ИКОНОМИЧЕСКИ ИЗСЛЕДВАНИЯ
ECONOMIC STUDIES

Volume 29 (2), 2020

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THE IMPACT OF PUBLIC DEBT ON THE ECONOMIC GROWTH IN SOUTH-EASTERN EUROPE: AN EMPIRICAL PANEL INVESTIGATION

The goal of this paper is to examine the impact of public debt in six countries from South-Eastern Europe over the period 2008 to 2017, by applying three different panel methods: the fixed effects model, the GMM method and the system-GMM method. More specifically, we investigate if there is evidence of a non-linear (quadratic) relationship in this group of countries. The results of our study confirm that increasing public debt has a statistically significant negative influence on the GDP growth. Also, the results confirm the existence of a „U inverted" relationship, with a maximum debt threshold of about 58% of GDP. After this threshold, public debt is expected to negatively affect the economic growth rate, due to fear of public debt unsustainability higher interest rates, and severe budgetary consolidation measures.
JEL: E62; H63; O47

1. Introduction

The macroeconomic implications of public debt gained huge public attention in the last two decades in many countries and regions around the world, and especially in the European countries. The reason behind this is the enormous and continuously growing level of indebtedness that occurred after the latest financial crisis in 2008. The implications from the crisis have raised serious concerns about the fiscal sustainability and potential negative impact on the financial markets and economic growth in all European countries.

In that regard, the specific aim of this paper is to empirically examine the impact of public debt on the economic growth in the sample of six countries from Southeastern Europe (Albania, Bosnia and Hercegovina, Kosovo, Macedonia, Montenegro and Serbia)[2] for the period 2008-2017. According to the knowledge of the author, very little has been written about the experience of the public debt in the countries from Southeastern Europe. Namely previous empirical studies have been based either on euro area (Baum et al., 2012;

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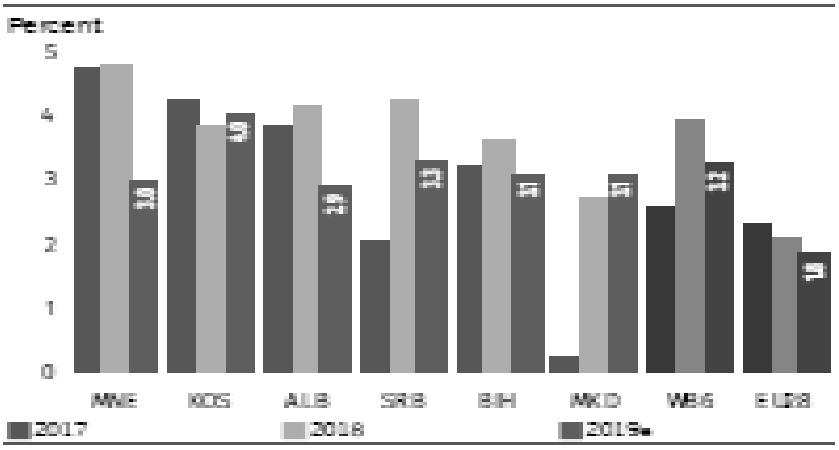
[2] This six countries listed in the World Bank's Regular Economic Report are grouped as "South Eastern European Six" (SEE6).

Checherita and Rother, 2010), selected group of developing countries (Imbs, Rancire, 2005; Pattillo et al., 2011) or countries from Central and Eastern Europe (Časni et al., 2014).

When considering the countries in South-eastern Europe, we must keep in mind that these are small economies and not very large markets. In 2018, the economies in the region, with few exceptions, suffered from more or less the same problems: declining rates of GDP and high unemployment. Current average GDP per capita for the six countries is only half the average in the 11 EU member states of eastern Europe, and just one-quarter of the most advanced western European countries EBRD (2018). Growth in the (SEE6) countries is projected to slow from a high of 3.9 per cent in 2018 to 3.2 per cent in 2019 (Figure 1). Except for Macedonia, where growth has continued to pick up after a major slowdown in 2017, and Kosovo, where it is expected to remain strong at 4.0 per cent, in the rest of the region growth will be somewhat lower than in 2018. By year-end, growth in Macedonia is projected to reach 3.1 per cent, driven by higher investment. In Kosovo, growth is expected to be driven mainly by consumption and service exports. Serbia, the largest economy in the region, is expected to grow at 3.3 per cent in 2019, down from 4.2 per cent in 2018, as higher consumption is undermined by the negative contribution of net exports and a deceleration of investment growth. In Albania, also despite strong consumption growth, a plunge in energy production is projected to slow growth to 2.9 per cent. In Bosnia and Herzegovina, growth is expected to slip to 3.1 per cent because of lower contributions from net exports and investment. In Montenegro, growth is expected to moderate to 3 per cent from a high of 4.9 per cent in 2018 as the public investment cycle is phased out.

Figure 1

In 2019 growth in SEE6 countries is projected to decelerate



Source: National authorities and World Bank estimates.

Furthermore, according to the data from World Development Indicators, the unemployment in Bosnia and Herzegovina, Macedonia and Kosovo is the highest in Europe World Development Indicators, while, employment rates remain low. Namely, by June 2019, 150,000 additional jobs have been created in the (SEE6) countries compared to a year

earlier. Some 43,000 young people have found jobs, especially in Albania, as youth unemployment in the region has fallen supported by the growing business-process outsourcing sector. Economic activity in 2018 has also attracted more women into the labour force. Despite these positive labour-market developments, less than half of those of working-age in the Western Balkans have a job (44 per cent). In Bosnia and Herzegovina and in Kosovo, only 34 per cent and 30 per cent of the working-age population has a job and youth unemployment remains high in both countries. Sustaining high and equitable economic growth is thus essential to create many more, much-needed job opportunities in the region World Bank Regular Economic Report No 16. In addition, these countries obtaining economic growth and protecting the population, through reduction of inflation and measures for limitation of the unemployment phenomenon, are considered to be priorities. Budgetary deficit and public debt are the instruments the state can use to achieve these major objectives. While increasing continuously (and almost doubling at the regional level in absolute values since 2006), the total public debt of the countries from Southeastern Europe is still relatively moderate at around 55% of GDP (weighted average) WBIF, **"**Outlook for Macroeconomic Development in the Western Balkans: IFI Coordination Office However, there are considerable variances among the countries. Successful fiscal consolidation programs and more prudent fiscal management have allowed Serbia to reduce PPG debt as a share of GDP to 52.1 per cent and Albania to reduce its PPG debt to 68.4 per cent. Albania achieved its reduction by careful spending, clearance of arrears, and currency appreciation; but mounting off balance risks, including from a rapid buildup in PPPs, are now a major concern. In Bosnia and Herzegovina, PPG debt has been stable in nominal terms and has declined a bit as a percentage of GDP; much of its debt is longterm, at favourable rates. However, the country must also deal with fiscal risks emanating from its highly leveraged state-owned enterprises (SOEs) and from sizable expenditure arrears. Kosovo's PPG debt is projected to go up slightly, to 17.7 per cent, as capital investments (mainly financed by privatization proceeds) are expected to pick up later in the year World Bank Regular Economic Report No 16. According to World Bank, Macedonia will see an increase in PPG debt, due mainly to higher government borrowing, but also because the public investment is due to accelerate. Montenegro's PPG debt is projected to reach a high of 83 per cent of GDP by yearend following the government's issuance of €500 million in Eurobonds to service debt due in 2020, and an expected intensification of highway construction later this year. Levels of public debt in South-eastern Europe combined with the pressures on public finance due to increased demand for social assistance and sluggish revenue growth further limit the fiscal space on the budget for further expanding infrastructure investments. At the same time, the region is still lagging behind in terms of its capital stock, both private and public, so further investment is needed. WBIF Strategy, **"**Meeting the challenges of realizing the Socio-economic Investments in Western Balkans", Discussion paper, IFI Coordination Office, May 2013.

Bearing in mind the purpose of this paper we will follow the studies of **(**Mencinger, Aristovnik, Verbič, 2014; Checherita, Rother, 2010), and we have applied a dynamic panel data approach to explain the impact of public debt on the economic growth. In order to provide consistent and unbiased results, we implemented three different panel methods: the fixed effects model, the GMM method and the system-GMM method. Against this background, one important question refers to the economic consequences of a regime of

high and potentially persistent public debt. While the economic growth rate is likely to have a linear negative impact on the public debt-to-GDP ratio (a decline in the economic growth rate is, *ceteris paribus*, associated with an increase in the public debt-to-GDP ratio), high levels of public debt are likely to be deleterious for growth. Potentially, this effect is non-linear in the sense that it becomes relevant only after a certain threshold has been reached Checerita and Rother (2010). Bearing this in mind, this non-linear relationship that the present paper seeks to investigate.

The results show that increasing public debt has a statistically significant negative influence on the GDP growth. Also, the results confirm the existence of a „U inverted" relationship, with a maximum debt threshold of about 57% of GDP. After this, threshold public debt is expected to negatively affect the economic growth rate, due to fear of public debt unsustainability higher interest rates, and severe budgetary consolidation measures.

The main contribution of this paper is that he deals with a subject with a small volume of empirical literature for the region of Southeastern Europe. Namely, according to the author, this is the first study who have analyzed the effect od public debt on economic growth for this region using a panel investigation. Furthermore, it also contributes by increasing the volume of literature on economic growth by applying a theoretical model with instrumental variables in square regression with assumed sustainability of public finances in relation to government debt. Finally, the findings in the paper can be of use in further analysis of economic growth and the creation of policies for effective debt management.

The structure of the paper is as follows. After the Introduction, Section 2 briefly reviews the existing relevant studies on the public debt and economic growth relationship. The sources for the data used as well as model specification and data are presented in Section 3. The results are presented and interpreted in Section 4. Finally, Section 5 concludes the paper findings and gives policy recommendations.

2. Literature Review

In this section, we present a brief sublimate of empirical literature concerning the relationship between public debt and economic growth. In the literature, there are empirical studies that analyze the impact of public debt on economic growth, both on individual countries such as (Smyth and Hsing 1995) in the USA (Balassone, Francese, Pace, 2011) for the case of Italy and in the panel set of countries (Clements, Bhattacharya, Nguyen, 2003; Reinhart, Rogoff, 2010; Schclarek, 2004). Bearing in mind the purposes of our study, we will be focus only on studies that cover primarily the countries from Eastern and South-east Europe.

The empirical literature on the relationship of the public debt and growth in the countries from Eastern and Southeastern Europe is quite scarce (Časni, Badurina, Sertić, 2014; Gál, Babos, 2014; Bilan, Ihnatov, 2015).

With dynamic panel analysis of a sample with 14 countries from the Middle, East and Southeast Europe for the period 2000-2011, Časni, Badurina and Sertic (2014) found that public debt has a statistically significant negative impact on the rates of economic growth

both in short and long term. Based on their findings, they recommend the creation of policies in the direction of increasing exports, long-term investments, but also support fiscal consolidation to stimulate the economic growth.

Gál and Babos (2014) conducted a comparative analysis of the effects of public debt on economic growth in western and new countries member states of the European Union for the period 2000-2013 and have come to the conclusion that, although the new Member States are less indebted, high levels of public debt are much more harmful to them, so that maintaining debt under control is particularly important for these countries.

Applying a panel analysis Bilan and Ihnatov (2015) was estimate the effect of public indebtedness on economic growth with the involvement of 11 Central and Eastern European countries in the period 1994-2013, established the presence on the oversized debt threshold at the level of 45-55% of GDP. She came to the conclusion that the breaking threshold is lower in less developed countries of the analyzed group (e.g. Bulgaria and Romania), is entirely lower than that of the higher developed countries members of the European Union.

3. Model Specification and Data

The construction of a debt threshold model aims at examining the change in the impact of debt levels on growth after exceeding a certain threshold. For this purpose, as a basis for model building, we will consider the empirical literature who have investigated the relationship between public debt and economic growth.

In this respect, the model is based on the concept of Reinhart and Rogoff (2010), but due to the lack of methodological framework in their paper, as a reference of the model construction, we will use methodological explanations of Chudik, Mohaddes, Pesaran and Raissi (2015).

The basic model below contains a debt threshold, and its equation is:

$$Y_t = \alpha + \beta_1 I(b_t \leq \bar{b}) + \beta_2 I(b_t > \bar{b}) + \varepsilon_t \quad (1)$$

where Yt is real GDPPCG; b_t is the level of public debt relative to GDP; $I(b_t \perp \bar{b})$is an indicator variable that receives a value depending on the ratio of the observed debt level b_t b^*, and the debt threshold b^*, so that $I(b_t \leq \bar{b}) = b_t$ and $I(b_t > \bar{b}) = 0$; ε_t is the member of the error; α is the free member; and μ, β_1, β_2 and δ are the regression coefficients.

Particular attention should be paid to the coefficients β_1, and β_2 as they measure the impact of the debt level on the economic growth. Since the purpose is to determine whether the debt threshold of the set threshold has a negative effect on the change in the debt impact on economic growth, i.e. $\beta_1 > \beta_2$, the alternative hypothesis being tested is

$H_1: \beta_1 > \beta_2$, while the null hypothesis assumes that it has no such effect, ie $H_0: \beta_1 = \beta_2$, and is tested against the one-sided alternative.

Robustness tests. The robustness of the findings in the model is tested by including a set of independent control variables $C_t = \{GCFt, TRADEct, BBct, CABt, UN\}$which includes: Gross fixed capital formation (% of GDP), the sum of export and import shares into GDP; budget balance; current account balance, unemployment. Hence, the adjusted equation of the basic model undertakes the form:

$$Y_t = \alpha + \beta_1 I(b_t \leq \bar{b}) + \beta_2 I(b_t > \bar{b}) + \mu_t C_t + \varepsilon_t, \quad (2)$$

where μ_t is a vector composed of the regression coefficients of the control variables.

Determining debt thresholds. We set the 30% and 40% levels as public debt thresholds, respectively, as control levels in the movement of their time series in the group as a whole, as well as for each individual country, using the least-squares method.

Estimates of the regression coefficients in Table 1 basic model with a public debt threshold relative to GDP of 30% indicate a positive and statistically significant 1% level of debt impact on economic growth. From this finding, it can be concluded that the null hypothesis for the negative threshold effect of 30% $H_0: \beta_1 = \beta_2$ cannot be rejected and thus, the threshold effect is absent. Robustness tests with the inclusion of control variables confirm the relationship established in the baseline model for the absence of the threshold effect and are statistically significant at the 1% level in almost all models. The difference between the estimated ratios in these models is mainly due to the lower positive impact of debt as a consequence of the impact included in the control variables.

Table 1

Threshold estimations for the full sample and each individual country

	Albania	*BiH*	*Kosovo*	*Macedonia*	*Monte Negro*	*Serbia*	SEE six countries
Const	-9.925	9.491	9.555	3.811	-8.672	5.724	-4.340**
$I(b \leq 30\%)$	0.252***	0.367**	0.374**	0.327*	0.369***	0.453*	0.271**
$I(b > 30\%)$	0.284***	0.401**	0.391*	0.452***	0.424***	0.472**	0.321***
$I(b \leq 40\%)$	0.198***	0.254***	0.298***	0.254**	0.312*	0.314***	0.172***
$I(b > 40\%)$	0.124***	0.204***	0.245***	0.198***	0.274***	0.292*	0.121***
BUGET	0.556	0.047	0.483**	5.307*	0.490**	1.454	0.481*
CAB	0.912**	0.940	-0.429**	0.670*	2.578	0.113***	0.688
GCF	0.537*	0.186	0.004	0.732	2.110	1.049	0.087
TRADE	0.046**	0.446	0.178	0.126***	0.482**	0.087	0.026**
UN	-0.026***	-0.863*	-0.048***	-1.455	-1.472*	0.873	-0.147*

***, **, * denote statistical significance at the 1, 5, 10 per cent level respectively
Source: Authors' calculations

When the threshold is set at 40%, a positive and statistically significant relationship is positively assessed, but a decrease in the degree of positive impact is also evident in all models. Namely in the model where included all countries debt increase by 1 pp. at levels

below the threshold, it causes GDP growth of about 0.17%, while the same increase of debt at levels above the threshold results in a GDP growth of 0.12%, leading to the rejection of the null hypothesis of the threshold effect and its confirmation presence. Similar results were obtained in all models.

The absence of the debt threshold effect of setting a lower threshold and its presence at a higher threshold give evidence of a possible non-linear relationship between debt and growth. For this purpose, the following equation is tested:

$$Y_t = \alpha + \beta_1 I(b_t \leq \bar{b}) + \beta_2 [I(b_t > \bar{b})]^2 + \varepsilon_t, \quad (3)$$

whereas the threshold level is taken $\bar{b}$ = 40% while the quadratic member refers to the case where the debt exceeds the specified threshold. The reason for this model layout is the nonlinear change in the impact on economic growth precisely at the level of total public debt above 40%. What can be concluded is that the threshold effect starts at the level of public debt in the interval of 30-40%, which it is, in fact, a debt threshold where the impact of debt levels below it equals the impact of debt levels above it. However, the non-linear decrease in the positive impact of debt over higher thresholds also indicates its approximation to the debt threshold, which separates lower debt levels with a positive impact on growth from higher levels of negative debt. The debt threshold b^* is actually the level of debt that maximizes the amount of GDP. The first derivative of the quadratic function under is:

$$\frac{dY_t}{db_t} = \beta_1 + 2\beta_2 b_t, \quad (4)$$

Bearing in mind that the functional relationship between public debt and economic growth is non-linear, of a concave curve type ("Laffer" type), and coefficient β1 associated to the debt variable is positive, and β2 associated to debt² variable is negative. This allows us to determine the maximum affordable public debt that does not have a negative impact on economic growth ($debtmax$), according to relation Bilan and Ihnatov (2015). By introducing dY_t / db_t = 0 into the equation under (14) and expressing it through the debt member we obtain the sum of the debt threshold b*, i.e.:

$$b^* = -\frac{\beta_1}{2\beta_2}, \quad (5)$$

where prerequisite b* is the debt threshold that maximizes GDP and above which debt levels have a negative impact on economic growth is $\beta_2 < 0$.

The model described above is applied for the panel data analysis in order to determine the impact of public debt and other variables on GDP per capita growth in six countries from Southeastern Europe

We choose panel because the panel data have several advantages over time series or cross-sectional data. According to Hsiao, 2006 advantage are:

- Panel data have a higher degree of freedom which leads to the more accurate econometric estimates.

- Panel data control the impact of missing or unobserved variables; thus the effect of omitted variables is controlled.
- Panel data can solve the problem of the nonstationary data, while the ability to transform data can lead to unidentified models and eliminate the measurement errors.

The panel data can be analyzed by using a variety of models as OLS, fixed effects (FE), random effects (RE) models or generalized method of moments (GMM). But, according to Baltagi (2001), least-squares estimation methods produce biased and inconsistent estimates. Therefore, the analysis starting with the evaluation of the models with fixed and random effects – FEM and REM. In short, the analysis of fixed effects assumes that the units of interest (in our case, countries) are fixed, and that the differences between them are not of interest. What is of interest is the variance within each unit, assuming that the units (and their variations) are identical. By contrast, the analysis of random effects assumes that the units are a random sample extracted from a larger population, and that therefore the variance between them is interesting and a conclusion can be drawn for a larger population. The more fundamental difference between them is the way of locking. The model of fixed effects supports only a conclusion for the group of measurements (countries, companies, etc.). The random-effects model, on the other hand, provides a lock to the population from which the sample was extracted. Judson and Owen (1996) argue that the model of fixed effects is desirable in the analysis of economic and financial systems for two reasons: i) the unobserved individual effects that represent the characteristics of units (i.e, countries) are very likely to be in correlation with other regressors; and ii) it is quite likely that such a panel is not a random sample of many countries/companies, but of most countries/companies of interest. Accordingly, for our analysis of the countries, the model of fixed effects will be adequate, since the data set covers countries from a specific region-South-Eastern Europe with almost and the conclusions drawn from this analysis will only apply to them. However, in addition to this, we will also conduct the famous statistical test of Hausman (1978) for distinguishing between the models of fixed and random effects.

The models of fixed and random effects imply that all the variables on the right side of the model (1) are exogenous. However, for some of them, it can be argued that there is a reciprocal causation. Such feedback may cause inconsistency in the assessment of the model of fixed or incidental effects. In order to overcome it, the model can be evaluated by means of the so-called instrumental variables technique, in which potentially endogenous variables are instrumented with variables that are highly correlated with the particular regressor but are not correlated with the error member (Wooldridge, 2007). The most common method of evaluating with instrument variables is the generalized method of moments (GMM). In a GMM assessment, the information contained in the population momentum constraints is used as instruments (Hall, 2005), that is, the instruments are most often generated from the past values of the potentially endogenous variables. A second critique that can be given to models with fixed and random effects is the potential inertia of the dependent variable.

Due to the shortcomings of the previous describe models and in order to provide consistent and unbiased results, we have applied the Generalised Method of Moments (GMM) estimation methodology (Baltagi, 2001). The advantage of GMM model is the ability to

combine several instruments Wooldridge (2002). The selection of valid instruments is most difficult and a tricky issue in GMM methodologies. However, one drawback of the GMM approach, is that in samples with a limited time dimension (small T) and high persistence, the estimation has low precision (Blundell and Bond 1998). Therefore, we also estimate a "system GMM "developed by Arellano and Bover (1995) and Blundell and Bond (1998), which addresses this concern. There exists no rule of thumb in the selection of instruments. However, Murray (2006) discusses various tricks that are handy for this purpose. In this study, we follow Chang Kaltani, and Loayza (2005) and Naeem (2016), and we used the lagged values of independent variables as instruments. The validity of chosen instruments for parameters estimation can be tested using the Hansen test. Accepting the null hypothesis means that the chosen instruments are valid. The second group of tests refers to tests of serial correlations in the differenced residuals – first-order (AR1) and second-order (AR2) serial correlation). The first-order autocorrelation in the differenced residuals does not imply that the estimates are inconsistent (Arellano, Bond, 1991). However, the second-order autocorrelation would imply that the estimates are inconsistent.

Hereinafter, we are developing the basic regression model (1), and we present it in the model, two different models. First, the non-dynamic baseline panel regression specification as follows:

$$GDPPCGct = \beta0 + \beta1(PD)ct + \beta2(PD^2)ct + \beta3(GCF)ct + \beta4(TRADE)ct + \beta5(BB)ct + \beta6(CAB)ct + \beta7(UN)ct + \varepsilon c\ t \quad (2)$$

Second, the instrumental variable dynamic GMM panel regression specification to control for endogeneity is as follows:

$$GDPPCGct = \beta0 + \beta1\left(GDPPCG\right)_{t-1} + \beta2(PD)ct + \beta3(PD^2)ct + \beta4(GCF)ct + \beta5(TRADE)ct + \beta6(BB)ct + \beta7(CAB)ct + \beta8(UN)ct + \varepsilon c\ t \quad (3)$$

Where:

GDPPCG = GDP per-capita growth;

PD = public debt as a share of GDP;

GCF = Gross fixed capital formation (% of GDP)

TRADE = the sum of export and import shares into GDP;

BB = budget balance;

CAB = current account balance;

UN = Unemployment

As a dependent variable in the panel-regression analysis, GDP per capita growth is taken as a variable of economic growth; while as control determinants we used public debt as a debt variable, gross capital formation as a measure of investments in the economy, trade balance and current account balance as measures of openness of the economy, as well as the total budget balance and as an additional measure. Also, we will use an unemployment rate. A detailed overview of the variables is done below.

Public debt. The interaction between public debt and economic growth is rather complex because public debt influences the economic growth dynamics and the economic growth rates impact the size of public debt (Časni, Badurina and Sertić 2014). According to Cantor and Packer (1996), higher rates of economic growth facilitate the public debt burden. Public debt sustainability depends on its ability to raise revenue which decreases when the economy experiences a downturn. The private sector default has an adverse effect on economic activity and increases public debt when private borrowing is backed by discretionary fiscal policy (Cecchetti, Madhusudan, and Zampolli 2011). Public debt may have positive as well as negative impacts on economic growth. In less developed countries, governments use public debt as an imperative tool to finance their expenditures. Economic growth can be increased by effective and proficient utilization of resources to achieve macroeconomic goals. However, if the public debt is not properly utilized, it would restrict economic growth and become the biggest curse for the economy.

The investment is the second determinant that we will use in our model. For these determinants, we expect a positive impact on economic growth. According to Ugochukwu and Chinyere (2013) capital accumulation "refers to the process of amassing or stocking of assets of value, the increase in wealth or the creation of further wealth." Namely, investment in capital stock increases the capacity for production, which also increases national income. In macroeconomics, consumption and fixed investment are the main indicators, which encourage the aggregate expenditure. Thus, the increased aggregate expenditure will fuel the growth. In this paper, we follow Bilan and Ihnatov (2014) as a measure of investments we will use Gross fixed capital formation (% of GDP).

The third determinant that we will use is trade openness. This indicator in the economic growth literature was sometimes used as a major determinant of growth performance (Sachs and Warner 1995). According to Edwards (1998), trade affects economic growth through several channels: technology transfer, exploitation of comparative advantage, and diffusion of knowledge, increasing scale economies and exposure to competition. In addition, Romer (1993) claimed that the countries have higher possibility to implement leading technologies from other countries if they are more open to trade. Furthermore, Chang, Kaltani and Loayza (2005) emphasized that trade promotes the efficient allocation of resources through comparative advantage, allows the dissemination of knowledge and technological progress, and encourages competition in domestic and international markets. Bearing this in mind, we expected a positive effect on economic growth for this determinant.

The next determinant that we will use is the current account balance. The current account balance is a broader measure that includes the trade deficit and is itself a part of a broader measure, the balance of payments. The balance of payments is the sum of all transactions between a nation and all its international trading partners. In addition to the trade deficit, the current account deficit includes factor income and financial transfers.

Furthermore, in our research, we will use the budget balance. It is expressed by the budget balance in % of GDP. Fatima, Ahmed, Rehman (2012) claimed that the balanced fiscal budget is a necessary condition in order to achieve sustainable economic growth. According to the Keynesian model, the budget deficit would have a positive impact on economic growth. Namely, if increased government expenditure or tax-cutting are the reasons for the

budget deficit, then customers would have more money and the marginal propensity to consume would increases.

The last determinant that we used is the unemployment. According to Sanchis-i-Marco, (2011) unemployment not only represents a high social cost for the individual, it also represents a high economic cost for the society Unemployment may be associated with structural change and subsequent economic growth. Bearing this in mind, we follow Baum, Checherita-Westphal, and Rother (2012) and we put this determinant in our model. As a measure for unemployment, we used % of the total labour force.

For our research, we focus on six countries from the South-Eastern Europe (Albania, Bosnia and Hercegovina, Kosovo, Macedonia, Montenegro and Serbia) using yearly data from 2008 to 2017. The choice of the countries and the time periods in this paper was contingent upon the availability of time series data on all the variables included in the model. The selection of countries is mainly based on similarities in terms of their historical developments, but also on their geographical and cultural familiarity, which greatly influences the creation of economic relations between some of them. The time period is chosen to correspond to the period of starting the growing trends in the dynamics of the debt and the increased uncertainty in the movement of economic activity at the time of the outbreak of the Great Financial and Economic Crisis of the late 2000s and the period of recovery immediately after.

Data are obtained from various sources. Data for the GDPPC, pubic debt, investments, trade and unemployment are taken from the websites of the World Bank. The current account balance and the budget balance are taken from the websites of the central banks for the selected countries. Table 2 presents the descriptive statistics for all the variables used in the regressions.

Table 2

Descriptive statistics

	GDPPCG	PD	GCF	TRADE	BUGET	CAB	UN
Mean	2.393	40.52	25.33	90.90	-2.916	-9.696	23.05
Median	2.636	38.25	25.79	87.88	-2.800	-8.193	22.15
Maximum	8.328	74.70	41.18	132.3	2.600	-0.629	47.50
Minimum	-6.001	5.510	16.33	69.02	-7.200	-49.66	13.05
Std. Dev.	2.386	20.86	5.652	15.87	2.130	7.506	7.785
Observations	60	57	60	60	53	60	55

Source: Authors' calculations

Although, as we pointed out in the Introduction, the countries of the selected sample are relatively similar; however, with the selected variables, there are significant differences among them. Namely, the differences in the level of economic development measured through the growth of GDP per capita are noticeable, so that the peak of GDP growth in one year was almost 8.5%, while there are countries in the sample where it decreased by 6%. Also, large differences appear at the level of public debt. Thus, it ranges from a minimum of 5.5% of GDP, up to a maximum of 75% of GDP. Also, the remaining determinants during the analyzed period have significant deviations.

3. Empirical results and discussion

In this section we begin with an analysis of the results of the empirical estimations of Equation (2) and (3) for the effect of public debt on GDP growth in six countries from South-Eastern Europe using data from 2008 to 2017, using a fixed model and generalized method of moments (GMM).

The results reported in Table 3 indicates the high robustness of our results, given that in all specifications, regardless of their specs, variables generally retain their economic and statistical significance. The Hausman test favours fixed effects estimation over random effects. Furthermore, the Hansen test shows that the chosen instruments are valid (with *p*-value of 0.37). The estimator ensures efficiency and consistency provided that the residuals do not show a serial correlation of order two. Inconsistency would be implied if second-order autocorrelation was present Arellano and Bond (1991), but this case is rejected by the test for AR(2) errors.

Since as we discussed before we prefer the dynamic GMM estimations, we will not discuss the estimation results of the fixed model.

First, from Table 4, it can be seen that the coefficient of the lagged value of the GDP per capita growth has a negative and significant impact on economic growth. This result is consistent with the convergence theory, explained by the neoclassical model. According to Barro (1996) "the lower the starting level of real per capita gross domestic product the higher is the predicted growth rate".

Table 4

Estimation Results

Independent variables	Fixed Effects (FE) regressions		Instrumental Variables– GMM		System GMM	
	Coefficient	*Std. Error*	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
GDPPCG(-1)			−0.308***	0.085	−0.274***	0.072
Const	−9.503	5.812	0.135	0.213	0.428*	0.139
PD	0.644***	0.192	0.453**	0.157	0.814***	0.049
PD2	−0.007***	0.001	−0.004**	0.001	−0.007***	0.057
BUGET	0.513***	0.180	0.373**	0.183	0.248**	0.148
CAB	0.314**	0.136	0.280	0.088	0.145*	0.005
GCF	0.0561	0.138	0.156***	0.143	0.198***	0.187
TRADE	0.0700	0.052	0.056*	0.040	0.075**	0.028
UN	-0.201*	0.101	-0.129	0.088	-0.146	0.053
Hausman test (p-value)		0.362				
Test for AR(1) errors				0.059		0.046
Test for AR(2) errors				0.611		0.722
Hansen test (p-value)				0.372		0.246
Turning point (%)		46		56.6		58.1

***, **, * denote statistical significance at the 1, 5, 10 per cent level respectively
Source: Authors' calculations

Next coefficient of the public debt variable has a positive value, while those associated to square public debt have negative implying that the functional relationship linking the growth rate of GDP to the size of public debt is one of concave type relationship between economic growth and public debt. These results confirm the general theoretical assumption that at low levels of public debt the impact on growth is positive, whereas beyond a certain debt turning point a negative effect on growth prevails Elmendorf and Mankiw (1998).

Furthermore, we calculated debt-to-GDP turning point. The results of our paper of 56.6% confirm the findings of other recent empirical studies on the situation of developing countries, Greenidge et al. (2012), of about 55% of GDP, or Dinca and Dinca (2015) of about 51%. A possible explanation for this situation lies that these six countries from Southeastern Europe have lower credibility from potential creditors, investors, etc., which makes the negative effects of a high public debt to occur more rapidly than in the case of developed countries. Namely threshold of debt in the study of Mencinger, Aristovnik, and Verbič (2014) who have analyzed 25 member states of the EU was above 75%.Thus, the effects on the economic growth of lower willingness of foreign creditors and investors to provide capital, due to the higher risk they perceive when public authorities' debt is important, are more unfavourable.

The result from the threshold does not provide the level to be targeted to support the growth projections. Namely, those results represent an additional argument for implementing fiscal consolidation strategies to reduce public debt. In this context, it is reasonable to assume that our research provides direct evidence of nonlinearity between public debt and economic growth. According to the Cecchetti, Mohanty and Zampolli, (2010) the results thus imply that unstable debt dynamics may increase the risk of a detrimental effect on capital accumulation and productivity growth, which would potentially trigger an adverse effect on economic growth.

The coefficients of the other explanatory variables are in line with expectations according to economic theory Checherita and Rother (2010) Kumar and Woo (2010) Dragos and Dragos (2012).

From the statistically significant variables, the budget balance has a positive impact on economic growth. Namely the results indicate that If the governments are running a budget surplus, then the governments do not have to borrow and can encourage economic growth through the efficient investment, social expenditure or other ways of money distribution. But, we can also mention that too high budget surplus does not necessarily encourage economic growth.

In addition, as we expected, current account balance and trade has a positive impact on GDP growth. Namely trade creates the opportunity for faster implementation of the rapidly improving technologies from the leading countries. According to Edwards (1997) emerging economies could grow faster than developed economies if it is cheaper to import new technologies than to create them within the country. In other words, trade helps to allocate the resources in a more efficient way. Thus, the trade increases economic growth due to efficient allocation of resources, implementation of new technologies and ideas, but the economy grows at a high rate until the trade openness reaches the equilibrium.

4. Conclusions

The public debt sustainability is one of the most important concepts nowadays in both developed and transition countries. The high public debt level doesn't necessarily need to hinder the economic performance of the countries, as some developed countries achieved substantial economic growth rates over the past years, despite the high debt level. However, the latest global financial and debt crisis raised serious concerns about the enormous and continuously growing debt level in countries of Southeastern Europe and its potential negative impact on the economic growth. The analysis we have conducted for a panel of six countries from South-Eastern Europe, over the period 2008-2017, confirmed the existence of a „U inverted" relationship between public debt and economic growth, with a maximum debt threshold of about 55.5% of GDP for the whole group. After this threshold, public debt is expected to negatively affect the economic growth rate, due to higher interest rates, fear of public debt unsustainability and severe budgetary consolidation measures.

This study does not face significant limitations, but their removal will certainly contribute to broader results. The first constraint is the lack of available data on selected determinants for longer periods. The existence of long time series of data would enable obtaining more accurate and more reliable results.

This study complements the existing economic literature by analyzing the impact of public debt on economic growth and threshold effect in the six countries from South-Eastern Europe, and according to the knowledge of the author, it is the first empirical study that analyzes these topics in this region.

The results obtained in this paper can provide an additional argument for implementing fiscal consolidation strategies to reduce public debt. Namely, the research motivation of this paper stems from the importance of the topic itself and the significance of the lessons learned for the macroeconomic policy during and after the crisis. The analysis of fiscal indicators pointed out some serious consequences for the public debt sustainability after the crisis, in almost all CSEE countries. Although the countries' experiences differ, and there is no behavioural pattern followed by all CSEE countries, some general tendencies in the implementation of restrictive fiscal policy can be observed. More specifically, most members focused on restructuring the public sector (rationalizing employment, benefits and freezing salaries), reducing social benefits and increasing VAT. Thanks to considerable efforts, the budget deficits are largely brought under control, but the economies are currently confronted with various economic and social difficulties and market uncertainties. The rising debt levels, along with the current emigration crisis, rising inequality and unstable labour markets, bring some serious challenges for the CSEE countries in future.

The future research in the analysis should include other countries from Central and South-Eastern Europe, to include the other channels through which the effects are transmitted (total factor productivity, long-term nominal and real interest rates, private investment and capital accumulation, public investment…) Econometric techniques that researchers could use in the future regarding this topic should be either the method of two or three least squares, Vector Error Correction Model (VECM) or the autoregressive distributed lag (ARDL).

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