



*Research Article*

# **Analysis of the Determinants of Economic Growth: An Empirical Study on the EU-28 Countries**

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## **Abstract**

This paper investigates the impact of determinants on economic growth within the EU-28 countries, over a period of 10 years. The database is collected from the official websites of Eurostat, the World Bank, and The Heritage Foundation, and includes the dependent variable, measured as GDP per capita, signifying the economic growth in the EU-28 countries, as well as the independent variables, namely: government revenue as a percentage of GDP, government expenditure as a percentage of GDP, foreign direct investment as a percentage of GDP, trade openness representing the sum of exports and imports of goods and services, measured as a percentage of GDP, inflation rate measured as consumer price index, unemployment rate, and index of economic freedom. Two models were estimated regarding the impact of influencing factors on economic growth, in which government revenue and government expenditure were separately included. The results of the econometric analysis indicate that both models are statistically valid at a significance level of 1%. Moreover, there is a significant and positive impact of government revenue, government expenditure, trade openness, and index of economic freedom on economic growth, while unemployment rate has a positive influence on GDP per capita in the model with government revenue, and in the model with government expenditure, the impact is negative. Consequently, an increase in government revenue, government expenditure, trade openness, and economic freedom generates economic growth, whereas unemployment can lead to both an increase and a decrease in GDP per capita. At the end of the study, the research results are compared with those obtained in the previous studies presented in the literature review, indicating similar or different results.

**Keywords:** economic growth, EU-28 countries, macroeconomic variables, panel data, multiple regression.

## Introduction

In this paper, the research is focused on the study of the determinants on economic growth in the EU-28 countries, while also aiming to converge the author's own results with those of previous studies published in the international specialized literature.

The research begins with a comprehensive analysis of the previous empirical results on this topic, at the level of countries from various geographic regions around the world. In this sense, there are significant studies that highlight the impact on economic growth: the negative influence generated by the interest rate and the positive impact of the exchange rate (Hatmanu et al., 2020); CO<sub>2</sub> emissions have positively influenced the level of economic growth, but bank loan, inflation, and non-performing loans have had a negative impact on GDP (Batrancea et al., 2020); domestic investments, labor force, trade openness, and inflation have had a positive effect, while infrastructure has negatively affected economic growth (Ngo & Nguyen, 2020); public expenditure, investments, and unemployment have positively affected economic growth, while government revenue, represented by taxes, have had a negative impact on GDP (González-Sánchez et al., 2020); economic freedom and investments have positively influenced economic growth (Brkić et al., 2020); the positive correlation between inflation rate, trade, and economic growth, as well as the negative influence of the unemployment rate on GDP growth (Zhang et al., 2021); the positive impact of foreign direct investment on economic growth, as well as both positive and negative effects generated by economic freedom and the trade openness (Dkhili & Dhiab, 2018); human capital, international trade, and net income inequality have had a positive impact on economic growth, while direct taxes negatively influenced economic growth (Muinel-Gallo & Roca-Sagalés, 2013); the negative influence of the economic globalization and capital and the positive impact of the labor force and government expenditure on economic growth (Baidoo et al., 2023); petroleum export and daily crude oil production have positively influenced GDP growth, while exchange rate and unemployment have had a negative impact on economic growth (Pekarčíková et al., 2022).

Subsequently, in accordance with the main objective of the research, which is to identify significant factors influencing economic growth at the level of European countries, and starting from the literature review, the following aspects are presented: the database subjected to empirical analysis and the research variables, as well as descriptive statistics and the correlation matrix, in order to finally estimate econometric models and interpret the results obtained. The database consists of macroeconomic indicators influencing economic growth, over a period of 10 years, and includes data taken from the official websites of Eurostat, the World Bank, and The Heritage Foundation. The variables used in the empirical analysis consist of the dependent variable – GDP per capita, signifying economic growth, and the independent variables, namely: government revenue, government expenditure, foreign direct investment, trade openness, inflation rate, unemployment rate, and the index of economic freedom.

The empirical method of parameter estimation is Panel Least Squares, using multiple linear regression models. In order to estimate econometric models, the existence of unit root was tested by conducting several stationarity tests for each of the variables used in the empirical analysis. Additionally, descriptive statistics were presented, as well as the correlation matrix, to highlight the correlations between variables. Several models were estimated, and their results illustrate a significant and positive impact of government revenue, government expenditure, trade openness, and index of economic freedom on economic growth, while unemployment rate has a positive influence on GDP per capita in the model with government revenue, and in the model with government expenditure, the impact is negative.

At the end of the paper, conclusions are presented, summarizing the results of empirical studies regarding the impact of influencing factors on economic growth at the level of the EU-28 countries, aiming to align them with the results of previous studies presented in the literature review.

## Literature Review

The impact of influencing factors on economic growth has been analyzed in various international studies, highlighting various

correlations between economic growth, represented, mainly, by GDP or GDP per capita, and a diversity of independent variables, primarily macroeconomic indicators.

The objective of the study carried out by Hatmanu et al. (2020) is focused on the empirical analysis of the influencing factors on economic growth in Romania, for the period January 2003 – December 2019, from the perspective of the interest rate, exchange rate, and the European business climate indicator. According to the authors, aligning Romania's interest rate with the Eurozone's interest rate and establishing a balance between monetary policy and exchange rate policy provides clues for considering the European business climate in domestic policy decisions. The dependent variable, economic growth, is measured by the industrial production index. The main results of the study showed that, in the short term, the two rates have different influences on economic growth: the interest rate has a negative influence on economic growth, while the exchange rate positively influences the industrial production index.

In another study (Batrancea et al., 2020), the authors examine the impact of certain factors, such as non-performing loans, CO<sub>2</sub> emissions, bank loan, and inflation, on sustainable economic growth, evidenced by GDP in India, Brazil, and Romania, during the period 2005-2017. The changes that occurred before, during, and after the global financial crisis were highlighted. To study the factors influencing sustainable economic growth, three countries with different levels of economic development, political instability, rule of law, social injustice, economic disparity, and human development were analyzed, namely: India, Brazil, and Romania. According to the research results, CO<sub>2</sub> emissions have a positive impact on sustainable economic growth. Additionally, an efficient banking supervision mechanism significantly positively influences the level of sustainable economic growth. During and after the global financial crisis of 2007-2009, factors such as bank loan, inflation, and non-performing loans had a negative impact on sustainable economic growth.

In the paper conducted by Ngo and Nguyen (2020), the authors study the impact of total factor productivity, institutional quality, and an interactive variable between institutional quality and factor productivity growth on economic growth, in low- to medium-income countries in Asia. The database covers the period 2000-2018, for a number of 13 countries, namely:

Bangladesh, Cambodia, India, Indonesia, Kyrgyz Republic, Lao PDR, Mongolia, Myanmar, Pakistan, Philippines, Timor-Leste, Uzbekistan, and Vietnam. The dependent variable used in the econometric models is represented by real GDP per capita, to illustrate economic growth across all countries, which is relevant for comparing the level of development and living standards. The estimated results show that total factor productivity positively affects GDP per capita growth. In low- to medium-income countries, institutional quality has a negative effect on economic growth, while domestic investment, labor force, trade openness, and inflation have a positive effect. However, infrastructure negatively affects economic growth.

Through the research carried out in another study (Humbatova et al., 2019), the authors examine the main macroeconomic indicators of the economy in Azerbaijan, including gross domestic product, gross national income, consumer price index, exchange rate, fixed assets, and investments. The research is aimed at identifying how oil production and oil prices influence the economic development of the country, estimated based on GDP, gross national income, consumer price index, exchange rate, investments, using statistical data from 2000-2016. The results show that the models are statistically significant and have economic relevance, indicating that at high levels of oil production and oil prices, economic growth reached its highest level during the period under analysis.

In the specialized international literature (González-Sánchez et al., 2020), an interesting issue from the perspective of economic growth is the influencing factors, analyzed based on person's gender, the data being collected from various geographic areas. The database includes 31 European countries, namely: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom. For each of these countries, data were collected for the period 2010-2019, thus analyzing the behavior of the included research variables. Following the analysis, it is found that investments, public expenditure, human capital, and entrepreneurship positively influence economic growth, while unemployment and education have positive effects on entrepreneurship, and

taxes have a negative impact. Subsequently, the authors conducted a new analysis by adding a set of input data regarding entrepreneurship, classified by person's gender, to validate differences between men and women, and the results were significant in all cases.

In another study, Mudronja et al. (2020) address an interesting aspect of economic growth from the perspective of regional economies for certain port regions of the European Union, over a period of 11 years. The research aims to develop a model based on endogenous growth theory that evaluates the impact of maritime port operations on the associated regional economy. The economic impact of maritime ports on the regional economy was analyzed using a panel database consisting of 107 port regions of the European Union, during the period 2005-2015, including regions of the following countries: Belgium, Bulgaria, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Poland, Portugal, Romania, Spain, Sweden, and the United Kingdom. In the empirical study, the dependent variable is represented by GDP per capita. The independent variables are related to the maritime port activities, such as: cargo traffic in maritime ports, investments in research and development, and human capital. The research results highlight that maritime ports have a significant positive impact on the economic growth of port regions in European Union countries, and the endogenous growth theory based on research and development has been statistically validated.

Brkić et al. (2020) analyze the impact of economic freedom and other traditional economic factors on economic growth across a sample of 43 developed and emerging European countries, over a period of 20 years, from 1995 to 2014. The sample includes countries with different levels of economic development, former socialist countries, transition countries, those that have completed this process, and traditional capitalist countries, considering both EU and non-EU countries. In the analysis, the dependent variable is represented by economic growth, measured by the annual growth in GDP per capita for the observed countries in the European region. The research results highlight the positive impact of economic freedom on economic growth in European countries, with investments and gross capital formation having the greatest influence on economic growth.

The analysis carried out in the study by Zhang et al. (2021) is oriented towards highlighting the main factors affecting economic growth, through empirical methods applied before and after the global economic crisis of 2008-2009, in economically large developed countries, as well as in emerging countries, namely: Brazil, Chile, China, Germany, France, the United Kingdom, India, Japan, Korea, the United States of America, and South Africa. The empirical research on economic growth covers a period of 28 years, from 1990 to 2018. In the quantitative research, several independent variables were used, of which only the inflation rate, trade, and the urban population growth rate have a significant and positive impact, while the unemployment rate negatively influences economic growth.

Another study (Dkhili & Dhiab, 2018) aims to explain the role of economic freedom and foreign direct investment on economic growth in the Gulf Cooperation Council countries, consisting of: Saudi Arabia, the United Arab Emirates, Qatar, Kuwait, and Oman, during the period 1995-2017. The authors use multiple regression analysis with panel data, and to study the relationship between economic freedom, foreign direct investment flows, and economic growth in the GCC countries, other independent variables such as the trade openness were integrated into econometric models. The empirical analysis illustrates statistically significant results for most of the independent variables.

In another approach (Ng et al., 2019), economic growth is analyzed from the perspective of the influence of road infrastructure development, as well as other socio-economic factors, across countries with different levels of economic development, in a global context. The sample under study consists of 60 countries, including Romania, over a period of three decades, from 1980 to 2010. In this sense, there is a significant and positive influence of variables such as road length per 1000 inhabitants, exports of goods and services per capita, government expenditure on education per capita, as well as the value of physical capital per worker, on economic growth, represented by GDP per capita. However, there is a negative impact of urbanization on economic growth, suggesting an over-urbanization in the analyzed countries.

The determinants of economic growth are also analyzed by Pekarčíková et al. (2022) on a sample consisting of the Organization of the Petroleum Exporting Countries, which are developing countries, during the period 1980-

2019. The dependent variable used for estimating the empirical models is GDP growth, while the independent variables are represented by exchange rate, petroleum export, daily crude oil production, world oil demand, inflation, population growth, and unemployment. The results of the estimated models suggest the positive influence of petroleum export and daily crude oil production, as well as the negative impact of the exchange rate and unemployment on the economic growth, with the other variables being statistically insignificant.

Baidoo et al. (2023) analyze the relationship between economic globalization and economic growth in Ghana over the period from 1984 to 2020, aiming to identify strategies for maximizing the benefits of economic globalization and minimizing the challenges associated with it. Thus, the authors investigate the long-term and short-term effects of economic globalization on Ghana's economic growth. The dependent variable used in estimating the empirical models is economic growth, while the independent variables consist of economic globalization, labor force, capital, government expenditure, and inflation. The results of the studies are generally similar in both the short-term and long-term models. It is found that economic globalization and capital negatively affect economic growth, while the labor force and government expenditure contribute to an increase in economic growth.

In another representative study (Muineló-Gallo & Roca-Sagalés, 2013), it is analyzed the relationship between income inequality and economic growth through fiscal policy, to identify the effectiveness of fiscal policies, with the database consisting of a sample of 21 high-income OECD countries over the period 1972-2006. The study's results indicate a positive influence of human capital and international trade on economic growth, measured as real GDP per capita growth, while population growth and inflation rate are statistically insignificant. Regarding net income inequality, measured by the Gini coefficient, it has a significantly positive impact on economic growth, suggesting that inequality is good for incentives and, therefore, good for growth. It is also found that direct taxes negatively influence economic growth, this aspect being explained by the distorting effects of this type of tax on the labor and investment decisions of economic agents, while indirect taxes are statistically insignificant.

Based on the presented studies, empirical models have been developed to analyze the impact of determinants on economic growth at the level of the EU-28 countries, for the period 2010-2019.

### **Research Methodology**

In accordance with the main objective of the research, which is to identify significant influencing factors on economic growth at the level of European countries, and based on the literature review, the research methodology relates to the following aspects: the database and the research variables, the descriptive statistics, and the correlation matrix.

#### ***Database and research variables***

The database consists of the dependent variable and the independent variables at the level of the EU-28 countries, over a period of 10 years, namely 2010-2019. The data are retrieved from the official websites of Eurostat, the World Bank, and The Heritage Foundation. Using panel data at the level of the EU-28 countries over a period of 10 years, 280 observations resulted from the analysis in order to estimate the empirical models highlighting the determinants on economic growth.

The determination of the research variables is in line with the previous studies presented in the literature review, these being mainly represented by: (a) the dependent variable (GDP) – natural logarithm of GDP per capita, signifying economic growth in the EU-28 countries, (b) the independent variables – government revenue as a percentage of GDP (REV), government expenditure as a percentage of GDP (EXP), foreign direct investment as a percentage of GDP (FDI), trade openness representing the sum of exports and imports of goods and services, measured as a percentage of GDP (TRADE), exchange rate, inflation rate (CPI), unemployment rate (UNEMP), and the index of economic freedom (FREE).

#### ***Descriptive statistics and correlation matrix***

Following the analysis of the 8 independent variables, it was found that exchange rate data are only available for countries outside the Eurozone, as the exchange rate relates to the Euro currency. In this context, the decision was made to exclude the exchange rate variable from the empirical analysis. Table 1 presents the

relevant statistical indicators for the variables used in the quantitative studies.

**Table 1. Descriptive statistics**

Variable	Mean	Median	Maximum	Minimum	Std. Dev.
GDP	41.132,85	37.426,12	114.323,40	17.496,36	17.700,99
REV	42,74	42,75	56,40	25,00	6,37
EXP	45,25	44,65	65,10	24,50	6,82
FDI	9,94	2,55	280,13	-40,41	30,08
TRADE	128,47	108,55	408,36	52,01	70,68
CPI	1,52	1,40	6,10	-1,60	1,41
UNEMP	9,13	7,80	27,50	2,00	4,81
FREE	69,18	69,05	81,30	53,20	5,64

Source: author's own computation

The maximum value of the dependent variable GDP per capita was recorded in 2019 by Luxembourg, while the minimum corresponds to Bulgaria in 2010. Significant differences were observed in the indicators of foreign direct investment and trade openness: Cyprus recorded the maximum value of FDI in 2012, reaching 280,13%, while Hungary recorded the minimum

value of -40,41% in 2018. Regarding the trade openness, it reached its maximum value in Luxembourg in 2015 (408,36%) and the minimum value of 52,01% in Italy in 2010.

In order to identify the correlations between variables, the correlation matrix was constructed (Table 2).

**Table 2. Correlation matrix**

	GDP	REV	EXP	FDI	TRADE	CPI	UNEMP	FREE
GDP	1							
REV	0,2198	1						
EXP	0,0704	0,8575	1					
FDI	0,0676	-0,1975	-0,1466	1				
TRADE	0,5293	-0,2434	-0,3638	0,2016	1			
CPI	-0,0498	-0,0908	-0,0581	-0,0378	0,0188	1		
UNEMP	-0,3356	-0,0582	0,2035	0,0425	-0,2960	-0,1918	1	
FREE	0,5137	-0,1394	-0,2361	0,0813	0,2884	0,0927	-0,4901	1

Source: author's own computation

It is observed that there is a direct and strong correlation between government expenditure and government revenue, which is why in empirical estimations these two variables will be integrated separately, in distinct models. Additionally, it can be noticed the presence of direct and moderate correlation between the trade openness and GDP per capita, as well as between the index of economic freedom and GDP per capita, while the other correlations are weak.

### Econometric models estimation and results interpretation

The empirical method for estimating the parameters is Panel Least Squares, using multiple linear regression models. The CPI variable is statistically insignificant in the estimated models, which is why it has been eliminated from the empirical analysis.

To test the existence of unit root, several stationarity tests were performed and, consequently, Table 3 presents the results of

stationarity tests for each of the variables used in the empirical analysis, showing that the variables are stationary at level.

**Table 3. Stationarity tests**

Variable	Unit Root	Tests – probability			
		Levin, Lin & Chu	Im, Pesaran and Shin	ADF – Fisher	PP – Fisher
GDP	Level	0,0000	0,0073	0,0001	0,5200
REV	Level	0,0000	0,1332	0,0208	0,0000
EXP	Level	0,0000	0,1088	0,0023	0,0022
FDI	Level	0,0000	0,0015	0,0000	0,0000
TRADE	Level	0,0000	0,1719	0,0159	0,0000
UNEMP	Level	0,0000	0,0009	0,0000	0,0002
FREE	Level	0,0000	0,0570	0,0007	0,0000

Source: author's own computation

Subsequently, two models are estimated regarding the impact of influencing factors on economic growth, in which government revenue and government expenditure are separately included.

coefficients of the government revenue variable, the trade openness, and the index of economic freedom differ significantly from zero at a significance threshold of 1%, meaning that these variables are significant in explaining the impact on economic growth.

The first model (Table 4) is statistically valid at a significance level of 1%. Additionally, the

**Table 4. Model 1 estimation**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REV	0,028287	0,002370	11,935570	0,0000
FDI	0,000653	0,000491	1,330158	0,1846
TRADE	0,001830	0,000224	8,181781	0,0000
FREE	0,034017	0,002974	11,437940	0,0000
UNEMP	0,001734	0,003534	0,490619	0,6241
C	6,733374	0,261301	25,768660	0,0000
<b>F-statistic</b>				
	77,033240	<b>No. observations</b>		280
<b>Prob(F-statistic)</b>	0,000000	<b>Akaike info criterion</b>		-0,019915
<b>R-squared</b>	0,584323	<b>Schwarz criterion</b>		0,057973
<b>Adjusted R-squared</b>	0,576738	<b>Hannan-Quinn criterion</b>		0,011326

Source: author's own computation

It is observed that there is a positive influence on economic growth exerted by government revenue, trade openness, and the index of economic freedom at a significance level of 1%. Thus, a 1 percentage point increase in government revenue spurs GDP per capita by

0,0283%; a 1 percentage point rise in trade openness leads to a 0,0018% increase in economic growth, while GDP per capita grows with 0,0340% if economic freedom increases by 1 percentage point. Nevertheless, foreign direct investment and the unemployment rate are

statistically insignificant. Moreover, the coefficient of determination highlights that the government revenue, the trade openness, and the index of economic freedom explain 58,43% of the economic growth.

Regarding the second model (Table 5), it is statistically valid at a significance level of 1%.

The coefficients of government expenditure, the trade openness, and the index of economic freedom differ significantly from zero at a significance threshold of 1%, indicating that the variables are significant in explaining the impact on economic growth.

**Table 5. Model 2 estimation**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXP	0,024602	0,002368	10,388370	0,0000
FDI	0,000325	0,000510	0,638685	0,5236
TRADE	0,001947	0,000238	8,190603	0,0000
FREE	0,032256	0,003090	10,438660	0,0000
UNEMP	-0,007971	0,003638	-2,190811	0,0293
C	7,027828	0,265779	26,442390	0,0000
<b>F-statistic</b>				
<b>F-statistic</b>	66,099480	<b>No. observations</b>	280	
<b>Prob(F-statistic)</b>	0,000000	<b>Akaike info criterion</b>	0,066663	
<b>R-squared</b>	0,546731	<b>Schwarz criterion</b>	0,144551	
<b>Adjusted R-squared</b>	0,538460	<b>Hannan-Quinn criterion</b>	0,097904	

*Source: author's own computation*

Economic growth is directly influenced by government expenditure, trade openness, and the index of economic freedom at a significance threshold of 1%, while the unemployment rate has a negative impact on economic growth at a significance level of 5%. Therefore, if the unemployment rate increases by 1 percentage point, GDP per capita decreases by 0,0080%. According to the coefficient of determination, the independent variables explain 54,67% of the economic growth.

From a statistical perspective, choosing the best model is based on several criteria such as the Akaike info criterion, Schwarz criterion, and Hannan-Quinn criterion. Since the results of all three criteria are lower for the first model, it could be considered that model 1 is better from a statistical point of view, for identifying the influencing factors on economic growth. Conclusively, the most important factors with a key role in increasing the GDP per capita are represented by the government revenue, the government expenditure, the trade openness, and the index of economic freedom.

## Conclusions

The study results highlight a significant and positive impact of government revenue, government expenditure, trade openness, and the index of economic freedom on economic growth. Additionally, it is noted that unemployment rate did not have a significant influence on GDP per capita in the model with government revenue, while, in the model with government expenditure, the impact was negative.

Similar or different results have been obtained in previous studies presented in the literature review. In this regard, there are highlighted positive correlations between government expenditure and economic growth in studies conducted on European countries (González-Sánchez et al., 2020), as well as on samples of countries around the world (Ng et al., 2019; Baidoo et al., 2023), while government revenue has a negative impact on GDP per capita in European countries (González-Sánchez et al., 2020). Foreign direct investment positively influences economic growth in several empirical research studies conducted on European countries (González-Sánchez et al., 2020; Brkić et al., 2020; Dkhili & Dhiab, 2018) and Asian



countries (Ngo & Nguyen, 2020). Additionally, three studies present direct influences of the trade openness on GDP per capita growth (Ngo & Nguyen, 2020; Zhang et al., 2021; Muinelo-Gallo & Roca-Sagalés, 2013), while, in other papers, there are both positive and negative effects on economic growth (Dkhili & Dhiab, 2018). Other studies show a direct impact of the index of economic freedom on economic growth (Brkić et al., 2020), as well as either a positive or negative influence (Dkhili & Dhiab, 2018). Moreover, the unemployment rate influences both positively (González-Sánchez et al., 2020) and negatively (Zhang et al., 2021; Pekarčíková et al., 2022) economic growth. Another representative indicator for previous studies was the inflation rate, which had a positive impact on economic growth (Zhang et al., 2021), but also a negative one (Batrancea et al., 2020), and, in the research conducted in this study, inflation, illustrated by the consumer price index, was not statistically significant, and consequently it was eliminated from the estimated models.

The research was conducted over a period of 10 years, between the two crises, namely the global economic crisis and the COVID-19 pandemic crisis. To increase the relevance of the results, the research could be extended over a period that follows the pandemic crisis, so that, by comparing the results from the two periods, the impact of the COVID-19 crisis on economic growth in the EU-28 countries can be highlighted.

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