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PUBLIC DEBT AND ECONOMIC GROWTH IN TRANSITIONAL ECONOMIES: INSIGHTS FROM A 50-COUNTRY PANEL STUDY

ЈАВНИ ДУГ И ЕКОНОМСКИ РАСТ У ТРАНЗИЦИОНИМ ЕКОНОМИЈАМА: УВИДИ ИЗ ПАНЕЛ-СТУДИЈЕ 50 ЗЕМАЉА

Summary: *The increase in public debt is a controversial issue in both developed and developing nations, but it is particularly prevalent in post-socialist economies. The challenge of rising public debt extends beyond economic concerns, encompassing political and social dimensions as well. Many former socialist countries have experienced a significant rise in public debt since their transition. This study explores the relationship between public debt growth and GDP, focusing on 50 post-socialist countries across Europe, Asia, and Africa from 2000 to 2019. Utilizing a panel model, the research incorporates macroeconomic factors such as gross investment, trade openness, human capital, and unemployment indices as control variables. The findings indicate a strong negative correlation between increasing public debt and GDP growth. The results suggest that, in post-socialist economies where there is no proper control over the use of credit funds, rising public debt hampers economic development.*
Keywords: *public debt, GDP, economic growth, fiscal policy, post-socialist economies*
JEL classification: *E60, H60, C33, O50*

Резиме: *Раст јавног дуга представља контроверзно питање у развијеним и земљама у развоју, али је посебно изражен у постсоцијалистичким економијама. Изазови који произилазе из повећања јавног дуга не односе се само на економске аспекте, већ укључују и политичке и социјалне димензије. Многе бивше социјалистичке земље су након транзиције доживјеле значајан пораст јавног дуга. Ова студија истражује везу између раста јавног дуга и БДП-а, са нагласком на 50 постсоцијалистичких земаља Европе, Азије и Африке у периоду од 2000. до 2019. године. Коришћењем панел-модела у истраживању су као контролне варијабле укључени и макроекономски фактори, као што су бруто инвестиције, отвореност трговине, људски капитал и стопа незапослености. Добијени резултати указују на снажну негативну корелацију између повећања јавног дуга и раста БДП-а. Налази сугеришу да у постсоцијалистичким економијама, гдје нема адекватне контроле над коришћењем кредитних средстава, раст јавног дуга успорава економски развој.*
Кључне речи: *јавни дуг, БДП, економски раст, фискална политика, постсоцијалистичке економије*
ЈЕЛ класификација: *E60, H60, C33, O50*

1. INTRODUCTION

Contemporary theory and practice recognize public debt as a useful and significant instrument of economic development. This is especially pronounced in developing and underdeveloped countries, where access to funding sources is limited and the financial market is underdeveloped. However, during financial and debt crises, debates intensify regarding the optimal management of public debt to ensure sustainable economic growth. While borrowing can initially stimulate economic expansion, excessive debt levels can create pressure on private investments and ultimately lead to a decline in overall national output.

The expansion of the state's financial activities and, consequently, the increase in indebtedness, always actualize the problem of determining the public debt limit. The last crises produced the dynamics of public debt growth, which in recent years grew at a rate higher than GDP growth in most countries. The analysis of the situation for the developing countries that we observed in this research shows its constant growth and requires special attention to how the borrowed money is spent and the degree of sustainability of the public debt. Taking into account the appearance of deflationary pressures and a possible recession with a fall in GDP, there are justified concerns about

the growth of the deficit/GDP and public debt/GDP ratios and the sustainability of the fiscal positions of individual countries.

In this paper, we examine the impact of public debt growth on economic growth. The subject of the research refers to the examination of the impact of the share of public debt in GDP on the economic growth of 50 post-socialist countries in Europe, Asia and Africa in the period from 2000 to 2019. The selected timeframe preceded the emergence of the coronavirus for several reasons. The pandemic caused abrupt and widespread economic disruption, including lockdowns, travel restrictions and supply chain disruptions. These shocks are atypical and can distort long-term trends in the relationship between public debt and GDP. Governments and central banks have taken extraordinary measures, such as large-scale quantitative easing and fiscal stimulus, that are not typical of non-crisis times. These measures have had a major impact on both debt levels and GDP, making causal analysis difficult. Governments also borrowed extraordinarily heavily to finance pandemic relief measures such as stimulus packages, corporate subsidies and healthcare spending. This debt accumulation was driven by emergencies rather than routine fiscal policy. Many countries experienced a sharp drop in GDP during the pandemic, followed by a rapid rebound. These extreme fluctuations make it difficult to assess the normal relationship between public debt and economic performance. Typical economic indicators such as employment, consumption, investment and productivity were significantly disrupted. The usual economic relationships broke down during the pandemic, making it difficult to draw reliable conclusions. The pandemic year is considered an "outlier" in the statistics. Including this year in analyses can distort the results and lead to misleading conclusions that cannot be generalised to periods outside the pandemic.

In our work, we applied the panel model. In the research, we use GDP as a dependent variable, and one independent variable - the share of gross public debt in GDP. Macroeconomic variables of gross investment, trade openness and human capital and unemployment indices were used as control variables in the model. A group of works important for this research also uses the population by share of education level, total investments, savings, openness of countries, as well as the fiscal balance and total external debt of the considered countries, inflation, as control variables important for developing countries.

Previous relevant literature indicates that at a certain level of the share of debt in GDP, there is a change in the effects of borrowing on economic growth. Although there are opinions that the budget deficit and the growth of public debt under certain conditions can have a positive effect on economic growth, the dominant opinion is that in the long term, the growth of public debt leads to a decline in GDP. The extensive study that is the subject of the most controversy regarding the results obtained is the one by the authors Reinhart and Rogoff from 2010. They determined the existence of a reference level of about 90% of the share of public debt in GDP, up to which the effect of public debt is weak, after which it becomes significantly negative on GDP growth. Also, Casaresu (2015) concludes that external public debt can have a non-linear impact on economic growth. At low levels of indebtedness, an increase in the share of external public debt in GDP could stimulate economic growth; however, at high levels of indebtedness, an increase in this ratio could harm economic growth.

A significant number of studies indicate that the least developed countries, as a rule, have a lower reference level, after which public debt begins to negatively affect GDP, while more developed countries, due to a more efficient fiscal policy, have a higher reference level. However, recent empirical studies question this result and conclude that there is no simple threshold for public debt, given several factors not considered in the aforementioned studies. Nevertheless, the conclusion obtained in most research inevitably points to one thing: excessive public debt will at a given moment negatively affect the economic growth of the observed country, regardless of the nature of the variables involved.

The structure of this paper consists of five chapters. The second chapter provides an overview of relevant literature so far that considers the effects of public debt on economic growth. The third chapter presents the methodology used in this research, which focuses on the formation of panel models with which we will examine the impact of the share of public debt in GDP on economic growth. The fourth chapter presents the results of the empirical analysis together with the discussion, while the last, fifth chapter summarizes the results and presents concluding considerations.

2. LITERATURE OVERVIEW

In the classic doctrine, public debt is treated as explicit income for budgetary difficulties and to cover extraordinary public expenditures. The monetary theory of public debt, rejecting the classical doctrine, develops the concept of modern functions of public debt. As an instrument of financial policy, public debt assumed: the function of balancing budget expenditures, the function of economic stabilization and the function of economic development (Ristić 2010).

Economic-theoretical assumptions state that an acceptable level of external debt should help economic growth and development. Debt theories used to better understand the implications of debt on economic growth (Krugman 1988; Cohen 1995) advocate the view that higher levels of debt suppress economic growth due to increased internal state borrowing. An increase in borrowing will increase the interest rate, which increases the cost of borrowing for both investment and consumption.

However, economic theory suggests that developing countries need a certain level of external debt in order to accelerate economic growth. However, if the external debt grows above a certain limit, then the external and total public debt puts pressure on private investments, reduces the competitiveness of the real economy, reduces production and wages. Governments borrow abroad due to the lack of long-term sources of financing in the country, but also to achieve lower interest rates (Stiglitz 2004).

The expansion of the economy and consumption also leads to an increase in the general price level. Under circumstances of increased money supply, indebted individuals need less money to pay off existing debts, and new loans become "cheaper", leading to growth in consumption, employment and investment (Topić-Pavković and Šoja 2023).

After the first major financial crisis in the 21st century, which turned into a public debt crisis, debates are intensifying regarding the negative effects of public debt growth on economic growth. The public debt ratio as a percentage of GDP stands out as the most significant indicator of this process. This is when the most significant works related to this issue are created, which start from the extensive research of the authors Reinhart and Rogoff from 2010, and a series of studies that try to confirm or refute the theses from the mentioned research (Cecchetti et al. 2011; Presbitero 2012; Afonso and Jalles 2013; Woo and Kumar 2015 and others).

Cecchetti et al. (2011) based on the analysis of 18 OECD economies claims that there is a threshold of 85% of debt to GDP which, if exceeded, leads to a reduction in future economic growth. They believe that a high initial level of public debt is significantly associated with a subsequent slowdown in economic growth in a large number of countries that make up both developed and developing market economies. This confirms the previous thesis of Reinhart and Rogoff.

External borrowing can have negative and positive effects on economic growth (Presbitero 2012). Presbitero found that industrialized countries are more efficient than developing countries in the productive use of debt. The aforementioned author came to the conclusion that public debt negatively affects economic growth when the debt amounts to more than 90% of GDP. His study is based on a sample of 114 developing countries during the period 1980 - 2004.

Woo and Kumar (2015) use initial debt levels to analyze the impact on future growth. Due to the problem of finding suitable external instrumental variables, the standard system GMM estimator is used to solve the issue of potential endogeneity. They find that a high initial level of public debt is significantly associated with a subsequent slowdown in growth in a large number of countries comprising developed and developing countries.

Research conducted by Gomez-Puig and Sosvilla-Rivero (2017), on a sample of central and peripheral countries of the Eurozone (EA) in the period 1961-2013. shows that public debt always has a long-term negative impact on the economic performance of these countries, although its short-term effect can be positive depending on the analyzed country.

Applying the OLS method to panel data on a sample of Western Balkan countries in the period from 1998 to 2019, Bacovic (2021) obtained results that when public debt increases by one unit, the GDP growth rate decreases by 0.042 units. Also, an increase in public debt by one unit leads to a decrease in the productivity growth rate by 0.086 units.

Observing the interdependence of the public debt/GDP ratio and the solvency of the member countries of the monetary union, as a result of constant debt growth, the author Topić-Pavković (2015) confirms in his research that an increase in the share of debt in GDP reduces the country's ability to settle the current value of foreign liabilities. As a result, the sustainability of the external debt decreases, i.e. the solvency of the country decreases and the negative perception of the country's rating

among investors increases, which ultimately leads to a higher risk premium in the price of government bonds, i.e. an increase in borrowing costs.

Another group of authors in their research finds a weak causal effect and a low level of connection between the level of public debt and subsequent GDP growth (Yang and Su 2018; Ash et al. 2020; Bentour 2021). Several authors point to systematic differences in the (non-linear) impact of public debt on growth among countries, which implies a lack of evidence for defining a universal threshold in the ratio of public debt to GDP above which economic growth slows down.

Yang and Su (2018) highlight the key role of the time-varying threshold of the effect of public debt on economic growth. They used data from the US for the period 1791-2009 and applied a model to investigate the impact of debt on growth. They used Hansen's extended regression model with a constant threshold that allows for a state-dependent time-varying threshold. Their empirical results clearly indicate the non-linear effect of the debt threshold, and the threshold is time-varying and dependent on the state of the observed country.

Ash et al. (2020) looking back from the 1970s analyze the impact of endogenous variables and reverse causality using the trend and decline of GDP growth in relation to public debt. They find that the relationship between the public debt-to-GDP ratio and growth is close to zero and there is no evidence of a causal effect of public debt on growth. Using different data sets from important works in the literature, primarily Reinhart and Rogoff (2010), the authors provide a comprehensive assessment of the impact of public debt on GDP growth. These authors argue that earlier results obtained in the literature indicating a negative effect of public debt on growth are sensitive to small samples, outliers, and particular econometric choices.

The results of the analysis by Bentour (2020) confirm that the relationship between debt and growth is not constant and depends on the level of debt and the state of a national economy. In his study, he analyzed the relationship between public debt and economic growth in a sample of 20 advanced economies in the period from 1880 to 2010. Using the kink regression model (regression kink design) with an unknown threshold proposed by Hansen (2017) shows that the relationship between public debt and economic growth is time-varying and country-dependent. In particular, the relationship between public debt and economic growth is volatile for each country in the sample over the entire period 1880–2010, and the postwar period 1950–2010, and is subject to data and country heterogeneities. These findings reject the existence of any common threshold that fits all countries and call for more theory-based models that take into account the fundamentals that differ across countries and affect debt-growth interactions.

Checherita-Westphal et al. (2012) point out that one should adhere to the basic principles when borrowing a country, primarily that the capital borrowed abroad or in the country is invested in production and export-oriented projects with a higher rate of profit than the interest on the loans taken, in order to ensure long-term economic growth, servicing debt and minimizing losses. According to Marić (2012), only by increasing GDP, exports and competitiveness can higher revenues be achieved in the budget and the repayment of the public debt can be facilitated. Using foreign debt for non-productive purposes (financing budget deficits, current consumption from imports, etc.) necessarily reduces the available income for debt repayment and brings the economy into a debt crisis. Servicing external debt in the absence of economic growth reduces potential savings, investment and economic growth.

3. APPLIED METHODOLOGY AND EXPLANATION OF VARIABLES

3.1. The data

In this study, we apply a panel model to analyze the effect of public debt as a share of GDP on economic growth. The research sample includes 50 post-socialist countries from Europe, Asia, and Africa, with the period from 2000 to 2019 serving as the timeframe for analysis. The following table presents an overview of all 50 countries included in the study, along with the proportion of gross public debt in their respective GDPs:

Table 1. Country data on public debt

Country	Public debt in 2019	Average Public debt 2000-2019
Afghanistan	6.13	67.94
Albania	67.29	63.34
Angola	113.55	58.14
Armenia	50.09	35.34
Azerbaijan	17.66	12.69
Belarus	41.00	34.63
Benin	42.52	26.66
Bosnia and Herzegovina	32.53	34.55
Bulgaria	18.31	28.85
Cabo Verde	124.92	92.93
Cambodia	28.59	32.38
Czech Republic	30.05	32.30
Chad	51.11	39.18
Republic of Congo	81.70	92.04
Croatia	71.08	56.16
Egypt	84.21	83.86
Equatorial Guinea	42.99	16.83
Estonia	8.56	7.03
Ethiopia	54.70	61.72
Georgia	40.43	37.60
Guinea	38.37	61.84
Ghana	62.69	45.31
Hungary	65.48	68.29
Kazakhstan	19.94	13.42
Kyrgyz Republic	51.60	70.85
Latvia	36.70	28.20
Lithuania	35.87	29.24
Madagascar	38.52	49.88
Mali	40.73	36.57
Mauritania	56.83	65.66
Moldova	28.29	42.60
Montenegro	78.79	54.02
Mozambique	96.05	66.64
Myanmar	38.75	83.00
Poland	45.61	48.12
Romania	36.80	28.99
Russia	13.75	18.40
Senegal	63.58	40.93
Serbia	52.75	64.84
Seychelles	54.21	116.02
Sierra Leone	72.45	80.43
Slovak Republic	48.14	44.57
Slovenia	65.61	46.22
Tajikistan	43.09	49.44
Tunisia	68.97	53.34
Ukraine	50.49	41.82
Uzbekistan	28.36	17.41
Vietnam	41.29	35.83
Yemen	76.53	54.48
Zambia	99.73	80.27

Source: Author's calculations and IMF

In the research, we use one dependent variable, GDP, and one independent variable, the share of gross public debt in GDP (DEBT). Additionally, a set of control variables is included: gross investments (INV), the human capital index (HC), trade openness (OPEN), and unemployment (UNEM). The following table provides an overview of the variables used in the research, along with the sources from which the data were obtained:

Table 2. Specification of variables in the research

Variable	Label	Type	Description	Source
Gross domestic product	*GDP*	Dependent	GDP variable is given in levels	International Monetary Fund
Public debt	*DEBT*	Independent	DEBT = Public debt/GDP	International Monetary Fund
Investments	*INV*	Control	INV = Gross Fixed Capital Formation/GDP	International Monetary Fund
Human capital index	*HC*	Control	Based on years of schooling and returns to education	Penn World Table version 10.01
Trade openness	*OPEN*	Control	OPEN = (Export+Import)/GDP	World Development Indicators
Unemployment	*UNEM*	Control	UNEM = Unemployment population/Total population	International Monetary Fund

Source: Author's view

Based on the research object, i.e. the impact of the share of public debt in GDP on economic growth, the following part of the paper builds a panel model for 50 countries from the sample for the period from 2000 to 2019. In addition to the explanatory variable, we will use four control variables that we successively include in the model to observe the relationship between the independent variable (DEBT) and GDP.

3.2. Applied method

Based on the research model given by the equation 1 for 50 countries, we form a panel model. In the empirical part, we will apply several different panel models that use different control variables, while we will choose the optimal model based on relevant tests. There are several different panel models that are present in econometrics, namely: independently pooled panel, differenced panel, panel with fixed and panel with random effects. In this research, we will use a panel with fixed effects and a panel with random effects, because they are most often used in relevant research so far.

A fixed effects (FE) model specifies the individual effects of unobserved, independent variables as constants over time. These constants are fixed for all individuals from the panel during the observation time. Therefore, we can write the panel model with fixed effects as:

$$y_{it} = \alpha_i + \beta \boldsymbol{x}_{it}^{`} + \varepsilon_{it};\ i = 1, \dots, N, t = 1, \dots, T \tag{1}$$

where N is the total number of individuals, T is the time period of observation of observations and individuals, $\boldsymbol{x}_{it}^{`}$ is a vector of independent variables, β is a vector of parameters with independent variables, α_i is a constant that is different for each observed individual (for each country), $\varepsilon_{it}$is the random error. This fixed-effects approach takes $\alpha_i$to be a group-specific constant in the panel model.

The random effects (RE) model determines the individual effects of unobserved, independent variables as random variables over time. These effects are able to "switch" between OLS and FE and can focus on both, depending on within-individual differences as well as between-individual differences in the panel model.

Therefore, RE can be formulated in the following form:

$$y_{it} = \mu + \beta \boldsymbol{x}_{it}^{`} + \alpha_i + \varepsilon_{it};\ i = 1, \dots, N, t = 1, \dots, T \tag{2}$$

where μ is a common constant and $\alpha_i$is a random effect for each individual. RE assumes that in this model α_i are independently and identically distributed random variables per observed observation units with mean 0 and covariance. If the covariance is different from zero then fixed effects is applied, if the variance is equal to zero then OLS is applied.

In this paper, when choosing between FE and RE, we will use the test proposed by Hausman (1978). The RE model is more efficient than the FE model, therefore the Hausman test tries to confirm the null hypothesis that the RE model is used. The Hausman test uses a chi-square distribution with degrees of freedom equal to the number of time-varying regressors.

4. THE RESEARCH RESULTS AND DISCUSSION

Before the formation of econometric models, we will present indicators of descriptive statistics as well as a correlation matrix that shows the degree of agreement in which the variables we observe in the research move. For the six variables we use in the model, descriptive indicators are presented in the following table:

Table 3. Descriptive statistics

	lnGDP	lnDEBT	lnOPEN	lnINV	lnHC	lnUNEM
Mean	13.026824	3.63826	4.223439	3.174038	0.83666	1.920274
Median	12.883263	3.703176	4.230486	3.196158	1.019456	2.092481
Maximum	17.73562	5.857933	5.234287	4.374511	1.347823	3.437529
Minimum	11.495937	-0.71744	2.411171	0.3379	0.121717	-1.966113
Std. Dev.	1.91493	0.787302	0.459595	0.385033	0.361927	0.862913
Sum	23026.824	3638.26	4223.439	3174.038	836.6597	1920.274
Sum Sq. Dev.	27292.719	619.2246	211.0163	148.1019	130.8598	743.8741
Obs.	1000	1000	1000	1000	1000	1000

Source: Author's calculations

Since the variables we use in economics almost always have the problem of multicollinearity, the panel model is a very good way to overcome this problem. The problem of multicollinearity can disrupt the assessment of the influence of independent variables on the dependent variable, ie, the assessment of parameters and their direction. According to Baltaga (2008, 2015), a good way to detect multicollinearity between two or more independent variables is correlation coefficients between independent variables. Therefore, in the following table we form a correlation matrix with independent and dependent variables:

Table 4. Correlation matrix

	lnGDP	lnDEBT	lnOPEN	lnINV	lnHC	lnUNEM
lnGDP	1					
lnDEBT	-0.2910	1				
lnOPEN	0.1034	-0.1082	1			
lnINV	0.0103	-0.1563	0.3333	1		
lnHC	0.4539	-0.2231	0.4332	0.0653	1	
lnUNEM	-0.0352	0.0497	0.0976	0.0437	0.3865	1

Source: Author's calculations

From the previous table, we can see that there is no significant correlation between the set of independent variables that we use in the research. The exception is the correlation between the variables HC and OPEN, where the correlation coefficient is 0.4332, but this coefficient is below the level of 0.5, so we cannot confirm the existence of a correlation between these two independent variables. From the correlation matrix, we see that the correlation coefficient between the dependent variable GDP and the independent DEBT is negative -0.2910, which indicates that there is a negative direction of movement between these variables. Also, there is a negative direction of movement between the independent variable and the UNEM variable. Between the other independent variables OPEN, INV and HC and the dependent variable there is a positive correlation, which is only in the case of the relationship between GDP and HC with a higher level of correlation. Between the DEBT variable and other independent variables, a negative correlation can be observed, while a positive correlation is shown between DEBT and UNEM. The OPEN variable is positively correlated with INV, HC and UNEM. Also, the variables INV, HC and UNEM are positively correlated with each other.

Based on the previously shown correlation matrix between the dependent and the set of independent variables, we see that there is no multicollinearity. Therefore, we can approach the formation of a panel model for the defined research variables. In the paper, we will evaluate a total of 4 models (including fixed effects and random effects specification of models). In Model 1, we add only one independent variable, that is the variable DEBT. In Model 2, we form a model with three independent variables, namely DEBT, OPEN and INV. In Model 3 together with the DEBT variable we have HC and UNEM as independent variables, while in Model 4 we use all five independent

variables to observe their influence on the dependent variable. The following table gives us an overview of all the models we evaluated in the research:

Table 5. Results of panel analysis

Variable	Model 1		Model 2		Model 3		Model 4	
	FE	RE	FE	RE	FE	RE	FE	RE
Dependent: lnGDP								
lnDEBT	-.380***	-.383***	-.377***	-.386***	-.275***	-.278***	-.255***	-.259***
	(.034)	(-0.034)	(.035)	(.035)	(.023)	(.024)	(.024)	(.025)
lnOPEN			.071	.081			-.043	-.064
			(.088)	(.087)			(.061)	(.062)
lnINV			.024	.0184			.161***	.147***
			(.070)	(.070)			(.049)	(.050)
lnHC					5.640***	5.148***	5.731***	5.230***
					(.193)	(.183)	(.194)	(.184)
lnUNEM					-.311***	-.358***	-.294***	-.343***
					(.043)	(.043)	(.043)	(.043)
Constant	4.411***	4.423***	4.011***	4.012***	-.095	.419	-.600*	.056
	(.125)	(.229)	(.393)	(.434)	(.220)	(.277)	(.343)	(.383)
R-squared	0.084	0.084	0.087	0.088	0.245	0.252	0.243	0.250
F-statistic	117.9***	127.3***	116.4***	128.5***	204.7***	207.0***	202.0***	226.9***
Hausman test	Prob>chi2 = 0.3359		Prob>chi2 = 0.7439		Prob>chi2 = 0.0000		Prob>chi2 = 0.0000	
Obs.	1000	1000	1000	1000	1000	1000	1000	1000

Source: Author's calculations

In the first model with one explanatory variable, we see a negative value of the coefficient with DEBT at the level of statistical significance of 1% in the model with Fixed Effects, as well as in the model with Random Effects. Based on the results of the Hausman test, we cannot reject the null hypothesis of the test, so we conclude that the random effects model is preferred over fixed effects. The values of the coefficient through these two specifications do not deviate to a significant extent, namely the value of the coefficient of -0.380 and -0.383 are approximately equal and both were obtained with a level of statistical significance of 1%. We can see that the coefficient of determination is identical in both models at the level of 0.084, which means that about 8.4% of the movement of the GDP variable is explained by variations in the DEBT variable. In Model 2, we include a total of three independent variables, namely DEBT, OPEN and INV. From the presented results in this model, we see that the value of the coefficients with the variable DEBT is negative with values of -0.377 and -0.386 for the model with fixed effects and the model with random effects, respectively. We interpret the coefficients in such a way that an increase in the share of public debt in GDP by 1% reduces GDP by about 0.37% and 0.38%, respectively, the constants of the OPEN and INV variables. In both cases, the calculated coefficients were obtained with a statistical significance level of 1%. Also, from the results we see that the coefficients with the variables OPEN and INV are not statistically significant. Based on the Hausman test, we see that the random effects model is preferred over fixed effects. As with Model 1, the value of the coefficient of determination is not at a high level.

In Model 3, we used DEBT, HC and UNEM as explanatory variables. The value of the regression parameter in both models is negative for the DEBT variable and in both cases the coefficients are statistically significant at the 1% level. Based on the Hausman test, we see that we prefer the fixed effects model over random effects. The parameter values for the DEBT variable indicate that a 1% increase in the share of public debt in GDP reduces GDP by about 0.28%. In both estimated models, the coefficients with the control variables are statistically significant at the 1% level. With the HC variable, the coefficient is positive, while with the UNEM variable, it is negative. The value of the coefficient of determination suggests that explanatory variables can explain 24.5% of the variation in the independent variable in the fixed effects model. In Model 4, we included all five variables that we use in the research as explanatory variables. The value of the coefficient with the DEBT variable is negative in both cases with a statistical significance level of 1%. The Hausman test suggests that the fixed effects model is preferred in Model 4. The parameter next to the DEBT variable tells us that a 1% increase in public debt in GDP reduces GDP by about 0.25%. The parameters with the control variables INV, HC and UNEM in both cases are statistically significant at the 1% significance level, while the parameter with the OPEN variable is not statistically significant. The

coefficient of determination tells us that the explanatory variables in Model 4 with fixed effects can explain 24.3% of the movement of the dependent variable.

From the observed results of the estimated panel models, we can conclude that the value of the regression parameter with the explanatory variable DEBT did not change, that is, the sign of the regression parameter is the same throughout all the estimated models with a statistical significance level of 1%. As Model 3 and Model 4 are models that use more control variables, we can rely on their validity when estimating parameters with an independent variable. Also, the coefficient of determination with these models is significantly higher compared to Model 1 and Model 2, so we make conclusions based on these models.

4. CONCLUSION

The fiscal role of public debt manifests itself in the financing of the budget deficit incurred, but at the same time it represents an effective economic policy instrument that has a certain impact on economic growth. Public debt can be justified if the borrowed funds are directed to development programs and capital projects to promote economic growth and development. The size and structure of public debt directly affect the volume of investment activity and thus the overall dynamics of economic growth. While economic theory suggests that developing countries need a certain level of external debt to accelerate economic growth, recent research shows that too much public debt can reduce economic growth beyond a certain point. Therefore, an appropriate public debt management policy that allows the government to achieve its fiscal objectives and sustainable economic growth is extremely important.

Our research contributes to the literature on the impact of public debt growth on economic growth and focuses on a sample of countries that have increased their public debt since the transition to a new economic system, as well as on the indicator most commonly used in this assessment - public debt as a share of GDP. We selected period before the coronavirus due to extraordinary measures taken by governments , such as large-scale quantitative easing and fiscal stimulus, that are not typical of non-crisis times. These measures have had a major impact on both debt levels and GDP, making causal analysis difficult. Debt accumulation was driven by finance pandemic relief measures such as stimulus packages, corporate subsidies and healthcare spending rather than routine fiscal policy. These extreme fluctuations make it difficult to assess the normal relationship between public debt and economic performance. The year of the coronavirus pandemic (2020 and, to some extent, 2021) was excluded from the analysis because it may distort the results and lead to misleading conclusions that cannot be generalised to periods outside the pandemic.

In general, our results suggest that high government debt has a negative impact on economic growth. Our main results can be summarized as follows: (i) there is a negative direction of movement between GDP and public debt, (ii) the obtained results proved to be robust, as the results did not change in all the evaluated models due to changes in the variables we used in the research and (iii) the calculated regression coefficients with the independent variables were obtained with a high statistical significance level.

In the models presented and through the empirical analysis performed, the results obtained show that the increase in public debt contributes to the decrease in GDP, with some intensity of differences depending on the control variables included. Model 3 and Model 4, which use more control variables and whose validity we can rely on when evaluating the parameters with an independent variable, show that a 1% increase in the ratio of public debt to GDP decreases GDP by about 0.28%, that is, a 1% increase in public debt to GDP decreases GDP by about 0.25%. The coefficient of determination in the above models is about 0.24, which means that about 24% of the variation in the dependent variable can be explained by changes in the independent variable.

Based on the findings, it can be concluded that the share of public debt in GDP is negatively correlated with GDP growth in transition economies. This can be attributed to the fact that many of these countries still need to implement essential reforms to fully benefit from a free-market economy. Additionally, the negative impact of public debt growth on GDP is exacerbated by high levels of corruption, weak institutional frameworks, and a lack of transparency in the management of public funds.

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