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INSUFFICIENT IMPACT OF PUBLIC DEBT ON ECONOMIC GROWTH: EMIRICAL ANALYSES FOR WESTERN BALKAN COUNTRIES

Abstract: The issue of public debt and its effects on economic growth is highly discussed among scholars and policymakers, notably after the last global financial crisis that led to an extraordinary increase of public debt crossways developed countries. While there are a number of studies that empirically analyse the effects of public debt on economic growth for developed economies, the studies on less developed economies are scarce. The global financial crisis significantly had impact also in increasing of public debts in Western Balkan countries. Even after crisis, in all these countries, some haw continue the trend of increase, especially in some of them (like Republic of North Macedonia) with high intensity and does not have an impact in growth consolidation. In some of them, become more as instrument of political cycles than economic one!

Thus, this paper intends to empirically analyse the impact of public debt on economic growth of Western Balkan Countries using yearly data for the time period 2003–2016. The study employs panel regression techniques, such that fixed and random effects, 2SLS, as well as a causality test after a panel VAR. The short run estimation results, in almost all specifications and models, indicate that public debt is weakly negatively correlated with economic growth of the sample countries, but the coefficient is only statistically significant in random effects as well as in 2SLS model. The quadratic term of debt is also included in the model, reflecting the nonlinear relationship of debt and growth. Its results disclose a maximum debt threshold of 50.87%. While the causality test reveals a uni-directional relationship, meaning that public debt doesn't cause real GDP growth, whereas GDP growth causes public debt. The policy implications for the region are that governments should take actions for a, fiscal sustainability and active debt management, as the rise of the level of debt above

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the found threshold of 50.87% of GDP will deteriorate the economic growth. In addition, fiscal policies need to be designed, through cyclical adjusting fiscal policies based on business cycles.

Key words: *Public debt, economic growth, random effects, 2SLS, causality analysis, Western Balkan*

1. INTRODUCTION

The last published Reports from World Bank for Western Balkans countries (WBR, No 15, 2019), underline that in Albania, Serbia, B&H still remain in high level and in others, like Montenegro, North Macedonia and Kosovo, the public and publicly guaranteed debt rose in 2018. Fiscal risks related to pensions, municipal finances, and state-owned enterprises are also on the rise. Improving the efficiency and equity of public spending as well as strengthening revenue mobilization remain priorities for fiscal policy to reduce the high debt levels, create fiscal buffers to mitigate risks, and improve the delivery of public services in the Western Balkans.

The issue of public debt and its effects on economic development has gained a huge prominence amongst all, the public, policymakers and academic researchers. Even more it became one of the hottest topics among research community, notably after the last global financial crisis that led to an extraordinary increase of public debt crossways developed countries. It has been revealed that large public debts have adverse effect on capital accumulation and productivity that in turn affects negatively the economic growth. Indeed, high public debt adversely impacts the economic growth in the long run through several channels, such that higher long-term interest rates (Baldacci and Kumar, 2010), higher future distortionary taxation (Barro, 1979; Dotsey, 1994), higher inflation (Barro 1995; Cochrane 2010), greater uncertainty and vulnerability to crises (cited in Kumar and Woo, 2010). Not only economic factors but also political and institutional factors are influencing a lot in public debt increase in OECD countries (Perrotini and Alesina, 1995).

Miller and Robert (1992) econometrically estimated that high deficits and growing public debts cause reduction of available capital funds, with which a large number of economists agree. According to their estimations, the high deficit in the 1980s in the United States has caused decline of gross national income (GNP) by 6%. In particular, economists with liberal orientation and perspective argue that public debt growth, as a result of rising public spending, undermines the vitality of a nation. The crowding out effect caused by the growing debt is predetermined by rising interest rates

and inflation as a result of rise of the deficit! Thus, it discourages domestic saving and investment through the crowding out effect causing debt overhang in the long run.

Economists have long recognized the fiscal policy as an instrument for boosting the economy, especially in the waves of economic stagnations. Alongside that, the permanent increase of government expenditures makes it puzzling for countries to finance them from current government revenues, which leads to budget deficits. The public debt is one of the alternatives that reliefs governments to finance their projects and stabilize the economies. In fact, the majority of developing countries have a weak tax revenue structure and as such the persistent borrowing became a typical practice. In this regard, Western Balkan region is no exception to borrowing. So, despite the economic and the political significance of the problem, so far there has been very limited research of the underlying key issue for the sample countries. Indeed, most of the studies have been descriptive and does not use rigorous methods of analysis. Thus, the main purpose of this paper is to empirically analyze the impact of public debt on economic growth by an econometric perspective. Therefore, this research is of academic and practical interest for the region.

The reminder of the paper is as follows: the second section affords a brief literature review, section three provides some stylized facts concerning the economic growth and public debt of Western Balkan region, section four describes data and the methodology, section five provides the empirical results while section six concludes.

2. BRIEF REVIEW OF THE LITERATURE

A great number of theoretical and empirical studies exist in the literature that analyzes the public debt and its impact on economic growth. Yet, the empirical evidence provides mixed and conflicting results and predictions. In fact, the majority of studies find an adverse effect of high public debt on economic growth, especially for developed countries and the debt levels above a threshold. In this regard, the most cited findings are those of professors of Harvard University, Reinhart and Rogoff (2010a and 2010b) that analyze the developments of public (gross central government) debt and the long-term real GDP growth rate in a sample of 20 developed countries over a period spanning about two centuries (1790–2009). They found that "the linkage between growth and debt seems relatively weak at 'normal' debt levels, median growth rates for countries with public debt over roughly 90 percent of GDP are about one percent lower than otherwise; (mean) growth rates are several percent lower" (Reinhart and Rogoff, 2010a

p. 573). The authors also found that economic growth was 3–4% when the debt was in moderate levels, below 60%, and growth was only 1.6% when debt was above 90%. Their research afforded attention-grabbing results for spacious other researchers, meaning that the obtained evidences were questionable and the same were very criticized. Thus, a group of authors from the University of Massachusetts, Herndon, Ash and Pollin (2013) replicated Reinhart and Rogoff (2010a and 2010b) work and find coding errors and unconventional weighting of summary statistics that lead to errors that erroneously represent the relationship between public debt and GDP growth. Their finding suggests that average GDP growth at public debt/GDP ratios over 90 percent is not dramatically different than when debt/GDP ratios are lower. Challenged from their results and conclusions, Reinhart et al. (2012) reviewed the previous estimations and again confirmed that in advanced economies, levels of sovereign debt above 90% of GDP ("debt overhangs") lead to a decline in economic growth. The magnitude of the debt threshold has only been partially confirmed by other studies. Some economists, among others Paul Krugman (Nobel Prize) argues that the low economic growth causes debt growth and not the opposite.

While an earlier study of Patillo *et al*. (2002) analyzes the external debt effect on per-capita GDP growth for the time period (1969–1998) using a panel dataset of 93 developing countries. Their empirical results indicate that the effect of external debt on per capita GDP growth is negative for the net present value of debt levels above 35–40 percent of GDP. Also, Clements *et al*. (2003) reported a negative correlation between external debt and growth for a panel of 55 low-income countries for a period that spanned from 1970 to 1999. Checherita and Rother (2010) evaluated the effect of government debt on economic growth for 12 European countries over the period of 1970–2010 using a panel fixed effects estimation technique. The study reported a non-linear impact of debt on economic growth, indicating that the government debt-to-GDP ratio has a negative effect on long-term growth when debt is about 90–100 percent of GDP. Kumar and Woo (2010) studied the long-run effect of public debt on economic growth using time series data that spans four decades of some developed and emerging countries. They concluded that there is a long-run negative relationship between debt and growth and the possibility of some non-linearity effects of debt on growth.

In the recent researches, Woo and Kumar (2015) and Cecchetti et al. (2011) find a linear inverse relationship between initial debt and subsequent growth in a sample of emerging and advanced economies, with the impact being somewhat smaller in the latter group. Both of them find that beyond

a certain threshold about 80–90% of GDP higher public debt lowers potential growth. Woo and Kumar (2015) find that higher debt starts affecting growth at a lower threshold (40% of GDP), but the effects become statistically significant only at about 90% of GDP. According to these results, countries with high debt should address their fiscal problems to avoid a deterioration in their growth perspectives. The creation of fiscal buffers might be an appropriate strategy to compensate for extraordinary shocks. Also, Panizza and Presbitero (2012) examined the impact of public debt and economic growth for a sample of OECD countries using the instrumental variable approach and causality analysis. They rejected the hypothesis that high debt causes lower growth. The study concluded that there is a negative relationship between debt and growth, but revealed that debt does not have any causal effect on growth.

On the other hand, Schclarek (2004) assessed the impact of gross government debt on economic growth for a sample of 24 industrial countries over the period 1970–2002. The study found no robust relationship between debt and growth. Additionally, Baum *et al*. (2012) investigated the relationship between public debt and economic growth using the dynamic threshold panel methodology for 12 European countries for the period 1990–2012. The study reported a positive and high statistically significant impact of debt on GDP when the debt-to-GDP ratio was less than 67 percent; after which point, there was no relationship between debt and GDP. Another study for the twelve Euro area countries conducted by Checherita-Westphal and Rother (2012), for the time period 1970–2010, conclude that government debt negativey affects the economic growth starting from the threshold between 70% and 80%. They also found that total factor productivity growth, private saving and public investment are the channels where public debt is found to have a non-linear effect on growth.

Mencinger et al. (2014) investigate the short-term effects of public debt on the economic growth rates of 25 EU countries affected by the European sovereign debt crisis, for the period 1995–2010 (for the "new" EU Member States) and 1980- 2010 (for the "old" EU Member States). They find evidence of a nonlinear (inverted U-shape) relationship, the debt turning point being higher for the "old", more developed EU Member States (of about 80%-94% of GDP) and lower for the "new" EU Member States (of about 53%-54%). One year later, Mencinger et al. (2015) further expand their analysis for a panel of 36 countries (31 OECD countries and 5 non-OECD member states) and achieved similar conclusions. The same concave relationship is confirmed, with a debt-to GDP threshold of about 44%-45% in emerging market countries, about half the value of developed countries.

In addition, Afonso and Alves (2014) have analyzed the impact of public debt on the real per capita GDP growth, as well as the existence of nonlinearity effects of debt on growth, both annually and with 5-year average growth rates, for 14 European countries for the time spin 1970–2012. They confirmed the negative relationship between debt and growth, both in the short and long term by considering interactions of debt with monetary, public finance, institutional and macroeconomic variables. Concerning the interactions with macroeconomic variables, it was found that taxation on capital and profit and growth rate of credit to the private sector are negatively related with growth, whereas growth rates of gross fixed capital formation, trade openness, and current account balance are positively related. They also revealed the existence of inverted U-shape relationship between debt ratio and economic growth. Another study that confirms the nonlinear relationship between debt and growth is that of Bilan (2015). She finds a maximum debt threshold of 45–55% of GDP for Central and Eastern European countries over the period 1994–2013, that is lower for less developed countries (Romania and Bulgaria) and higher for more developed ones, however it is much lower than developed EU countries.

Misztal (2010) use a panel VAR methodology over the period 2000–2010, for the EU Member States and find that the increase of public debt by 1% resulted in the reduction of GDP by 0.3%, while a 1% increase in GDP led to the reduction of public debt by 0.4%.

Gnegne and Jawadi (2013) examine public debt and its dynamics for the UK and the USA, which also evidenced to be asymmetric and nonlinear, concluding that public debt seems to be based on several threshold effects, which helps to understand its dynamics with more accuracy. Certain, macroeconomic events such as economic slowdowns, debt and financial crisis, as well as oil shocks, have proved to be important factors linked with structural breaks in public debt dynamics.

Contrary to all these findings for developed countries, Fincke and Greiner (2014) analyzed the effects of public debt on economic growth for emerging market economies using panel data estimation techniques and procedures, and found a significant positive relationship between public debt and the subsequent growth of per capita GDP.

From all the previous findings, one can be concluded that this issue is highly debatable and there is not still any conclusive consensus among researchers concerning the threshold of negative impacts of public debt on economic growth. Even more it differs considerably for developed and less developed economies.

3. ECONOMIC GROWTH AND PUBLIC DEBT OF WESTERN BALKAN COUNTRIES

In the period of 2005–2008, the average annual growth rate of Western Balkan countries was around 6% that was higher than that of the EU countries. However, the global financial crisis affected the economy of the region, causing severe negative consequences such that, increase in public debt levels, decline in European and international market demand for products and raw materials (lower exports), decrease of foreign direct investment (FDI), and a decline of remittance inflows. As a result of above repercussions, in 2009 year, all countries of Western Balkan except Albania fell into recession (see Figure 1 below). Even Albania had a decline of economic output, although was less impacted compare to other countries of the region. The economies slowly started to recover in 2010 and 2011 year, as real GDP grew by an average of 2.2 and 2.1 percent, respectively. However, the negative effects of the euro zone debt crisis were felt in 2012 year, as the economies of countries fell again in recession. Almost a decade after the global financial crisis, the pre-crisis growth levels are not still restored. Based on Western Balkan Regular Economic Report (World Bank, 2017), regional growth in 2016 was 2.9 percent, whereas in 2017 year it was estimated to be 2.4 percent, and it is projected to rise to 3.3 percent in 2018 and 3.6 percent in 2019.

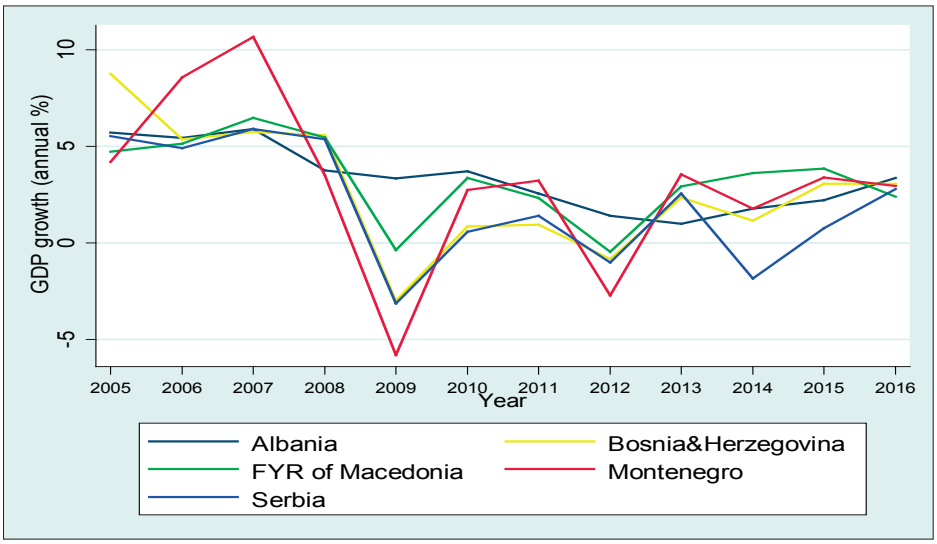

Fig. 1. Economic growth of Western Balkan Countries
Source: World Development Indicators, World Bank

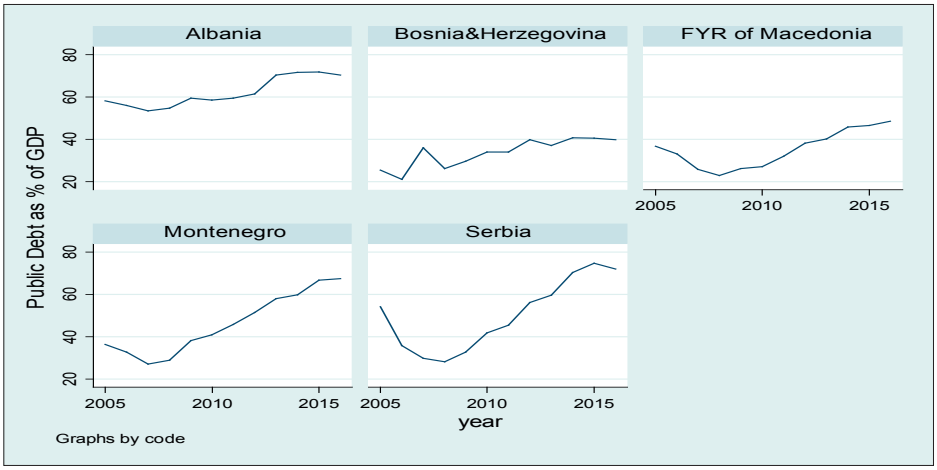

Fig. 2. The level of Public Debt of Western Balkan countries
Source: Countries' Central Banks

Prior to the 2008 global financial crisis, the Western Balkan region as a whole had government budget deficit levels below the EU average. However, since the crisis, the region faced with slower economic activity, reduced government tax revenues, and increased government expenditures to deal with the consequences of crisis. These created pressures to the debt levels as percentage of GDP to rise. In almost all countries after 2009 year the debt rapidly increased (see Figure 2 below). In several cases, the IMF provided

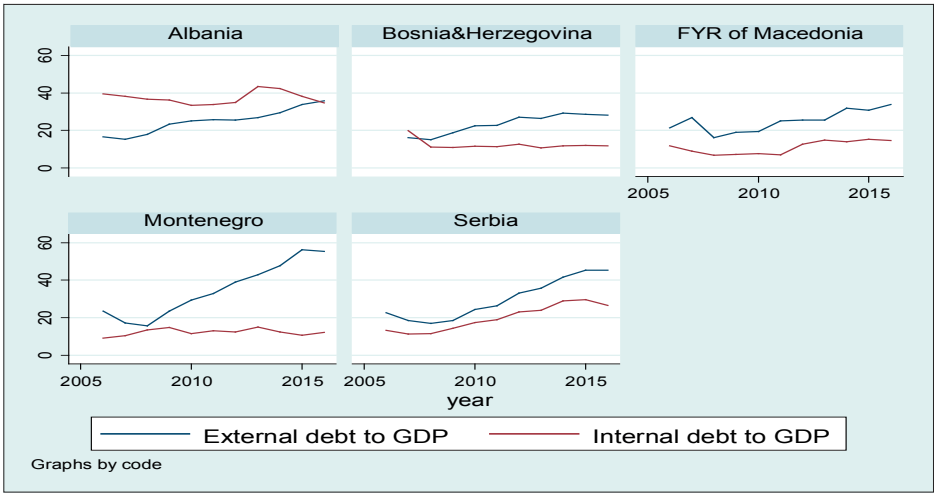

Fig. 3. The level of External and Internal Debt of Western Balkan countries
Source: Countries' Central Banks

emergency credits to shore up government balances and protect the national currencies from depreciation.

In all countries of the region, except Albania, the external debt is higher than the internal debt. However, since the crisis the external debt rapidly increases in the whole region (see Figure 3 below). The intensity of public debt increase, especially after 2011 was much more higher than the growth rate. The governments of the countries use the advantages of relatively favourable interest rates and the improved access to global capital markets. However, many economists see this increased level of debt as being unsustainable.

4. METHODOLOGY AND DATA

The research methodology of this paper consist of panel regression analysis, first examining the models for both fixed and random effects and using the Hausman's test for determining the appropriate and consistent model for the sample countries, second Two Stage Least Square (2SLS) estimator for panel data is used for solving the problem of endogeneity, and third, a panel VAR model, in order to test after the causality between growth and debt.

Initially is presented the methodology of panel regression analysis and after panel VAR. In fact, data sets that combine time series and cross sections (countries) are called longitudinal or panel data sets. Panel data sets are more orientated towards cross section analyses — they are wide but typically short (in terms of observations over time). Heterogeneity across countries is central to the issue of analyzing panel data. The basic framework is a regression of the form:

$$Y_{it} = X_{it}\beta + Z_i\pi + \varepsilon_{it}$$

X has k columns and does not include a constant term. The heterogeneity or individual effect is Ziπ where Z contains a constant term and a set of individual or group specific variables. It will be considered two cases:

Fixed Effects: *Zi* is unobserved, but correlated with *Xit* then OLS estimators of β are biased. However, in this case where ai = Ziπ embodies all the observable effects and specifies an estimable equation, in which ai =a1,..., an are treated as unknown intercepts to be estimated, one for each country.

Random Effects: if the unobserved heterogeneity however formulated can be assumed to be uncorrelated with *Xit* then:

$$\begin{aligned} Y_{it} &= X_{it}\beta + E[Z_{i\pi}] + \{Z_{i\pi} - E[Z_{i\pi}] + \varepsilon_{it}]\} \\ &= X_{it}\beta + \alpha + u_i + \varepsilon_{it} \end{aligned}$$

Random effects approach specifies that ui is a group specific random element which although random is constant for that group throughout the time period.

The specification test devised by Hausman is used to test for whether the random effects are independent of the right hand side variables. This is a general test to compare any two estimators. The test is based on the assumption that under the hypothesis of no correlation between the right hand side variables and the random effects both fixed effects and random effects are consistent estimators but fixed effects is inefficient (This is the assumption with random effects). Whereas under the alternative assumption (i. e. that with fixed effects) fixed effects is consistent but random effects is not. The test is based on the following Wald statistic:

$$W = [\beta_{FE} - \beta_{RE}]'^{\Psi^{-1}}[\beta_{FE} - \beta_{RE}], \text{ where:}$$
$$Var[\beta_{FE} - \beta_{RE}] = Var[\beta_{FE}] - Var[\beta_{RE}] = \Psi$$

W is distributed as C2 with (K-1) degrees of freedom where K is the number of parameters in the model. If W is greater than the critical value obtained from the table then we reject the null hypothesis of that both estimators are consistent i. e. of "no correlation between the right hand side variables and the 'random effects'" in which case the fixed effects model is better.

On the other side, the endogeneity is one of the main problems that panel data analysis features. The main challenge is to fix and solve this problem, in order to obtain unbiased estimators. In a panel context, most studies on growth regressions have made use of the instrumental variable (IV) approach to deal with the issue of simultaneity bias. The Two Stage Least Squares estimator (2SLS) enables the correction of the problem of endogeneity even for multiple endogenous explanatory variables, thus, it is used to estimate the parameters and to avoid the problem of endogeneity.

Panel VAR model is also used in order to estimate the dynamic effects of total public debt on the economic growth and after that the causality test. The estimation and inference of panel VAR is done in the framework of generalized method of moment (GMM). Panel VAR analysis is predicted upon choosing the optimal lag order in both panel VAR specification and moment condition. The following panel VAR model is used in the empirical analysis:

$$\Delta Y_{it} = \Phi_0 + \Phi(L)\Delta Y_{it} + X_{it}\Psi + u_i + \varepsilon_{it}$$

Where *i* represents each country i. e. the cross sectional dimension; t represents the time dimension; is the vector of dependent variables; is a vector

of control variables; L is the lag operator; represent the matrices of parameters; is a vector of dependent variable-specific panel fixed-effects; is the idiosyncratic error term.

4. 1. THE DATA

In this empirical research are used the annual data from 2003 to 2016 for five Western Balkan countries, namely Albania, Bosnia and Herzegovina, FYR of Macedonia, Montenegro and Serbia, whereas Kosovo is omitted from the sample due to data availability on public debt. The GDP per capita growth and other control variables were collected from World Development Indicator (WDI) database provided by World Bank, whereas the data for total public debt from the respective countries' National Banks, and from China economic database that provides economic country data for whole world. The time span of the analysis is limited because of the lack of the data of public debt for the first decade of transition. The summary statistics of the variables used in the empirical research are presented in Table 1. Over the period of analysis, the average of GDP per capita growth of the region has been 3.14 percent, whereas the average total debt to GDP level is 45.49

Table 1. Summary Statistics of the data

Variable	Mean	Std. Dev.	Min	Max	Observations
GDP per Capita Growth	Overall 3.1398 Between Within	2.917733 0.5037077 2.882144	-5.99698 2.46187 — 5.73561	10.50518 3.795673 10.76655	N = 70 n = 5 T = 14
Real GDP per capita (2010 prices)	Overall 4999.12 Between Within	1199.945 963.3914 827.5221	2709.143 3969.385 2273.244	7378.345 6400.495 6171.638	N = 70 n = 5 T = 14
Debt to GDP (%)	Overall 45.49 Between Within	15.25005 11.6236 11.07455	21.25 33.7633 23.70583	74.7 62.15167 70.10583	N = 70 n = 5 T = 14
GFCF to GDP (%)	Overall 23.476 Between Within	5.655161 4.235654 4.169529	16.68177 19.97251 17.15282	39.21585 30.48241 39.17913	N = 70 n = 5 T = 14
Trade openness	Overall 93.102 Between Within	15.69195 13.91726 9.41588	69.59133 75.95557 74.71116	132.3403 110.2609 115.1818	N = 70 n = 5 T = 14
Population growth rate	Overall -0.2543 Between Within	0.377475 0.341239 0.218526	-1.19124 — 0.60424 — 0.84133	0.214529 0.127119 0.356338	N = 70 n = 5 T = 14
Human Development Index	Overall 0.7473 Between Within	0.029514 0.026107 0.017769	0.696 0.723272 0.707509	0.807 0.787364 0.775509	N = 70 n = 5 T = 14

Source: Authors' calculations

percent. However, these averages don't exhibit large discrepancies between WB countries. Bosnia &Herzegovina and FYR of Macedonia have lower average total debt-to-GDP levels compare to the other countries.

4. 2. SPECIFICATION OF ECONOMETRIC MODELS

The econometric models that estimate the effects of public debt on economic growth in the Western Balkan (WB) countries are basically based on the alternative versions of models employed by Kumar and Woo (2010), Cecchetti, Mohanty and Zampolli (2012) and Checherita-Westphal and Rother (2012). Thus, the first model is specified as in the following form:

$$Y_{it} = \alpha_0 + \beta_1 lnGDPC_{it-1} + \beta_2(DEBT)_{it-1} + \phi_k X_{k,i,t-1} + \lambda_i + \mu_t + \varepsilon_{it} \quad (1)$$

Where is the dependent variable that represents the GDP per capita growth for country i at time t. The independent variables are: the initial stock of income that is proxied by the logarithm of GDP per capita of country *i* at the beginning of each period (, initial GDP per capita); DEBT consists of total public debt as % of GDP; is a vector of control variables that affect the economic growth, considering the conventional growth literature and growth determinants, such that trade openness (OPENNESS) that corresponds to the ratio of the total value of exports and imports to GDP, gross fixed capital formation (GFCF) as % of GDP to reflect the impact of physical capital accumulation, population growth rate (POP), and human development index (HDI) that assess the level of development of countries in three dimensions, knowledge, long and healthy life and decent standard of living. Whereas as instrumented variable with public debt in the 2SLS is considered the public debt with one-time lag. While, is the unobserved country specific effect; is the unobserved time specific effect which captures global shocks; and is the error term.

For estimating the equation (1) the annual GDP per capita growth is used in order to maximize the number of observations, instead of 5 years GDP growth, as the sample size is limited due to availability of data for public debt for the sample countries. This approach may lead to estimates that are fully driven by business cycle fluctuations but can suffer from endogeneity problems as debt is only lagged by one year with respect to economic growth. On the other hand, the models conducted by Cecchetti, Mohanty and Zampolli (2012), and Checherita-Westphal and Rother (2012) include 5- year forward GDP growth rate to alleviate these problems.

In the second equation, the quadratic term, debt squared (DEBT2) is included to study the non-linearity effect. Some recent studies find a

nonlinear relationship between growth and debt, these include among others, (Checherita and Rother, 2010; Mencinger et al, 2012; Afonso and Alves, 2014; Mencinger et al, 2015). Also an interaction variable is considered between public debt and a dummy variable that takes the value 1 for debt level above 50% of GDP and value 0 for the debt level below 50% of GDP.

$$Y_{it} = \alpha_0 + \beta lnGDPC_{it-1} + \delta_1 (DEBT)_{\mathrm{it}} + \delta_3(DEBT * D) + \phi_k X_{k,i,t} + \lambda_i + \mu_t + \varepsilon_{it} \quad (2)$$

In addition, several control variables are considered in order to examine the effect of debt to GDP ratio in real per capita GDP growth as well as interacting variable with public debt is taken into consideration.

5. EMPIRICAL RESULTS

According to the OLS fitted line, the relationship between public debt and economic growth show that there is a weak negative correlation between them. Figure 4 below shows a scatter plot of their linkage. It suggests that a 1 percentage point increase of public debt is associated with a decrease of subsequent economic growth of 0.04 percentage points, holding other factors unchanged (constant). The countries with higher average growth rates over the sample period tend to have a higher average level of indebtedness as well as a higher rate of increase in the level of relative indebtedness.

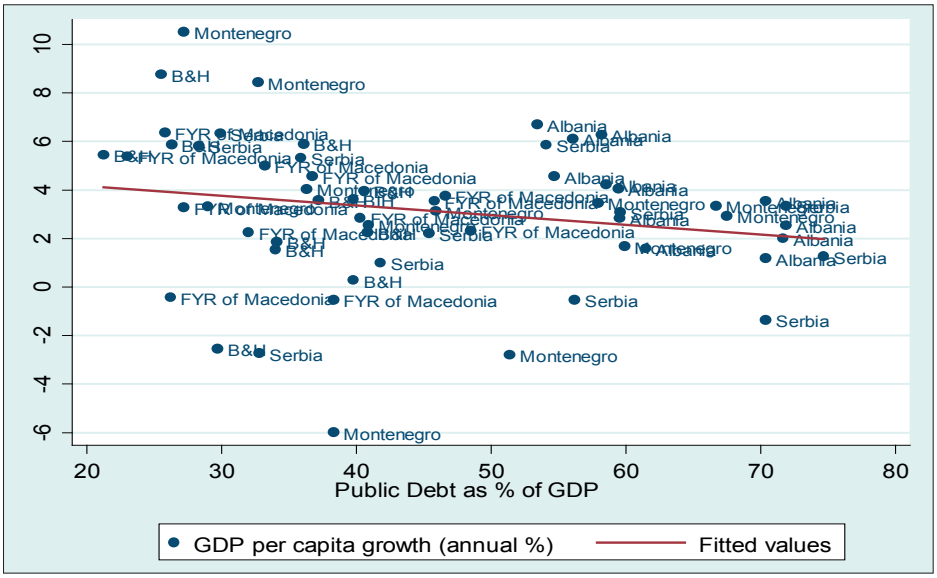

Fig. 4. The relationship between Public Debt and Economic growth of Western Balkan
Source: Authors' calculations

From the Figure 4 can be observed that there are countries with higher debt which experience sound growth rates, like Albania. Reversely, there are countries with lower debt levels and that exhibit higher economic growth. The Spearman's correlation coefficient was also estimated to determine the relationship between debt and growth and it shows that there is a relatively low negative monotonic correlation between the two variables ($\rho = -0.269$).

The estimation results of models for the sample of 5 Western Balkan countries are summarized in following tables. Observing at all the results in Table 2, it can be confirmed the existence of convergence course. The expected negative coefficient for the initial real per capita GDP is attained and in all cases the coefficient is statistically significant at 1% level of significance, revealing that WB countries converge for their own steady state in the analysed time period.

In all five models the coefficient of debt is with negative sign as it was expected, but it is statistically significant only in the random effects models. Concerning the fixed effects model the coefficient of debt is statistically significant in the model where only the initial GDP per capita and debt are considered as independent variables, whereas when other control variables are included in the model (see Model 3 in the Table 2), its statistical significance disappears. However, after performing the fixed and random effects models, it was conducted the Hausman test for deciding between them and which one is more efficient. It basically tests whether the unique errors *(ui)* are correlated with the regressors, the null hypothesis suggests that they are not. Based on the results of the test, the null hypothesis cannot be rejected, revealing that random effects is more preferred compare to fixed effects model. Thus, the random effects model suggests that public debt negatively affects the economic growth of the Western Balkan countries, and also controlling by the other growth determinants. Yet, in Two Stage Least Square (2SLS) model, that to some extent mitigates the problem of endogeneity, the coefficient of public debt is again statistically significant at 10% level. Considering its results as more reliable, it can be endorsed that public debt has a weak negative effect on the growth of WB region in the analysed time span. However, the model may suffer from omitted variable bias. Concerning the other control variables, gross fixed capital formation (GFCF) is with positive sign but statistically insignificant in all models. This result reveals that the region is less equipped with capital in relation to population and resources. The region needs to raise the saving rate in order to reach the Golden Rule steady state, that requires a fall in consumption and a rise in capital investment, so over time higher investment causes the capital stock to rise and the real output to enhance. On the other side, the

coefficient of population growth rate is negative at the 5% level of significance, as predicted by Solow growth model, that an increase in the rate of population growth reduces the steady-state level of capital. Regarding the coefficient of trade openness, it is with positive sign and statistically significant at 5% level, in random effects and 2SLS models. Human development index is positively linked with economic growth and statistically significant at 1% level in random effects model and 10% level at 2SLS model.

Table 2. Panel regression Results

Variables	Fixed Effects **Model (1)**	Random Effects **Model (2)**	Fixed Effects **Model (3)**	Random Effects **Model (4)**	2SLS **Model (5)**
	-12.1444*** (1.741992)	-7.002896*** (1.291354)	-14.12595*** (2.507035)	-14.24751*** (2.15012)	-13.37953*** (2.278159)
DEBT	-.0823662** (0.033595)	-0.0395925* (0.0245786)	— 0.018182 (0.038741)	— 0.045196** (.00243842)	— 0.066535* (0.036521)
GFCF	—	—	0.049949 (0.097503)	0.037536 (0.054036)	0.078599 (0.064254)
TRADE	—	—	0.052072 (0.035024)	0.063205** (0.02194)	0.056674** (0.022397)
POP	—	—	-1.87804 (1.34535)	-2.145578** (0.904783)	-0.231198** (0.112642)
HDI	—	—	55.00751 (33.10765)	77.83497*** (22.101)	4.44348 (2.91041)*
Constant	6.88663** (1.572137)	4.94086** (1.178241)	75.87006** (18.3836)	-3.0579 (3.3841)	35.30041 (74.48378)
N	65	65	65	65	65

Notes: Standard errors are in parentheses; heteroscedasticity and autocorrelation robust standard errors For the specification tests, p-values are reported. *, ** and *** indicate that the coefficients are significant at the 10%, 5% and 1% level of significance, respectively.

Source: Author's calculations

In this section, we extend the preceding analysis to study the nonlinearity between debt and growth, including the quadratic term. This is done by estimating the instrumental variables regression for panel data estimating fixed and random effects, where the lag of debt to GDP ratio is considered as instrumental variable. Unlike the previous models, in these regressions the saving rate is included as a control variable beside the others, whereas the gross fixed capital formation, is omitted from the models since it was statistically insignificant.

Table 3 presents results for 2SLS panel regressions of the nonlinear effects of public debt on economic growth. As in the preceding models, the coefficients on initial GDP per capita are negative and statistically significantly

different from zero at the 1% level in all models, which again confirm the existence of -convergence. It can be seen from regressions in Table 3 that the nonlinear quadratic type relationship is only obtained in random effects panel regressions. Still, after performing the fixed and random panel regressions, again the Hausman test suggests that random effects model is more efficient and appropriate for this set of data and variables. Thus, the coefficients of DEBT and DEBT^2 in models labelled as (3) and (4), are both statistically significant at 10% level. Regarding the sign of the coefficient of DEBT is with positive sign, while the quadratic term (DEBT^2) has a negative sign, revealing that the functional relationship that connects the growth rate of GDP and public debt is somehow of concave shape, disclosing the existence of a maximum value. Based on these results, it is confirmed the hypothesis that when public debt is lower, the effects on growth are positive, but these effects steadily decline as public debt is rising, meaning that after a debt threshold the effects are opposite. Accordingly the turning point is estimated by the formula: . This result shows that the debt to GDP turning point for Western Balkan countries is 50.87% of GDP, which is much lower than the one found in the existing literature for developed countries. The majority of empirical studies on this issue find a maximum public debt to GDP threshold of about 90–100% of GDP for developed countries, including among others Reinhart and Rogoff (2010), Checherita and Rother (2010), Baum et al. (2012), Mencinger et. al (2014), Kumar and Woo (2015). Yet, this result is in line with the results of authors that analyzed this situation for developing countries and found that the public debt to GDP threshold is about half the value of developed ones (see Pattillo et al. 2002; Bilan, I. 2015; Mencinger et. al 2015). According to Bilan (2015) the possible reasons are that developing countries enjoy lower credibility compare to developed ones from potential lenders and investors, which makes the negative effects of a large public debt to appear sooner, as well as developing countries are more vulnerable and depend to a large extent on foreign capital.

Concerning the other explanatory variables, the coefficient of trade openness is positive and statistically significant in all models, revealing that openness to international trade is an important determinant of economic growth of WB countries.

The most surprising result is concerning the sign of the coefficient of the saving rate that is negative and statistically significant in random models. Therefore, this means that the decrease of public savings as a result of a higher budget deficit hasn't been compensated by an increase in private savings. It has implied the national savings to decrease, resulting in lower

total investment, either domestically or internationally. Thus, lower investment has a negative effect on GDP, as it leads to a smaller capital stock, higher interest rate, lower labor productivity and wages (Elmendorf and Mankiw, 1999).

In the models labelled as (2) and (4) in Table 3, the variables of population growth and human development index are both dropped since they were not statistically significant, instead is added the dummy variable. The coefficients on the other regressors do not change substantially when this modification is made, indicating that the results are not so sensitive to these variable's omissions. The coefficient of the dummy variable that takes the value 1 for the debt level above 50% of GDP is negative and statistically significant at 5% level, validating the threshold of 50.87%. Accordingly, from both results the debt level above 50% of GDP affects negatively the

Table 3. Panel regression Results of nonlinearity

Variables	2SLS Fixed Effects **Model (1)**	2SLS Fixed Effects **Model (2)**	2SLS Random Effects **Model (3)**	2SLS Random Effects **Model (4)**
	-19.2369*** (6.86216)	-19.39764*** (7.60862)	-15.14086 *** (3.746906)	-15.37848*** (3.836914)
DEBT	1.493181 (1.11392)	1.647401 (1.468641)	1.298113 * (0.7444941)	1.285231* (0.748101)
DEBT ^2	-0.0138757 (0.010413)	-0.01567 (0.0144)	-0.012759 * (0.007451)	-0.0124672* (0.2856)
TRADE	0.068229** (0.059484)	0.062368 *** (0.066427)	0.096495*** (0.0371)	0.096397*** (0.037219)
SAVING	-0.3892809 (0.340069)	-0.451718 (0.47258)	-0.187756** (0.08526)	-0.191414** (0.086355)
POP	-0.287729 (2.049416)	-	-0.1096075 (1.226692)	-
HDI	15.19246 (55.7533)	-	36.04859 (34.33305)	-
DDEBT	-	-0.157779** (0.069361)	-	-0.1545347** (0.0763733)
Constant	129.2071 (41.52788)	130.078 (45.66668)	95.24832 (20.55915)	96.91198 (21.31672)
R-squared	0.4932	0.3962	0.5706	0.4123
N	65	65	65	65

Notes: Standard errors are in parentheses; heteroscedasticity and autocorrelation robust standard errors. For the specification tests, p-values are reported. *, ** and *** indicate that the coefficients are significant at the 10%, 5% and 1% level of significance, respectively. Maximum value of the quadratic model in public debt:

Source: Author's calculations

economic growth of WB countries. However, the results should be treated with caution because of the short time span, as well as the rise of debt and the slow economic growth might have been as a result of global financial crisis and Eurozone debt crisis. This concern is particularly relevant when considering the short-term correlation between growth and debt as in this case, since recessions obviously lead to an instantaneous increase in the debt ratio. In this case, almost all WB countries fell into recession in 2009 that resulted with decline of tax revenues, particularly marked for taxes on goods and services and international trade and transactions, as a result the public debt sharply increased. Aftermath there was a very sluggish economic recovery while public debt was persistently increasing.

All in all, the results confirm that the public debt impacts negatively the economic growth after a threshold that differs for developed and developing economies. Having in mind the economic development and position of Western Balkan countries, a further increase of public debt raises the concerns about its sustainability and the future stance of monetary and fiscal policies. Such a situation causes the distrust to the citizens by deteriorating the private savings and investments that in turn will affect negatively the economic growth. Moreover, the high public debt spurs governments to implement severe fiscal consolidation measures, either by increasing taxes or by cutting down public expenditures such as productive capital investments, impacting depressingly the output growth.

5. 1. RESULTS OF PANEL VAR AND GRANGER CAUSALITY TESTS

Before performing the panel VAR model, the lag selection order is conducted, thus based on the Akaike Information Criterion (AIC) the optimal lag order for the used variables is 3. As it is common in most of the VAR models and studies, we report the results in the form of impulse response functions. In the Figure 5 below are displayed the impulse response functions after the two variable panel VAR. The responses are estimated over 8-period horizon. According to the results, the growth is not much affected from a shock of public debt, meaning that for one standard deviation shock given to public debt, GDP per capita growth reacts very slowly, even very close to zero. In other words the response of GDP growth by a shock of public debt is above zero in the first two periods, whereas at the other periods it is negative but very low. The explanation behind this stands in the fact, that in the aftermath of the crisis, the Western Balkan countries faced with difficulties in regaining control over public finances. Even the increased public debt served to finance a great portion of the current

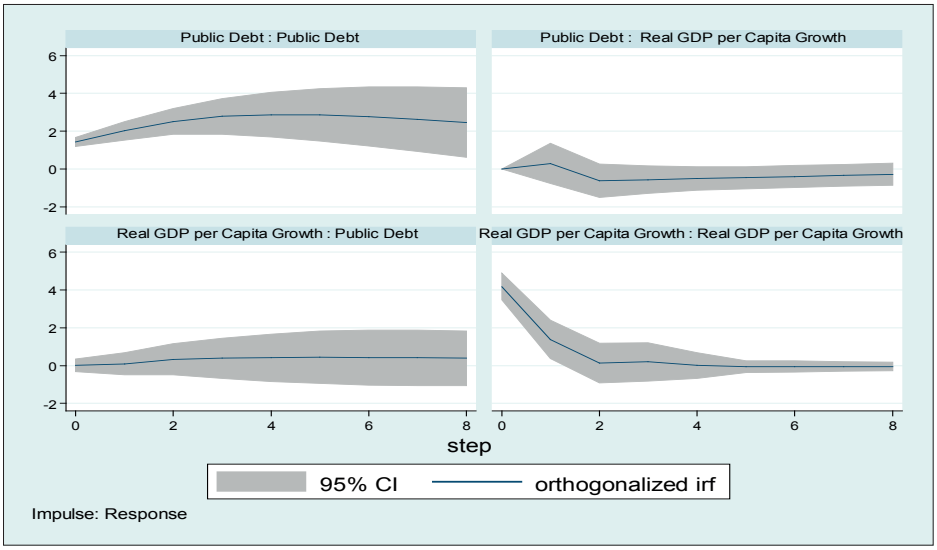

Fig. 5. Impulse Response Functions
Source: Authors' calculations

government expenditures, rather than capital investment. In particular, public sector salaries and pensions constitute a larger share of overall spending in the Western Balkans.

Another explanation might be, as public debts increased, interest payments also drifted up. Mandatory governmet expenditures (salaries, pensions, and interest payments) is now much higher in the Western Balkans than in the New Member States or the EU-15, in particular in Albania, FYR Macedonia and Montenegro, thus severely constraining the flexibility of the budget (Koczan, 2015).

A panel VAR stability test was also run in order to check for stability conditions, so the results confirmed that the estimations are stable, as all moduli of the eigenvalue of the estimated models are strictly less than unity and all the units lie in the circle.

In order to define the causality between GDP per capita growth and public debt, a Granger causality analysis is performed after the two variable panel VAR model. The test investigates whether the GDP growth follows the changes of public debt, or vice versa the debt follows the changes of GDP growth. The ordering of the variables is GDP per capita growth rate and the total debt to GDP ratio; however the estimation results remain unaffected by a change in the ordering of the variables. The Table 4 below shows the results, through which can be observed that the null hypothesis cannot be rejected, meaning that public debt does not cause economic growth. While

the null hupothesis that GDP per capita growth does not cause public debt is rejected at 10% level of significance. This result implies a weak causality from the real per capita GDP growth rate to the public debt but not vice versa. Thereby correlation does not necessarily imply causation. As Krugman (2011) argues that the linkage between debt and growth could be driven by the fact that it is low economic growth that leads to high levels of public debt, which claim is characteristic and holds for Western Balkan countries.

Table 4. Granger causality test

Equation \ Excluded	chi2	df	Prob > chi2
RGDPCG			
Public Debt	2.005	1	0.157
ALL	2.005	1	0.157
Public Debt			
RGDPCG	4.019	1	0.061
ALL	4.019	1	0.061

Source: Authors' calculations

A uni-directional causality from economic growth to public debt was found by a number of authors. For instance, Lof and Malinen (2014) conclude that the negative correlation between both variables is mainly driven by the impact of economic growth on sovereign debt, not the other way around. Miguel and Marcos (2015) also investigated the causal relationship between debt and growth for 16 OECD countries over the period 1980–2009 and provide evidence against the null hypothesis according to which government debt does not cause real GDP growth.

5. 2. LIMITATIONS OF THE STUDY

Summing up, based on the obtained results of all models, the effect of public debt on the economic growth for this set of countries is still ambiguous. Although we obtained evidence of a nonlinear concave relationship, the results are only statistically significant at 10% level. Moreover, the time span is too short and the number of observations is only 70, which is too short for a robust panel estimation. Furthermore, it restricts the analysis to short run estimation, whereas the medium term and long term analysis is impossible with this number of observations. Thereby, the future econometric estimations should expand the time period by providing also data for the first decade of transition, more updated period of time, as well as

adding in the sample the other transition countries of South East Europe, that will also increase the number of observations.

Nevertheless, the paper contributes to the existing empirical literature since it is among the first attempts that empirically investigates the effects of public debt on economic growth for Western Balkan Countries through several estimation procedures.

6. CONCLUSIONS

The global financial crisis and Eurozone debt crisis have fuelled and intensified the debate concerning the effectiveness of fiscal policy and the consequences of escalating public debt. Thus, a number of authors were enthused to empirically investigate the effects of debt on growth, especially for EU member and OECD countries. Fewer studies were focused on analysing this issue for developing countries. Thereby, the intention of this research paper was to examine the effects of public debt on economic growth of Western Balkan countries over the period 2003–2016, using panel regression techniques. The results revealed that the random effects model is appropriate for the used variables. The negative influence of public debt on economic growth was evident in almost all models, however the coefficient was only statistically significant in random effects and 2SLS. Also through panel 2SLS were estimated the fixed and random effects of a nonlinear relationship, including the quadratic term of public debt. The results revealed the existence of an "inverted U-shape" relationship between public debt and GDP per capita growth rate, with a debt turning point of about 50.87%. Beyond this threshold, a further increase of public debt is expected to negatively affect the economic growth. This result was also confirmed through adding the dummy variable in the model, which takes the value 1 for debt levels above 50% of GDP and 0 below. Its coefficient was negative and statistically significant.

However, compared to the results of other empirical studies on developed countries the threshold appears to be much lower for Western Balkan countries, on the other hand very similar on the findings for Central and Eastern European countries. It was also found a uni-directional causal relationship from GDP per capita growth to public debt but not vice-versa, as well as a slow response of GDP per capita growth by a shock of public debt.

The findings of this study suggest that policymakers should take serious actions towards ensuring fiscal sustainability, and active debt management, as the rise of the level of debt above the found threshold of 50.87% of GDP will deteriorate the economic growth. In addition, fiscal policies need to be designed, through cyclical adjusting fiscal policies based on business cycles.

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