.016	11.968	.015 <sup>c</sup>
Czech Republic	18240222.377	188744.289	7	2605746.054	47186.072	55.223	.001 <sup>c</sup>
Hungary	18844609.575	282215.425	7	2692087.082	70553.856	38.156	.002 <sup>c</sup>
Poland	23742633.718	73032.949	7	3391804.817	18258.237	185.768	.000 <sup>c</sup>
Romania	15707228.844	172740.387	7	2243889.835	34548.077	64.950	.000 <sup>c</sup>
a. Dependent Variable: RGDPcap							
b. Statistics are based only on cases for each Country							
c. Predictors: (Constant), GDErd, RDp, NEET, PATENT, EMPLrate, RMC, RISCpov							

Source: Elaborated by the author

Pearson correlations for the analysed indicators are presented in Table 4.

**Tabel.4. Pearson Correlation**

Pearson Correlation Sig. (1-tailed)	RGDPcap Bulgaria	RGDPcap Czech Republic	RGDPcap Hungary	RGDPcap Poland	RGDPcap Romania
NEET	-0.928 (0) ***	-0.94 (0) ***	-0.882 (0) ***	-0.845 (0) ***	-0.479 (0.049) ***
EMPLrate	0.951 (0) ***	0.978 (0) ***	0.964 (0) ***	0.993 (0) ***	0.985 (0) ***
RISCpov	0.627 (0.014) ***	-0.701 (0.006) ***	0.563 (0.028) ***	-0.901 (0) ***	-0.808 (0) ***
RMC	0.93 (0) ***	0.791 (0.001) ***	0.94 (0) ***	0.532 (0.038) ***	0.91 (0) ***
PATENT	0.766 (0.002) ***	0.829 (0) ***	0.311 (0.162) ***	0.737 (0.003) ***	0.72 (0.003) ***
RDp	0.91 (0) ***	0.894 (0) ***	0.892 (0) ***	0.983 (0) ***	0.62 (0.012) ***
GDErd	0.598 (0.02) ***	0.541 (0.035) ***	0.827 (0) ***	0.973 (0) ***	0.464 (0.055) **

Source: Elaborated by the author

Table 4 on Pearson correlations shows that each of the socio-economic indicators analysed plays a significant role in determining real GDP in these CEE countries. The relationships are statistically significant, highlighting the importance of factors such as employment, innovation, resource utilization and R&D investment for the economic growth and prosperity of these nations.

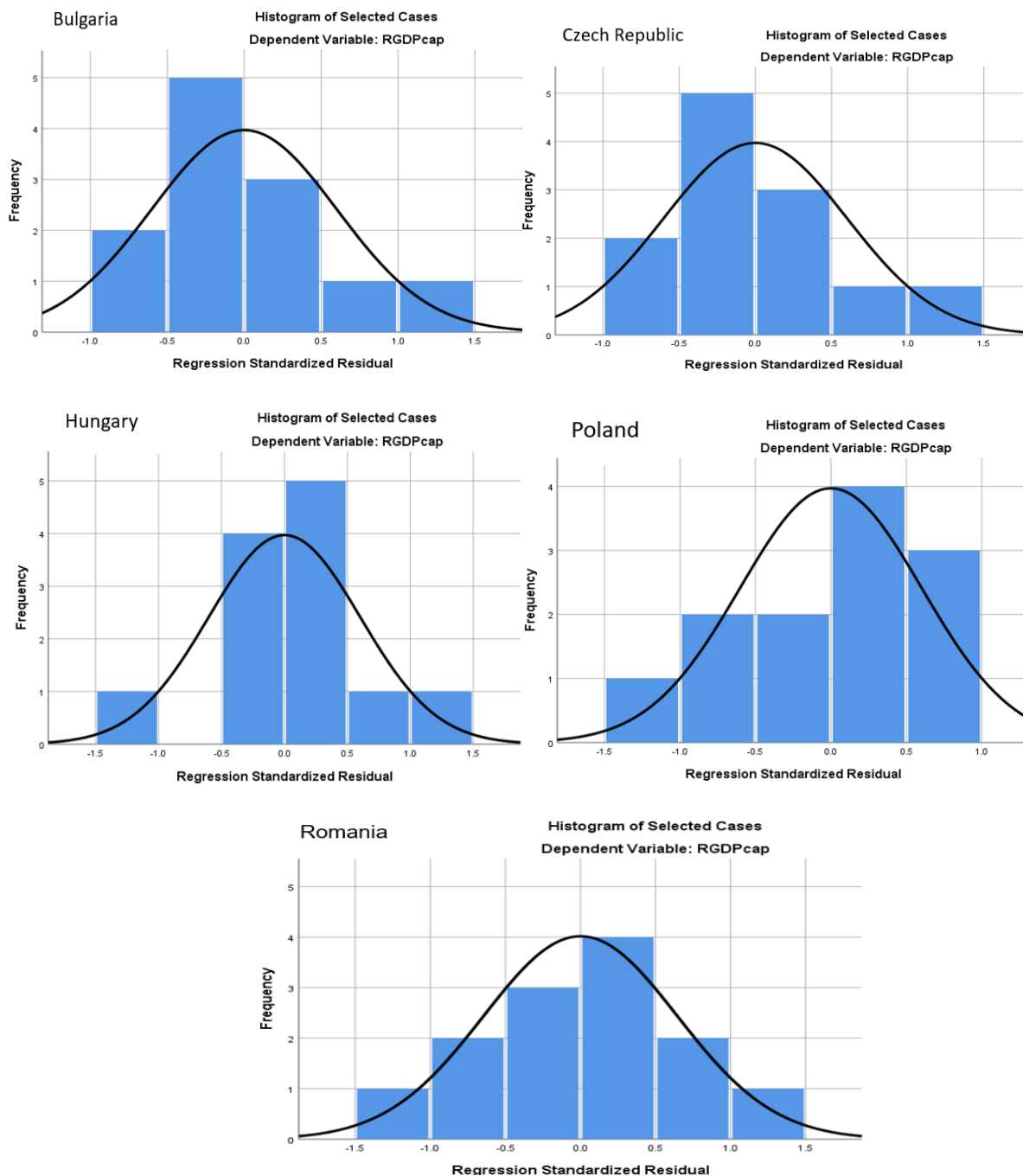
In all five countries analysed, the NEET rate has a negative impact on GDP per capita, with the most significant effects observed in the Czech Republic and Bulgaria. This suggests that large numbers of young people who are neither in employment nor in education are an economic burden,



limiting the potential for economic growth. The employment rate has a positive impact on GDP per capita in all the countries analysed, indicating that an increase in employability contributes substantially to economic growth. This suggests that employment-supportive policies are essential to stimulate economic growth in these countries. Patent applications, as an indicator of innovation, have a positive impact on GDP per capita in most of the countries analysed, with the exception of Hungary, where the impact is lower. In the Czech Republic, Bulgaria, Poland and Romania, innovation is an important contributor to economic growth, suggesting that policies that promote research and technological development significantly boost GDP.

R&D spending has a positive impact on economic growth, with the largest effects observed in Poland and Hungary. This suggests that R&D investment is essential for economic growth, although the impact varies depending on the efficiency of the use of these funds in each country.

Histograms of the five models are shown in Figure 2 below.

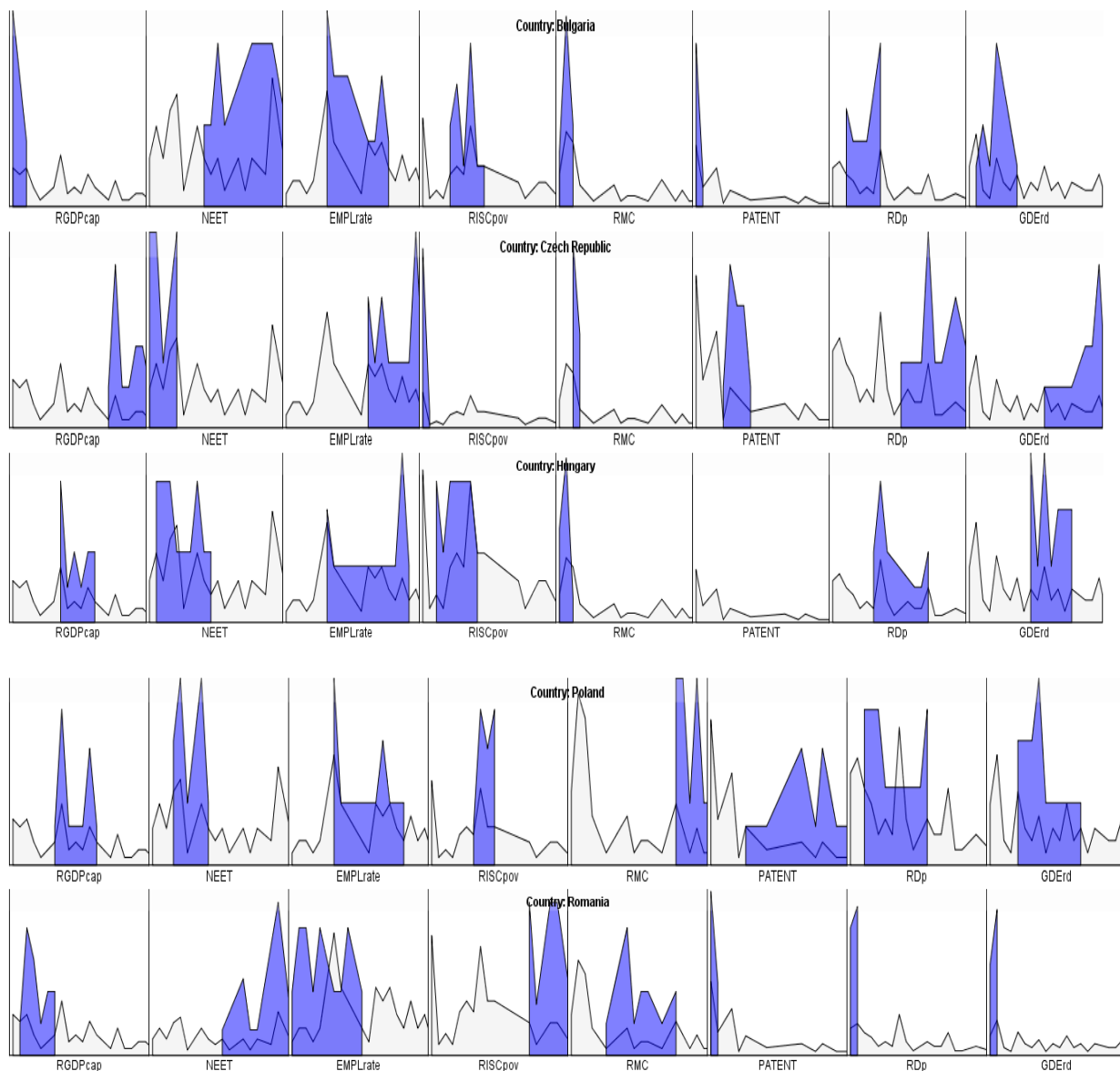


**Figure 2. Histograms of the 5 models for assessing the impact of economic and social factors on sustainable economic development**

Source: Elaborated by the author

The histograms presented for the five countries (Bulgaria, Czech Republic, Hungary, Poland, Romania and the Czech Republic) reflect the distribution of standardized residuals from econometric models assessing the impact of economic and social factors on sustainable economic development. The histograms suggest that the applied econometric models are reliable and well calibrated for all five countries. The normal distribution of residuals indicates that the basic assumptions of the regression are respected, which lends credibility to the results obtained on the impact of economic and social factors on sustainable economic development in each country.

Figure 3 shows the evolution of the economic and social factors on sustainable economic development for the five countries analysed for the period 2011-2022.



**Figure 3. Evolution of economic and social factors on sustainable economic development for the 5 analyzed countries**

Source: Elaborated by the author

In Bulgaria, the evolution of the NEET rate has fluctuated significantly over the period under analysis, indicating continuing challenges related to the integration of young people into the labor market and the education system. This reflects persistent structural difficulties that have negatively impacted negatively on the country's economic development. In contrast, the employment rate (EMPLrate) has shown a general upward trend, indicating an improvement in employability and a gradual adaptation of the labor market to the requirements of the modern economy. Likewise, raw material consumption (RMC) showed moderate but positive trends,

suggesting a more efficient use of natural resources. In terms of innovation, as measured by patent applications (PATENT) and research and development personnel (RDp), the trend was positive but with some fluctuations, reflecting efforts to stimulate R&D, albeit with variable results. R&D expenditure (GERD) increased, although its impact on GDP remains a matter of debate, suggesting possible inefficiencies or a need to optimize the allocation of resources. In the case of the Czech Republic, the NEET rate has shown a gradually decreasing trend, suggesting an improvement in the integration of young people into work and education, which has contributed positively to the country's economic development. The employment rate (EMPLrate) has followed an upward trajectory, indicating a favourable economic climate and a strengthening labour market. At the same time, patent applications (PATENT) and research and development personnel (RDp) grew significantly, underlining the Czech Republic's continued efforts to stimulate innovation and research, which are essential for the long-term competitiveness of the economy. In Hungary, the NEET rate has shown a gradual decrease, reflecting efforts to integrate young people into the labour market and education, which has had a positive impact on economic development. The employment rate (EMPLrate) has been increasing steadily, indicating a growing economy and increasing employment opportunities. In contrast, the at-risk-of-work-poverty rate (RISCpov) varied considerably, suggesting that despite economic growth, a part of the population continued to face financial insecurity, which limited the potential for sustainable growth. Consumption of raw materials (RMC) was relatively constant with small fluctuations, indicating stable utilization of natural resources. Innovation, as measured by patent applications (PATENT), showed a positive evolution, reflecting an increase in R&D activities, also supported by an increase in R&D personnel. Poland has seen a steady decline in the NEET rate, indicating the success of measures to integrate young people into the labour market and education, which has contributed significantly to the country's economic growth. The employment rate (EMPLrate) has been on a strong upward trend, reflecting the economic expansion and increased employment opportunities. Innovation, as measured by patent applications (PATENT) and R&D personnel (R&D personnel), grew significantly, reflecting Poland's efforts to become a regional leader in R&D. Spending on research and development (GERDrd) has increased steadily, indicating a significant investment in innovation, although its impact on the economy has been less consistent at times, suggesting the need to improve the efficiency of the allocation of funds. At the Romanian level, there have been significant fluctuations in the NEET rate, with a general downward trend, indicating continued efforts to improve the integration of young people into the labor market and education. The employment rate (EMPLrate) showed steady growth, suggesting a strengthening labour market and sustained economic growth. Innovation, as measured by patent applications (PATENT) and R&D personnel, showed growth, but with fluctuations, suggesting a need to stabilize and intensify R&D efforts. R&D expenditure (GERD) increased, but its impact on GDP was variable, suggesting possible inefficiencies in the use of these resources and the need for better targeting of investment to maximize the impact on economic development.

## 5. CONCLUSIONS

The study achieved the four set objectives. Respectively, an extensive survey of the literature on sustainable economic development in the European Union was conducted. The analysis of the econometric model applied to the five Central and Eastern European countries (Bulgaria, Czech Republic, Hungary, Poland and Romania) revealed the relationships between various socio-economic factors and sustainable economic growth, measured by real GDP per capita. The results confirm that these factors play a significant role in determining each country's economic performance. One of the main aspects highlighted by the model is the negative impact of the NEET rate on economic growth, underlining the need for effective policies to integrate young people into the labor market and education. This indicates that an active and well-educated young population is important to support sustainable economic growth. The employment rate has also been identified as a significant factor with a significant positive impact on GDP, suggesting that policies that support

job creation and increased employability are fundamental for economic development. In order to ensure sustainable economic development in the context of Central and Eastern Europe, it is essential that public policies are geared towards a coherent integration of the socio-economic factors that have been identified as having a significant impact on economic growth. There is a need to implement education and training policies that address the problem of young people not in education and training (NEET). This can be achieved through lifelong learning programs, vocational training adapted to the needs of the labour market and public-private partnerships to facilitate the transition from education to employment. Employment policies also need to be prioritized by creating an economic environment conducive to entrepreneurship and investment that encourages the creation of quality jobs. It is important to support emerging economic sectors, which have the potential to absorb the available workforce, and to promote flexibility in the labour market while ensuring adequate social protection for employees. Innovation must be placed at the heart of the economic development strategy, by supporting research and development and improving the efficiency of investment in this area. Public policies should facilitate collaboration between the private sector, universities and research centres, while ensuring intellectual property protection and access to finance for innovative projects. It is also important to stimulate patent demand and ensure that innovations resulting from research are effectively deployed in the economy, thus contributing to the long-term competitiveness of the region. By implementing these policies, the countries of Central and Eastern Europe can ensure sustainable economic growth, which not only fosters long-term prosperity, but also promotes social inclusion and environmental protection, thus contributing to the economic and social stability of the region.

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