

THE IMPACT OF PUBLIC DEBT UPON ECONOMIC GROWTH

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Abstract

The aim of this paper is to investigate the relationship between GDP growth rate and a series of five variables on a sample of five former Communist bloc countries: Bulgaria, the Czech Republic, Romania, Hungary and Slovakia, during the period of 1996-2010. Also, we focus upon the determination of the returning point of the public debt. We found that in all the five countries public debt can negatively influence the economic growth if goes above 44.42% of GDP. This level can be significant for these countries as they still display some structural weaknesses and have difficulties accessing the financial markets in times of financial crises.

Keywords: Public debt, economic growth, sustainability, fiscal policy, interest rate

1. INTRODUCTION

The economic and financial crisis which started in 2008 has affected virtually all the EU member countries. In the five years which have passed since the advent of the crisis, stopping the deterioration of the public finances in the Eurozone and the other EU countries has been one of the main concerns of EU governments. This period has proven that the Eurozone does not fit the requirements of an optimal monetary zone, being very sensitive to outside shocks. Its main weakness has been the great discrepancies between the national economies, boosted by the rather different national fiscal and budgetary policies in the absence of a fiscal authority able to define common guidelines in this area.

The increase of the indebtedness degree of the countries has generated worldwide debates regarding the identification of the sustainable level of the public debt, with many researchers proving that in fact it was sustainable until 2008. Starting with the moment a govern is confronted with financial problems related to the fulfillment of its budgetary commitments or it has to sustain high financing costs when issuing debt, the effects will engulf the entire economy, as proven by the recent macroeconomic crisis from various countries.

Blanchard (1984) defines sustainability as the maximum level of public indebtedness without having the government forced to repudiate part of the debt. A sustainable public debt is the result of the market conditions and of fiscal and budgetary decisions. Sustainability refers to the capacity of the government of assuming the financial burden of its debt in the future and there seems to be no superior limit for the sustainability of the debt.

The limits of the sustainability differ accordingly to country and period in time. The capacity of operating with high debt depends, among others, by the degree of development of the financial markets, the risks perceived and the confidence in the capacity of any given government of implementing structural reforms and consolidating public finances. Nevertheless, the high debt countries are exposed to market turbulences such as the changes in the interest rates and in the risk margins during periods of changing economic perspectives.

A high weight of the short term public debt or the one contracted at variable interest rate generates, on the one hand, vulnerabilities of the debt service when the interest rate increases, and on the other hand, supplementary risks due to the refinancing difficulties of the existing debt at an acceptable cost. In this sense, we have to consider the risks induced by an inappropriate structure of the debt portfolio, with referral to the source, initial maturity date, type of debt instruments, as well as the risks due to the structure of the public debt service.

In the current context, the European Community has established as one of its main priorities the medium and long term sustainability of the public finances for all the EU member countries. This will be made possible through a coordination of the fiscal policies and a sound reform of the social insurance policies, as the ageing problem becomes a widespread issue.

The question which arises under present conditions, when states are confronting with high public debt and low economic growth rates is: can a high level of public debt influence the economic growth?

Starting with this question we focused our attention in our paper toward researching the possible correlation between the public debt, fiscal and macroeconomic variables and the economic growth for a five emergent countries sample, new EU members, respectively Bulgaria, the Czech Republic, Romania, Hungary and Slovakia. The period chosen for the analysis is 1996-2010. Another objective was determining the returning point of the public debt, level from which the debt negatively influences the economic growth and questions its long term sustainability.

We mention that the analyzed countries do not have developed financial markets and for most of them structural reforms are still needed.

The paper is structured as follows: in the coming section we present the literature review, followed by a short scrutiny of the recent evolutions of the economic growth, public debt and budgetary

deficits. In the fourth section we focus upon the work methodology, the data and the elaboration of the econometric model. The work finalizes with the conclusions section.

2. LITERATURE REVIEW

The cause-effect connection or the correlations between public deficits, public debt and economic growth have represented the subject of numerous studies and research. Taylor *et al.* (2012) applied a Vector Auto-regression econometric model to study the relationship between the GDP, net federal debt, primary deficit, primary incomes, primary expenditures and real interest rate for the USA economy, for the 1961 to 2011 period. The results obtained showed that the primary federal deficit and the net government financing have an expansionary evolution during the recession periods, which prove the counter-cyclical role of the fiscal policies. A one-trimester real GDP contraction of 1% will determine an increase of the debt/GDP ratio of 0.7% for the entire year, with the reverse still true.

The researchers preoccupied with the public debt and economic growth theme are evidencing the direct connection between the budgetary deficits and the interest rates. Gale and Orszag (2004) have drawn the attention upon the fact that present budgetary deficits clearly affect the future interest rates. The governments are forced to appeal to loans for covering the current deficits, both from internal and external markets, which influences the demand for capital loans and puts pressure in the sense of increasing the interest rates. This in turn leads to a decrease of the saving and investment rate in the private sector.

The relation between economic growth, public debt and inflation was the subject of an ample research of professors Reinhart and Rogoff (2010). The two researchers have analyzed these measures and the relation between them on a panel of 44 countries for a period of approximately 200 years. Their research showed that the relation between government debt and the real rate of GDP increase is weak for a debt/GDP ratio below 90% of the GDP. Over a threshold of 90%, the median rates of growth drop by 1 percentage point, whereas the average growth decreases even more than that.

The results obtained have generated ample debates, especially within the political decisional environment and the media. Irons and Bivens (2010) are questioning the relevance of the 90% threshold upon the economic growth rate mentioned by Reinhart and Rogoff and draw the attention upon the fact that the danger appears not due to the capacity of sustaining the budgetary deficits and the public debt service, but rather to the lack of political action and to the fears related to budgetary deficits.

In a recent study, Panizza and Presbitero (2012) tried to find whether public debt induces a cause-effect relation upon the economic growth for a sample of OECD developed countries. Their results revealed a negative correlation between the public debt and the economic growth. In the same time, they maintained that the debt-growth relationship should not be used by decision makers in applying the austerity policies.

Colingnon and Mundschenk (1999) have realized a study regarding the sustainability of the public debt and fiscal policies, for a sample made of the current Eurozone countries at the end of the

1990's, previous to the EMU creation. They defined sustainability as the capacity of one's nation to be solvable, as well as its willingness to honour its pecuniary obligations. A state allowing an ever growing public debt bears a high insolvency risk. A dramatic modification of the interest rate-economic growth rate relation requires a drastic change of the economic policy, either by a fiscal adjustment in order to return to a sustainable situation, or by the mean of economic policies which can influence the economic growth rate and the real interest rate.

Chalk (2000), respectively Rankin and Roffia (2003) maintain, using exogenous growth models, that sustainability of the public debt requires low starting levels for the public debt and deficits.

The public debt can be instrumental for the economic development up to a certain threshold beyond which it can become quite the opposite. Besides, the capacity of the public debt to exert a negative effect upon the economic development has to do with the financial system, which can be either liberalized or remains depressed.

The perception that deficits rather hurt than help the economic recovery is as widespread as the traditional view, according to which, deficits, although generally lead to an increase in the interest rates, will determine the increase of the demand and of the economic activity. The opponents of the traditional view stress the problem of the oversized current deficits and of their sustainability. Those are so large and so prolonged such as the increase in the real interest rates will cancel their direct expansionary effects.

Giavazzi and Pagano (1990), Barry and Devereux (2003) have supported the validity of the *fiscal expansionary contraction hypothesis* – respectively a credible reduction in the state expenditures will ensure a sustainable fiscal consolidation and will reduce the anticipations regarding a possible tax increase. The real interest rate will decrease stimulating consumption, investments and long term production. The expectations regarding the credible tax reductions will determine the increase of the permanent incomes, hereby increasing the level of the private consumption.

In case of promoting public expenditures reduction policies in order to ensure the budgetary consolidation, the economic actors can anticipate further tax cuts, whereas the aggregated demand will increase, lowering the recession impact of the fiscal contraction (as the case with Denmark, for 1983-1986 and Ireland, for 1987-1989).

The ideological debates regarding the solutions to be taken for exiting the crisis can be grouped into two approaches (Vasilescu, 2011):

1. The supporters (manly Europeans) of the fiscal consolidation measures, which envision the adjustment of the budgetary deficits and the control of the public debt, risking however the economic slowdown;
2. The critics of the austerity measures, such as Stiglitz and Krugman, maintain that the priority should not be the balancing of the public budgets, but rather the adoption of measures for stimulating the economic growth by encouraging the economic productivity and competitiveness.

3. RECENT EVOLUTIONS

In Europe, the government debt and the budgetary deficits are not viewed merely as national problems but rather as European level concerns.

The public debt for EU27 has increased substantially starting with 2007 and although the level and the trajectory of this measure are very diverse across the member states the general trend is negative. The inadequate efforts and a relaxed attitude in the management of a high level of public debt in the period preceding the advent of the crisis have increased the vulnerability of different states when facing the economic cyclical shocks.

This new stage is not specific only to the EU or Monetary Union states, given that the United States and Japan have also registered a considerable increase in the government debt financing costs. Greece, Ireland and Portugal have reached a situation in which the public debt service and the accumulated stock of their public debt were perceived as unsustainable by the markets, jeopardizing their financing capacity on the international markets.

The main causes of increasing the public debt have factors specific to the economic crisis, such as budgetary deficits, unemployment, discretionary fiscal stimulus measures taken within the European plans for economic recovery. Moreover, the public revenues have decreased significantly, determining the rethinking of the taxation policies for certain EU countries.

All along 2011 the EU member states have adopted various measures of fiscal consolidation in order to adjust their budgetary deficits. As a result, in the Eurozone the government deficit to GDP ratio decreased from 6.2% in 2010 to 3.7% in 2012, whereas for the EU27 from 6.5% to 4%. Unfortunately, in the Euro area the government debt to GDP ratio increased from 85.3% at the end of 2010 to 90.6% at the end of 2012, whereas for the EU27 from 80.0% to 85.3% (European Commission, 2013).

The five countries sampled in our analysis, post-communist countries from the Central and Eastern Europe have had low economic growth rates, even if they did not registered worrying levels of the public debt/GDP ratio, with the exception of Hungary. The authorities from these countries have implemented along 2010 various measures with the purpose of reducing the levels of budgetary deficits, but which also produced contraction of the GDP growth levels, as shown in table no. 1 below.

Their public debt increased compared to previous years, with the exception of Hungary. For the Czech Republic, Romania and Slovakia the pace of public debt increase for the last four years should represent a concern for the decision makers. For example, Czech Republic had a public debt ratio of 45.8% in 2012 compared to 28.7% in 2008, Romania 37.8% compared to 13.4% for the same period, whereas Slovakia moved from 27.8% to 52.1%. Bulgaria managed to keep under control its public debt ratio, amounting to only 18.3% in 2012. Hungary is the only country which entered the crisis with a high level of public debt, of 72.9% of the GDP in 2008, reaching 81.8% in 2010 to slightly diminish in 2012 at 79.2%, as we can notice from table no. 1.

Table no. 1 The evolution of the real GDP growth rate, government debt and government deficit

	Real GDP growth rate			Government debt as % of GDP			Government deficit as % of GDP		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Bulgaria	0.4	1.8	0.8	16.2	16.3	18.5	-3.1	-2.0	-0.8
Czech Republic	2.5	1.8	-1.2	37.8	40.8	45.8	-4.8	-3.3	-4.4
Hungary	1.3	1.6	-1.7	81.8	81.4	79.2	-4.3	4.3	-1.9
Romania	-1.1	2.2	0.7	30.5	34.7	37.8	-6.8	-5.6	-2.9
Slovakia	4.4	3.2	2.0	41	43.3	52.1	-7.7	-5.1	-4.3

Source: European Commission

Found themselves in a situation to finance their budgetary deficits, the authorities of most EU countries have promoted austerity measures which envisioned the reduction of the public expenditures, the reform of the pension systems, social security and of publicly funded medical insurances. In the short run these measures had contraction effects.

In light of the recent macroeconomic evolutions and of the aggravation of the financial imbalances emerged as a necessity the coordination of the fiscal policies in the EU and the implementation of clear rules in order to ensure the observance of the fiscal and budgetary discipline for all the member states.

The leaders of 25 EU states have signed in March 2012 the Treaty for stability, cooperation and European governance. According to the Treaty, the states will have to observe a structural deficit of maximum 0.5% (the so-called Golden Rule), whereas the maximum cyclical deficit should not be higher than 3% of the GDP. In case of the countries that have a public debt ratio less than 60% of the GDP, the structural deficit can be increased by up to 1% of the GDP. When these limits are not observed, the Treaty has foreseen an automatic sanction mechanism which entails fines of up to 0.1% of the GDP. The treaty will be enforced as of First of January 2013 or as soon as it will be ratified by 12 signing countries.

4. DATA, METHODOLOGY AND EMPIRICAL RESULTS

The aim of this paper is to investigate the relationship between GDP growth rate and a series of five variables on a sample of five former Communist bloc countries: Bulgaria, the Czech Republic, Romania, Hungary and Slovakia, during the period of 1996-2010. The model was inspired by Checherita and Rother (2010).

The explanatory variables used in the empirical model include: GDP/capita (logarithm), the level of gross government debt as a share of GDP (quadratic equation), the openness of the economy, the interest rate and the level of labour productivity. The use of the quadratic equation in debt was based on the assumption that using the linear form does not yield significant results. Another reason consists in our interest in determining the turning point of debt.

The empirical model used is:

$$g_{it} = \alpha + \beta_1 \ln(\text{GDP}/\text{cap})_{it} + \beta_2 \text{debt}_{it}^2 + \beta_3 \text{debt}_{it} + \beta_4 \text{op_ec}_{it} + \beta_5 \text{int_rate}_{it} + \beta_6 \text{lab_prod}_{it} + v_t + \varepsilon_{it}$$

where:

g_i = the growth rate of GDP per capita(percentage change of the previous year);

t = year; i = country;

$\ln(\text{GDP}/\text{cap})_{it}$ = natural logarithm of the gross domestic product per capita at market prices;

debt_{it} = gross government debt (share of GDP);

op_ec_{it} = the sum of export and import (shares in GDP);

int_rate_{it} = nominal short term interest rate;

lab_prod_{it} = labour productivity per person employed, (index EU27=100);

v_t = time fixed effects;

ε_{it} = the error term.

Throughout our study we used cross-sectional time-series that originate primarily from the European Union statistics database Eurostat. The results were computed using the Stata 11 software. First, we ran a Hausman test in order to determine the regression method to be applied, fixed or random effects. The results allow us to conclude that the appropriate method of use is the fixed effects regression.

One important characteristic of the panel data is the potential presence of heteroscedasticity and of serial correlation. We addressed the two by performing a modified Wald test for the first, and a Lagrange-Multiplier test for the second.

The computed results allowed us to reject the null hypothesis of homoscedasticity and emphasized heteroscedasticity, causing standard errors to be biased.

The second test revealed the presence of serial correlation. This leads to a higher coefficient of determination and to smaller standard errors of the coefficients.

We have further performed the Pesaran CD test, a cross-sectional dependence test used to determine whether the residuals are correlated across entities.

The results strongly reject the null hypothesis of no cross-sectional dependence and reveal a high value of the average absolute correlation of 0.336. Therefore is enough evidence to suggest the presence of cross-sectional dependence under a fixed effects model specification.

Given all previous results we have decided to use the Driscoll and Kraay standard errors regression model. The computed results are shown in the table no. 2:

Table no. 2 Regression results using time fixed effects with Driscoll and Kraay errors

Variable	Estimated coefficient level	Driscoll and Kraay standard errors
$\ln(\text{GDP}/\text{cap})$	14.08495*	(6.667281)
debt.sqr	-0.0028973***	(0.0009236)
debt	0.2574028**	(0.0935776)
Op_ec	0.1851064***	(0.0372282)
Int_rate	-0.0179075	(0.0480633)
Lab_prod	-0.0010312	(0.1486528)

Year dummies	Included (14) (1997-2010)	
_cons	-125.3963	
N	71	
R ²	81.72%	
F(20,14)	1645.14	
Prob>F	0.0000	

Note: The dependent variable is the economic growth rate. The table shows the estimated coefficients and their significance level (*10%, **5%, ***1%). Driscoll and Kraay standard errors are shown in parentheses.

The total number of observations is 71. We have also included 14 year dummies to control for common shocks, economic and monetary changes that occurred during the analyzed period of time. Based on the determination coefficient we can conclude that 81.72% of the growth rate of GDP is explained by the predictors chosen in our model. The p value of F-statistic is 0.0000, thus resulting in a statistically significant joint effect of all explanatory variables on the economic growth rate.

The slope for the explanatory variable government debt is 0.2574. This indicates that the economic growth rate could be expected to increase by 0.2574 percentage point (pp) for each additional 1 pp growth in the Gross government debt as share into GDP. A more subtle interpretation of the result compares two countries that have the same values for all of the other explanatory variables but who differ by 1 pp in their government debt to GDP ratio. We would expect the country with the higher debt to have annual economic growth rates that exceed those of the other country by 0.2574 pp.

Given the positive linear relationship between debt and economic growth we investigate the point where the debt starts to negatively affect the economic growth rate by using two alternative methods: the delta method and the bootstrapping method.

The table no. 3 reveals the debt turning point and confidence intervals based on the delta method.

Table no. 3 The debt turning point

Debt turning point -delta method	Confidence interval
44.42%	(34.57 , 54.27)

The table no. 4 reveals the computed results of the confidence intervals for the debt turning point generated through the bootstrapping method based on normal, percentile and bias-corrected distribution. The confidence interval for the normal distribution rendered unstable confidence intervals thus, we considered unnecessary to reflect them in the table 4 below.

Table no. 4 The bootstrapping method

95% bootstrap method	Confidence interval
-normal biased	
-percentile	(20.21, 53.50)
-bias corrected	(18.72, 53.37)

The computed results based on the delta method determined that should the debt level into GDP surpass the 44.42% level for the five countries, it could generate a negative impact on the GDP growth rate. The 95% confidence intervals of the debt turning point may start as low as 18.72% of the GDP and go as high as 54% of the GDP. This calls for more prudent government debt policies.

Based on the p value for each explanatory variable in the regression table above, we have determined the other two statistically significant variables with potential impact over the economic growth rate: openness of the economy and $\ln(\text{GDP/capita})$. The computed results displayed no potential influence of the interest rate and of the labour productivity rate upon the evolution of the economic growth rate for the five analyzed countries.

Therefore, we reran the fixed effects regression with Driscoll and Kraay standard errors and year dummies based on the four explanatory variables that proved a potentially statistically significant impact upon the economic growth rate. The computed results are shown the table no 5.

Table no. 5 Regression table results-4 independent variables

Variable	Estimated coefficient level	Driscoll and Kraay standard errors
$\ln(\text{GDP/cap})$	14.0815***	(5.079401)
debt.sqr	-0.0002093**	(0.000988)
debt	0.135471	(0.0321849)
Op_ec	0.1748704***	(0.0485159)
Year dummies	Included (14) (1997-2010)	
_cons	-121.6487	
N	75	
R^2	78.28%	
F(18,14)	6927.42	
Prob>F	0.0000	

Note: The dependent variable is the economic growth rate. The table shows the estimated coefficients and their significance level (*10%; **5%, ***1%). Driscoll and Kraay standard errors are shown in parentheses.

The total number of observations increased to 75. Based on the computed results we can conclude that 78.28% of the economic growth rate is explained by the predictors chosen in our model. The p value of F-statistic is 0.0000, resulting in a discernible collective effect, as the coefficients of the explanatory variable do not simultaneously equal zero.

We notice that although debt does seem to have a potential impact on the economic growth rate, the p value pertaining to the predictor itself does not show visible impact, yet the quadratic term does. This can be reflected as a consequence of using the quadratic equation. As a result we shall remove the linear term of debt and rerun the regression using only its quadratic term (see table 6 below).

Table no. 6 Regression table results-3 variables

Variable	Estimated coefficient level	Driscoll and Kraay standard errors
ln(GDP/cap)	13.61673***	(4.66526)
debt.sqr	-0.0001668**	(0.00001)
Op_ec	0.1737714***	(0.047396)
Year dummies	Included (14) (1997-2010)	
_cons	-117.73	
N	75	
R ²	78.23%	
F(17,14)	158.65	
Prob>F	0.0000	

Note: The dependent variable is the economic growth rate. The table shows the estimated coefficients and their significance level (*10%; **5%, ***1%). Driscoll and Kraay standard errors are shown in parentheses.

Based on the coefficient of determination we can conclude that 78.23% of the economic growth rate variation is explained by the predictors chosen in our model. The p value of F-statistic is 0.0000, thus the joint effect of all explanatory variables on the GDP growth rate is statistically significant.

The slope for $\ln(GDP/capita)$ is 13.61. This indicates that the economic growth rate could be expected to increase by 13.61 pp for each additional 1 pp growth in the $\ln(GDP/capita)$.

Similarly, the openness of the economy expressed as the sum of exports and imports as share into GDP has a positive impact on the economic growth rate. A subtler interpretation of the result compares two countries that have the same values for all of the other explanatory variables yet differ by 1 pp in their openness of the economy ratio. We would expect the country with the higher openness to have annual economic growth rates that exceed those of the other country by 0.1737 pp.

The econometric model of the GDP growth rate becomes:

$$g_{it} = -117.73 + 13.61673\ln(GDP/cap)_{it} - 0.0001668debt_{it}^2 + 0.17377op_ec_{it} + v_t + \varepsilon_{it}$$

The slope for government debt is -0.0001668. This indicates a negative, yet extremely reduced influence of each additional 1 pp growth in the Gross government debt square as a share of GDP upon economic growth rate.

5. CONCLUSIONS

The cause-effect relationship between the public debt and the economic growth has been subject to numerous studies and research along several decades. The conclusions emerged from the literature review show that usually there is a negative relationship between public debt and economic growth in case of developed industrialized countries where the public debt returning point is located around 90% (Reinhart and Rogoff, Checherita and Rother, Panizza and Presbitero).

Starting from these results, in our paperwork, we have looked to check whether this relationship is observed even in case of EU emergent countries. We have analyzed the correlation between the per-capita GDP growth rate and five explanatory variables, respectively the logarithmic GDP/capita, the level of gross government debt as a share of GDP (quadratic equation), the openness of the economy, the interest rate and the level of labour productivity.

The sample is made up of five emergent, post-communist EU countries, displaying under-developed financial markets, namely Bulgaria, Czech Republic, Hungary, Romania and Slovakia.

The results obtained show that the returning point of the public debt for the five sampled countries is situated around 44.42%, which means that beyond this level the public debt can negatively influence the rate of economic growth. As a consequence beyond the 44.42% level the public debt can become unsustainable.

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