

## FACTORS INFLUENCING THE ABSORPTION OF EU FUNDS FOR THE LAST MEMBERS STATES ECONOMY IN EUROPEAN UNION

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### **Abstract**

*The absorption of European funds is widely seen as a way of economic growth and job creation through payments made from the EU budget as co-financing for eligible projects granted to EU member states. The article presents a study on the absorption of European funds in the last 3 states that entered the European Union for the last programming period 2021-2027 and investigates the determining factors of the absorption of European funds in Romania, Bulgaria and Croatia. The average absorption rate at the EU level is 68% at the end of 2022. The findings of the estimates of economic and human development on the absorption of European funds show us multiple negative influences of the independent variables due to the fact that the analysis was carried out on the new countries that entered the EU have recorded low absorption rates of European funds. Positive influences are observed in the case of Gross capital formation, Imports of goods and services, Expense and Human Capital Index, but some of the variables are statistically insignificant.*

**Keywords:** *EU Funds, absorption, Economic Development, Human Development, the last three EU states*

**JEL Classification:** *C33, F21, F63, O15*

### **1. Introduction**

The European Union brings numerous advantages to member countries, among which one of the most important refers to the EU's commitment to the creation, growth and qualitative development of jobs and a society favorable to social inclusion. In other words, the European Union achieves sustainable development through non-reimbursable funds in order to reduce the gaps between economic and social development. The management of non-reimbursable European funds operates according to well-established rules in the sense that it is based on a system of responsibility concluded between the European Commission and the authorities of the member countries. Throughout history, the expansion of the economic and social cohesion policy has evolved, identifying some turning points that appeared with the launch of the multiannual programming cycles from the periods 1988-1993, 1994-1999, 2000-2006.

In the programming period of non-reimbursable European funds between 2007-2013, the cohesion policy is based on the fusion between convergence (aimed at accelerating the development of GDP per capita), regional competitiveness and employment (strengthening employment), European Territorial Cooperation (strengthening the economic and social cohesion of the European Union) in order to achieve the objectives of the Lisbon Strategy. This strategy attempts to provide financial support to the countries of the European Union, with a greater contribution to the poor regions of Europe so that priorities are established taking into account their own national policies.

European Union funding between 2014-2020 is managed through joint collaboration by the European Commission and the member countries of the European Union. The purpose of the funds is to invest in job creation in a healthy economy and sustainable European environment. EU states could commit funds under these categories until the end of 2023, being able to implement a wide range of programs and funds that provide financial support to beneficiaries. Mainly, the 2014-2020

ESIF focus areas are research and innovation, digital technologies, supporting the low-carbon economy, sustainable management of natural resources, small businesses.

Currently, the funding programs between the years 2021-2027 are underway, which aim to implement the regulations by supporting the general objectives of the cohesion policy for all EU member states. The priorities in the absorption of European funds through the currently offered programs try to bring a new image to Europe that becomes "smarter", "greener", "more connected", "more social", "closer to its citizens". The current funding period 2021-2027 continues the approach of the previous periods for job creation, competitiveness among commercial companies, economic growth, sustainable development, improves the quality of life of citizens. We therefore identify both microeconomic and macroeconomic objectives, and the beneficiaries of the funding can be from multiple areas such as public bodies, private organizations, NGOs, associations.

The Council of the European Union, specified in a study from 2006, that sustainable development has as its general objective stipulated in the Maastricht Treaty, the maintenance of the Earth's capacity to support life in all its diversity and is based on the principle of democracy, gender equality, solidarity, respect for the law and fundamental rights, including freedom and equal opportunities for all. It aims to continuously improve the quality of life and well-being on Earth, both for present and future generations. For this purpose, a dynamic economy must be promoted, which ensures jobs and a high level of education, health protection, social and territorial cohesion and environmental protection, in a safe world that respects cultural diversity [5].

The main objective proposed in this paper is to develop a model applicable to the absorption of European Union funds for countries that joined the EU after 2007 – Romania (2007), Bulgaria (2007), Croatia (2013). The purpose of the research is to analyze the absorption of European funds through economic and demographic influencing factors in the 3 countries for ESIF funding 2021-2027 programs. We consider the relevant factors used to be relevant because in all periods of non-reimbursable European funds the focus is on economic growth and population. The absorption of funds differs from one country to another for ESIF funding 2021-2027, according to the European Commission's inquiry [17], Romania benefits from EUR 32 billion of cohesion policy funding; Bulgaria benefits from EUR 11.3 billion of cohesion policy funding, and Croatia benefits from EUR 9.1 billion of cohesion policy funding.

Seen as optimal multiple instruments, European funds from 2021-2027 are divided into [17] - European Regional Development Fund (ERDF) which focuses on the objective of investment in jobs and economic growth; The European Social Fund Plus (ESF+) is mainly aimed at finding jobs, supporting disadvantaged groups, improving education and making public services more efficient; the Cohesion Fund (CF) which focuses on a greener Europe and trans-European transport networks; The Just Transition Fund (JTF) supports the territories most affected by the transition to climate neutrality; Interreg helps European territorial cooperation; The Asylum, Migration and Integration Fund (AMIF) aims to implement an approach to migration and asylum management; The Border Management and Visa Instrument (BMVI) aims to ensure European management at the EU's external borders; The Internal Security Fund (ISF) contributes to preventing and combating terrorism, radicalisation, crime and the European Maritime Fisheries and Aquaculture Fund (EMFAF) contributes to the achievement of maritime objectives.

The following sections of the paper are structured as follows: Section 2 includes relevant literature studies taking into account the developed hypotheses; Section 3 explains the data and methodology used; Section 4 discloses obtained results and presents the discussions based on the results, and Section 5 concludes the paper with the main findings.

## 2. Literature review and Hypothesis

The approach to sustainable development is the result of goodwill and civic responsibility based on taking into account, in a global and balanced way, economic performance, social aspects and environmental protection with the aim of favoring a fair sharing of business advantages and results, according to the game of power, as well as preserving the future and the interests of future generations.

### 2.1. EU Funds and Economic Development

Economic development at the macroeconomic level presupposes the ability of a state to produce goods and services continuously, to maintain levels of governance, manageable external debts and to avoid extreme sectoral imbalances that affect industrial production. The quantitative, structural and qualitative transformations occurring in the economic processes and in the functioning mechanisms of the economy aim to satisfy the current consumption requirements so as not to prejudice those of future generations, an argument unanimously accepted for EU Funds as well.

The economic essence of sustainable development is according to Burja C. [4] the form of economic growth, which satisfies social needs in terms of short, medium and long-term well-being, based on the consideration that development must meet present needs without endangering those of future generations [10]. Under the economic aspect, it was the creation of a body called the "Organization for Economic Cooperation and Development", which is an international organization of those developed nations that accept the principles of representative democracy and free market economy.

The impact of economic development on the absorption of European funds is a subject to be updated. In the debate regarding the fact that EU regional financial support promotes economic growth, increases labor productivity and creates new jobs initiated in the study of Mindaugas, B., Maciulyte-Sniukiene, A., Matuzeviciute, K. [12], the estimates have provided evidence that EU regional financial support improves growth and that the significance and extent of the positive effect is conditioned by the institutional quality of the supported region.

The existence of gaps in European development represents an obstacle in accelerating the absorption of European funds and the appropriate implementation of the Operational Programs, so the performance of the absorption of European funds studied over a period of 7 years in all EU member states through the positive impact of public governance through the six dimensions of and financial absorption capacity. This implies a positive impact of governance on the performance of the absorption rate, instead it reveals a positive but insignificant impact of financial growth (expressed as GDP) on the absorption of EU funds [1].

Estimating the impact of EU funds on regional or macroeconomic growth has been widely debated from all program periods of EU funds, including 2000-2006 [14] compared to the previous programming period. The results suggest an improvement in the effectiveness of the funds promoting economic growth that helps the European Union's central objective of strengthening social, economic and territorial cohesion. More recently, between the years 2007-2011 [2] to see to what extent the absorption rate of EU funds affects the short-term economic growth rate in EU member states. The obtained results of the absorption rate show that it has no effect on the short-term economic growth rate. Both for cohesion funds and for rural development funds, the impact of the absorption rate in the case of the group of net beneficiaries is negative. In another example, relative to the same period Nistor, R. L., Glodeanu A. C., [14] addresses the importance of European funds in regional economic development and their influence by the multidimensional absorption rate and finds that although economic growth is achieved, this fact is not due to the higher absorption rate, but due to the investments actually made. Findings demonstrated by Tosun,

J. [23] show that the new Member States generally had higher absorption rates than the old Member States.

Therefore, based on all the facts and findings of the aforementioned studies and others similar to our study [3], [6], [9], [11], [15], based on the formulation and conduct of the empirical tests, we expect to the following hypothesis:

*H<sub>1</sub>: An economic development leads to a higher percentage of absorption of EU funds*

EU funds are a natural path to success, influencing a country's economic potential. Based on the studies researched above in accordance with hypothesis H<sub>1</sub>, we propose and then examine the following alternative hypotheses that are currently poorly addressed in the specialized literature:

*H<sub>1a</sub>: Economic growth leads to a higher percentage of absorption of EU funds;*

*H<sub>1b</sub>: Gross capital formation leads to a higher percentage of absorption of EU funds;*

*H<sub>1c</sub>: Exports of goods and services leads to a higher percentage of absorption of EU funds;*

*H<sub>1d</sub>: Imports of goods and services lead to a higher percentage of absorption of EU funds;*

*H<sub>1e</sub>: Inflation, GDP deflator leads to a higher percentage of absorption of EU funds;*

*H<sub>1f</sub>: Expense leads to a higher absorption percentage of EU funds;*

*H<sub>1g</sub>: Revenue, excluding grants leads to a higher absorption percentage of EU funds.*

## **2.2. EU Funds and Human Development**

Human development presents the need to protect and support human and material resources with the aim of creating long-term sustainable values, through the optimal use of available resources. Long-term human sustainability concerns the current and future value of natural resources, such as drinking water, products, investments, consumption, markets and the global economy. Economic development is a means of human development, but it does not automatically lead to population development and the elimination of poverty. Although sustainable development has well-defined principles and objectives, humanity is essentially the one that can bring the most improvements, by changing the mentality, using resources in an appropriate way and economic discoveries that add value to what is already known.

Šostar, M.; Ristanović, V., by Alwis C. [21] investigated how the absorption of EU funds has an impact on the sustainable development of Croatia, Slovenia, Hungary and Poland. The empirical study was tested through the statistical analysis of the questionnaire applied in these countries, and the research results show the importance of human resources, not only in regional planning, but also in the preparation and implementation of projects financed by EU funds - a higher degree of education means a number larger of projects. On the other hand, it was found that the problems that arise during the preparation of projects for EU funds are problems of financial capacity, especially in less developed countries that have low annual budgets, with insignificant financial resources allocated for co-financing projects.

In 2017, Kersan-Škabić I. and Tijanić L. [9] investigate the influence of selected territorial economic preconditions important for the successful absorption of EU funds in two cohesion policy programming periods. The empirical result suggests that the determinants of the absorption of EU funds are - education level, unemployment rates, decentralization, investment, institutional framework and infrastructure development. The empirical study of Jagódka, M. and Snarska, M. [7] is based on the regions of Poland, estimating the state of their human capital and innovation. The Wilcoxon test was applied and the local and global data depth method was used, and the findings show that the processes of regional convergence in human capital and innovation showed short-term character.

Finally, in a recent study by Sergejeff, K., Domingo, E., and Veron, P. [16] it is shown that human development has received a priority for external action - NDICI-GE from 2021-2027. The

study shows that over 90% of the multiannual indicators present human development as a specific priority area, to be integrated into other areas.

So, taking into account the results of the opinions of Kalfova, E., [8], Sostar, M. [21] and the discussions mentioned above, based on the presentation and empirical examination we expect to see the following hypothesis:

*H<sub>2</sub>: A human development leads to a higher percentage of absorption of EU funds*

Specialized research does not provide clear evidence and information about the analysis of the impact of human development on the absorption of European funds. Therefore, based on the consultation of the World Bank, according to hypothesis H<sub>2</sub> we derive the following alternative hypotheses which are based on their usefulness in multiple studies, as well as the facility of accessing the data:

*H<sub>2a</sub>: Population growth leads to a higher percentage of absorption of EU funds;*

*H<sub>2b</sub>: The Human Capital Index leads to a higher percentage of absorption of EU funds.*

### **3. Data and Methodology of Research**

The study presents the economic and population influence on the absorption of European funds by using annual data from the last 3 countries that joined the European Union – Romania, Bulgaria and Croatia. We use data from the accession of each country to the European Union, up to the current period - Romania: 2007-2022, Bulgaria: 2007-2022 and Croatia: 2013-2022. The lack of data availability for the year 2023 leads to the impossibility of using them in the present study. The European Union made up of 27 European countries advocates for a better, easier and safer life for its citizens. The particularities of the expansion of the European Union through Romania and Bulgaria did not represent an easy process and a "cooperation and verification mechanism" was created for key sectors (judicial system reform, combating corruption and organized crime) with the aim of monitoring the progress made after accession to the EU. And as far as Croatia is concerned, the accession process was subject to stricter conditions, imposed by the "renewed consensus on enlargement" of the European Council.

The first explanatory indicator analysis on the absorption of European funds is the economic development through the Economic growth indicators; Gross capital formation, Exports of goods and services, Imports of goods and services, Inflation, Expenses, Revenue. Economic development expresses the quality of economic activity aimed at using production factors in a rational manner. The measurement of economic development based on efforts (expenditures) and effects (results), appears taking into account the complexity of the economic environment with the aim of obtaining reduced costs, through the receipts obtained from the sale of results that must exceed expenses.

The second explanatory indicator with an impact on the absorption of European funds is human development, focused in the study on the indicators: Population growth and Human Capital Index. Looking at the structure of the population, it reflects the result of the action over a period of time of the demographic phenomena. We believe that the constantly low values of the birth rate and higher life expectancy contribute to the modification of the pyramidal structure of the population in the 27 member countries of the European Union. Statistics show that the percentage of the young population is decreasing while the relative number of elderly people is increasing and the outlook shows a significant upward trend in the coming decades.

Table 1 shows the variables used in the proposed model, the description of the variables and the consulted data sources.

**Table 1. Variables and data sources**

Variables	Abb.	Unit	Description	Source
<b>Absorption of European funds</b>	<b>EU Funds</b>	mil. €	“They include ESIF funding 2014-2020 and ERDF, ESF+, CF, JTF 2021-2027”	European Commission
<b>Economic growth</b>	<b>GDP growth</b>	annual %	“It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.”	World Bank
<b>Gross capital formation</b>	<b>GCF</b>	% of GDP	“They include of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.”	
<b>Imports of goods and services</b>	<b>Imports</b>	% of GDP	“They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services.”	
<b>Exports of goods and services</b>	<b>Exports</b>	annual % growth	“They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services.”	
<b>Inflation, GDP deflator</b>	<b>Inflation</b>	annual %	“The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.”	
<b>Expense</b>	<b>Expense</b>	% of GDP	“It includes compensation of employees (such as wages and salaries), interest and subsidies, grants, social benefits, and other expenses such as rent and dividends.”	
<b>Revenue, excluding grants</b>	<b>Revenue</b>	% of GDP	“The formula and calculation of revenue will vary across companies, industries, and sectors.”	
<b>Population growth</b>	<b>Pop growth</b>	annual %	“Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.”	World Bank
<b>Human Capital Index</b>	<b>HCI</b>	scale 0-1	“Measures the productivity as a future worker of child born today relative to the benchmark of full health and complete education.”	

*Source:* Authors’ processing

The summary of the basic statistical testing for the model variables are presented below in Table 2:

**Tabel 2. Descriptive statistics**

Variables	Mean	Std. Dev.	Min	Max	Obs.
<b>EU Funds</b>	142.216	190.4667	0.8862	587.6523	42
<b>GDP growth</b>	2.6972	4.2028	-8.5914	13.7849	
<b>GCF</b>	11.8978	13.7769	-24.1710	33.0900	
<b>Exports</b>	7.3255	10.0544	-23.1940	32.7343	
<b>Imports</b>	51.2615	10.4562	32.4492	72.2110	
<b>Inflation</b>	4.7057	4.3566	-0.0612	16.1819	
<b>Expense</b>	35.3637	3.7577	29.8699	45.1327	

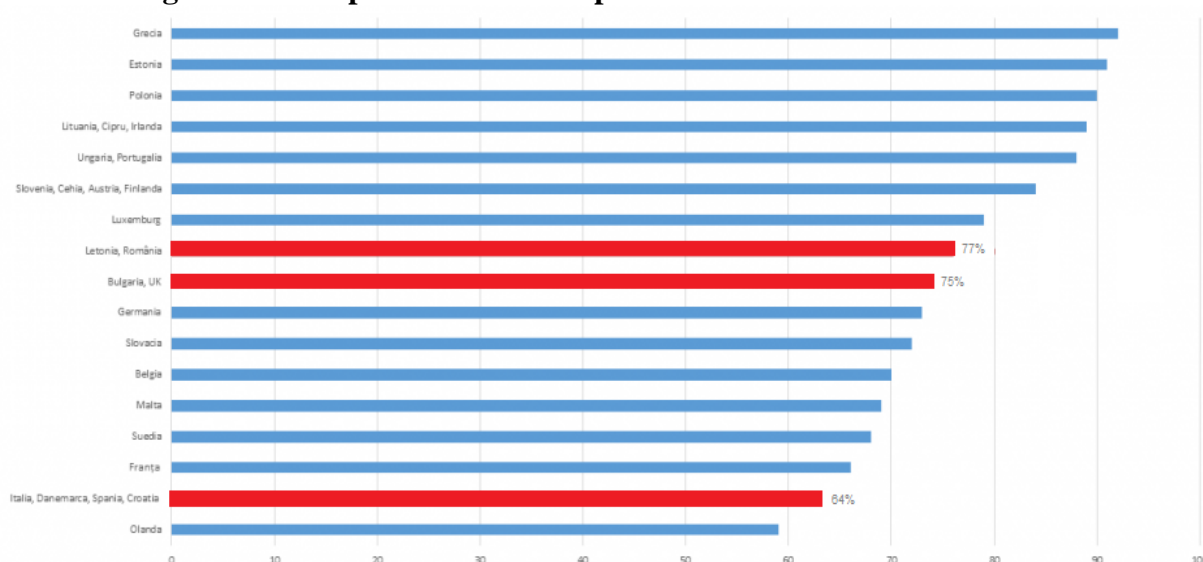
<b>Revenue</b>	33.2984	3.4443	28.6807	39.8400
<b>Pop growth</b>	-0.8813	1.0392	-6.1872	-0.2785
<b>HCI</b>	0.7264	0.0807	0.5500	0.8900

Source: Authors' processing in Eviews

Analyzing the descriptive statistics, we find that the EU Funds average is 142.22 million euros, and the standard deviation is 190.46 million euros, which shows a greater dispersion compared to the average. Related to the evolution of the independent variables, we can see that there is a substantial dispersion between the average and the standard deviation of the variables GDP growth, GCF, Exports. On the other hand, the variables Imports, Inflation, Expense, Revenue, Pop growth and HCI show standard deviations lower than the average, so that the degree of homogeneity in the studied sample is higher. The quality of the regression models was analyzed through annual series of statistical data for the 3 countries for which 42 observations resulted according to the time periods studied.

The efficiency of the absorption of European funds proves complete when it is analyzed from a qualitative, quantitative and speed point of view. The utilization of European funds at the country level helps to grow the national economy in general, and to human development, infrastructure, health, education and local communities, in particular. The stage of absorption of European funds in the member states of the European Union is presented in Chart 1.

**Figure 1. Absorption rate of European funds in EU member countries**



Source: Website of the Ministry of Investments and European Projects, [www.mfe.gov.ro](http://www.mfe.gov.ro), item Stage of absorption of European funds on December 31, 2022, accessed on March 2, 2024.

The graphic analysis of the absorption rate of European funds in the 27 member states of the European Union related to the last year presented in the research, 2022, shows that Romania has an absorption rate of European funds of approximately 77%, while the analyzed rate of Bulgaria is of 75%, and of Croatia of 64%. The consulted values of the absorption rate in the 3 countries are still below the European average in 2022. The comparative study of 2022 with the previous years shows an increase in the utilization of European funds in the 3 countries, which reflects the expression of European solidarity. The prospects of the strategic investment programs for the next periods are suitable for all 27 member states of the European Union to achieve performance in attracting European money.

Studying the influence of the independent variables described in table 1 on the dependent variable - EU Funds is the purpose of this approach, which will be carried out through multiple

linear regression models with panel data. In order to discover the causal link between EU Funds and economic development, the following model was developed according to the relationship:

$$EU\_FUNDS_{i,t} = \alpha_0 + \alpha_1 GDP\_GROWTH_{i,t} + \alpha_2 GCF_{i,t} + \alpha_3 IMPORTS_{i,t} + \alpha_4 EXPORTS_{i,t} + \alpha_5 INFLATION_{i,t} + \alpha_6 EXPENSE_{i,t} + \alpha_7 REVENUE_{i,t} + u_{i,t} \quad (1)$$

According to the objectives of the European Union, we introduce the variables that present the indicators of human development into the model, thus the relationship becomes:

$$EU\_FUNDS_{i,t} = \alpha_0 + \alpha_1 GDP\_GROWTH_{i,t} + \alpha_2 GCF_{i,t} + \alpha_3 IMPORTS_{i,t} + \alpha_4 EXPORTS_{i,t} + \alpha_5 INFLATION_{i,t} + \alpha_6 EXPENSE_{i,t} + \alpha_7 REVENUE_{i,t} + \alpha_8 POP\_GROWTH_{i,t} + \alpha_9 HCI_{i,t} + u_{i,t} \quad (2)$$

where in equations (1) and (2):  $\alpha_0$  - constant,  $\alpha_1 \dots \alpha_9$  - regression coefficient,  $i$  - country,  $t$  - years,  $u$  - error

#### 4. Results and discussion

First, we consider it appropriate to test in table 3, the unit root for the stationarity of the proposed variables in the assumptions of the linear regression model in the initial form as previously established. To investigate the stationarity of the data for the regression model variables we perform the Levin-Lin-Chu test which estimates the panel unit root test, the Augmented Dickey-Fuller test checks whether a unit root is present in a time series sample and the Breitung t-stat assumes a balanced panel that does not require correction factors.

**Tabel 3. Stationarity tests**

Variables	Levin-Lin-Chu test		ADF test		Breitung t-stat	
	Statistics	Prob.	Statistics	Prob.	Statistics	Prob.
<b>EU Funds</b>	-0.2373	0.4062	1.7784	0.9389	-0.03973	0.4842
<b>GDP growth</b>	-5.2368	0.0000	26.415	0.0002	-0.07105	0.4717
<b>GCF</b>	-5.1933	0.0032	25.0516	0.0003	1.21344	0.8875
<b>Exports</b>	-4.3548	0.0000	26.6994	0.0002	0.11850	0.5472
<b>Imports</b>	-1.4997	0.0668	14.4666	0.0248	0.24941	0.5985
<b>Inflation</b>	0.5104	0.6951	8.2199	0.2224	3.57663	0.9998
<b>Expense</b>	-0.8561	0.1959	5.7482	0.4520	-1.13277	0.1287
<b>Revenue</b>	-4.0237	0.0000	18.9469	0.0043	-1.51896	0.0644
<b>Pop growth</b>	-6.7288	0.0000	22.6150	0.0009	3.27187	0.9995
<b>HCI</b>	-2.1855	0.0144	7.2033	0.3025	-1.49902	0.0669

Source: Authors' processing in Eviews

By applying the 3 stationarity tests, we find that in most cases the variables are stationary as presented in table 3. The results suggest the existence of a unit root at the individual level, as well as as a whole if we look at the Levin-Lin-Chu test that rejects the null hypothesis, however, there are also some discrepancies generated especially in the Breitung test. Therefore, it is necessary to pay more attention to the linear regression results proposed in the following.

We continue testing the multicollinearity between the variables, where we found balanced values according to the correlation matrix, in all cases below 0.8, which demonstrates the absence of intercorrelation between the variables. We also checked the homoscedasticity of the random errors by White test which shows a high probability value of the statistic, therefore the null hypothesis of constant variance is accepted, thus it reveals the homoscedasticity of the random errors. So, we go through homoscedasticity correction through the robust regression model.



To examine the impact of economic and human development variables on the absorption of EU funds, we start by developing multiple least squares linear regression models by stepwise introducing the variables proposed in H<sub>1</sub> and H<sub>2</sub>, followed by the OLS estimator model with robust option (Table 4):

**Tabel 4. OLS and OLS robust models**

EU Funds	Model 1 Ordinary Least Squares (1)	Model 2 Ordinary Least Squares (2)	Model 3 Robust Least Squares
<b>GDP growth</b>	18.9310* (9.1842)	6.4285* (8.9008)	-1.7360* (7.3652)
<b>GCF</b>	1.7187** (2.8659)	3.0653* (2.5788)	5.1381*** (2.1339)
<b>Imports</b>	8.2820* (2.8659)	4.1737* (3.1212)	6.2229*** (2.5827)
<b>Exports</b>	-7.5376** (3.4186)	-4.5274* (3.1937)	-2.6683* (2.6428)
<b>Inflation</b>	10.9050* (6.7505)	11.0547* (6.3870)	5.9256** (5.2851)
<b>Expense</b>	46.5983*** (10.6212)	22.4706 ** (11.8522)	18.6602** (9.8075)
<b>Revenue</b>	-44.5884*** (12.6468)	-16.7958** (13.8126)	-9.7977* (11.4297)
<b>Pop growth</b>	-	-24.5780* (24.4105)	-32.9477* (20.1993)
<b>HCI</b>	-	-1124.875** (335.3808)	-1523.559*** (277.5224)
<b>Constant</b>	-513.1384* (343.8170)	409.0549* (405.7039)	490.6796** (335.7137)
<b>Obs.</b>	42	42	42
<b>R<sup>2</sup></b>	<b>0.5033</b>	<b>0.6388</b>	<b>0.4020</b>

Notes: \*, \*\*, \*\*\* means significance at 10 %, 5 %, 1 % and (...) expresses the p-value for the z test.

Source: Authors' processing in Eviews

In the models obtained for EU Funds, we outlined the first model taking into account the hypotheses H<sub>1.a</sub> - H<sub>1.g</sub>, then in the second model we introduced the hypotheses H<sub>2.a</sub> and H<sub>2.b</sub>. We notice that the R<sup>2</sup> coefficient of model (1) increases compared to (2) by 13.55%, but it is much less statistically significant, and the robust regression coefficient is 40.20%. Only in OLS models 1 and 3 were statistically significant variables identified at the 1% level, the variables Expense and Revenue for model 1 and the variables GCF, Imports, HCI for model 3. In model 2 there is weak statistical significance at the 5% level only in the case of the independent variable Expense. Correlation coefficients show that at an increase of one unit of GDP growth, EU Funds will increase by 0.10%, at an increase of one unit of GCF, EU Funds will increase by 0.13%, at an increase of one unit of Imports, EU Funds will increase by 0.15%, at a decrease of one unit of Imports, EU Funds will decrease by 0.11%, at an increase of one unit of Inflation, EU Funds will increase by 0.37%, at a decrease of one unit of Revenue, EU Funds will decrease by 0.10%, at a decrease of one unit of Pop growth, EU Funds will decrease by 0.30%, and at a decrease of one unit of HCI, EU Funds will decrease by 0.64%.

The following methods tested are Fixed Effects to estimate the effect of a variable within a group, Random Effects to estimate the effect of a variable across multiple groups and Two Stage Least Square uses the uncorrelated variables to calculate the estimated values of the predictors after which it uses the data in the estimation the linear regression model of the dependent variable. Regression models with effects and two-stage OLS are presented in Table 5:

**Tabel 5. Fixed Effects, Random Effects and Two Stage Least Square models**

EU Funds	Model 4 Fixed Effects	Model 5 Random Effects	Model 6 2SLS
<b>GDP growth</b>	8.3910* (9.1971)	6.4285* (9.0124)	36.7132** (82.6563)
<b>GCF</b>	0.9455* (4.1259)	3.0653* (2.6111)	-13.4992* (21.0122)
<b>Imports</b>	3.4981* (5.3864)	4.1737* (3.1603)	-26.5515* (29.5172)
<b>Exports</b>	-3.9245* (3.3302)	-4.5274* (3.2338)	1.4184** (15.8196)
<b>Inflation</b>	9.0610* (6.7072)	11.0547** (6.4671)	33.3298** (44.1695)
<b>Expense</b>	30.5898** (14.3278)	22.4706** (12.0008)	-65.6101* (137.7462)
<b>Revenue</b>	-4.6098* (17.6943)	-16.7958* (13.9858)	48.9351** (118.7465)
<b>Pop growth</b>	-25.4282** (25.1913)	-24.5780* (24.7166)	-87.7129 (271.5932)
<b>HCI</b>	-1036.944*** (350.0869)	-1124.875*** (339.5858)	-3074.183* (2313.489)
<b>Constant</b>	288.8169* (750.3194)	409.0549* (410.7907)	4238.171* (3694.193)
<b>Obs.</b>	42	42	39
<b>R<sup>2</sup></b>	<b>0.6539</b>	<b>0.6388</b>	<b>-1.8335</b>
<b>Hausman Test</b>	-	<b>1.0000</b>	-

Notes: \*, \*\*, \*\*\* means significance at 10 %, 5 %, 1 % and (...) expresses the p-value for the z test.

Source: Authors' processing in Eviews

The comparative analysis of the first models presented in table 4, with those presented in table 5 lead to convergent results. A comparative examination of OLS (2) with Fixed Effects and Random Effects does not show a greater statistical significance of the variables and constants of the models. The results of models 4 and 5 show that only the HCI variable is statistically significant at the 1% level, while Expense and Pop growth are statistically significant at the 5% level. In the case of models with effects, a reduction in standard errors and an increase in the values of correlation coefficients are observed. The Hausman Test shows a probability value greater than 5%, so we accept the null hypothesis and show that the random effects model is appropriate. Two Stage Least Square results are statistically significant at a maximum level of 5% - GDP growth, Exports, Inflation and Revenue.

Therefore, based on the obtained results, the configured research hypotheses  $H_{1.a}$  -  $H_{1.g}$  and  $H_{2.a}$  -  $H_{2.b}$  present the following situation. The first main hypothesis divided into seven sub-hypotheses shows that the absorption of European funds in Romania (2007-2022), Bulgaria (2007-2022) and Croatia (2013-2022) is positively influenced by GDP growth, but is not statistically

significant, therefore sub-hypothesis  $H_{1.a}$  is rejected. The macroeconomic variable GCF reflects a positive impact on EU Funds therefore hypothesis  $H_{1.b}$  is accepted, the situation is the same in the case of Imports therefore hypothesis  $H_{1.c}$  is accepted. The hypothesis that refers to Exports on the absorption of European funds has a negative impact and is statistically insignificant, therefore  $H_{1.d}$  is rejected. The situation is repeated for the Inflation variable, although it has a positive influence, it is not statistically significant, so  $H_{1.e}$  is rejected. Sub-hypothesis  $H_{1.f}$  is accepted because Expense is statistically significant and has a positive impact on the absorption of European funds. The variable Revenue reflects a negative influence on EU Fund and is not statistically significant, therefore  $H_{1.g}$  is rejected. For the second hypothesis tested, the sub-hypothesis that refers to population growth on the absorption of European funds in the 3 EU member states proves to have a negative influence and is statistically insignificant therefore  $H_{2.a}$  is rejected, while we accept  $H_{2.b}$  because HCI has a positive influence on EU Fund and is statistically significant at the 1 % level. We tend to believe that the negative influences are due to the fact that the analysis was carried out only on the last states that entered the European Union, which otherwise have the lowest rate of absorption of European funds.

## 5. Conclusions

The continuous study of the absorption of European funds is of interest because it is considered an optimal solution for overcoming the economic-financial crises that the EU states are facing. The efficiency of the absorption process of European funds represents an important measure in increasing them, which is possible through inter-institutional and administrative cooperation in order to harmonize existing procedures to achieve national and international objectives. Based on the primary objectives of sustainable development, the objectives of research, economic growth and improvement of the quality of life examined on the absorption of European funds we consider to be conclusive and to contribute to the specialty literature that is insufficiently detailed from this perspective.

Through this article I studied the influence of economic and human development on the absorption of European funds in the last 3 states that entered the European Union, taking into account a period of 15 years depending on the availability of data and the year of accession of each analyzed state to the European Union. Results were obtained through a progressive series of panel data tests using Ordinary Least Squares, Robust Least Squares, Fixed Effects model, random (Random Effects) and Two Stage Least Square (2SLS). The choice of the used models was based on the diagnosis of the data, which shows the fact that the data are stationary, the absence of multicollinearity, and the heteroscedasticity of random errors. Based on our findings, we show that there is a positive correlation between Gross capital formation and EU Funds, between Imports of goods and services and EU Funds, between Expenses and EU Funds and between Human Capital Index and EU Funds which suggests the effectiveness of the proposed model and its persistence dynamics of EU Funds. However, the rest of the independent variables show a negative influence on EU Funds or are statistically insignificant.

The obtained results have practical implications from a macroeconomic perspective. The findings suggest that the work positively influences specialized literature by bringing to the fore the last programming period of the European funds 2021-2027, so the study is current from a temporal perspective, but also spatially because the most recent states entered the European Union are captured. However, the limits of the paper are obvious and refer to the low degree of representativeness of the study which in perspective can be outlined for all the member states of the European Union - EU27. Extending the sample and the period of analysis may lead to interesting results in the field given the heterogeneous levels of development of the EU countries.

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## Conflicts of Interest

No potential conflict of interest was reported by the authors.

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