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Mencinger, Jernej and Aristovnik, Aleksander and Verbic, Miroslav

University of Ljubljana, Faculty of Administration

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THE IMPACT OF GROWING PUBLIC DEBT ON ECONOMIC GROWTH IN THE EUROPEAN UNION

Jernej Mencinger[1], Aleksander Aristovnik[1] and Miroslav Verbič[2]
[1)]University of Ljubljana, Faculty of Administration, Ljubljana, Slovenia
[2)]University of Ljubljana, Faculty of Economics, Ljubljana, Slovenia
E-mail: jernej.mencinger@fu.uni-lj.si; E-mail: aleksander.aristovnik@fu.uni-lj.si
E-mail: miroslav.verbic@ef.uni-lj.si

Abstract
The paper attempts to empirically explore the transmission mechanism regarding the short-term impact of public debt and growth. We examine and evaluate the direct effect of higher indebtedness on economic growth for countries in the EU which are in the epicentre of the current sovereign debt crisis. In comparison to similar empirical studies, our research will add to the existing literature by extending the sample of countries and providing the latest empirical evidence for a non-linear and concave (i.e. inverted U-shape) relationship. The empirical analysis primarily includes a panel dataset of 25 sovereign member states of the EU. Our sample of EU countries is divided into subgroups distinguishing between so-called 'old' member states, covering the period 1980–2010, and 'new' member states, covering the period 1995–2010. In order to account for the impact of the level of the debt-to-GDP ratio on the real growth rate of GDP, we employ a panel estimation on a generalized economic growth model augmented with a debt variable, while also considering some methodological issues like the problems of heterogeneity and endogeneity. The results across all models indicate a statistically significant non-linear impact of public debt ratios on annual GDP per capita growth rates. Further, the calculated debt-to-GDP turning point, where the positive effect of accumulated public debt inverts into a negative effect, is roughly between 80% and 94% for the 'old' member states. Yet for the 'new' member states the debt-to-GDP turning point is lower, namely between 53% and 54%. Therefore, we may conclude that the threshold value for the 'new' member states is lower than for the 'old' member states. In general, the research may contribute to a better understanding of the problem of high public debt and its effect on economic activity in the EU.
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Keywords: fiscal policy, public debt, economic growth, panel analysis, turning points, EU

JEL Classification:E62,H63, O40, C33

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[1] Corresponding author, **Aleksander Aristovnik** – aleksander.aristovnik@fu.uni-lj.si

Introduction

The development of many industrial countries over the last few decades was associated with relatively high public deficits, causing further rises in public debt and therefore a deterioration of the countries' fiscal positions. According to Tanzi and Schuknecht (1997), these former debt build ups were generally accompanied by an expansion of general government expenditures. In addition, the recent global financial and economic crisis has also led to a sharp increase in government debt in many advanced economies. Namely, in response to the financial crisis governments have employed fiscal measures to revive aggregate demand by recapitalizing banks and adopting sizeable fiscal stimulus packages mostly based on higher government expenditures. This has created serious concerns about fiscal sustainability, which has an adverse impact on the financial market and causes distortions in economic implications. Moreover, the recent financial crisis has shown that such sharp increases in public debt have a possible negative impact on sustained economic growth (Raskovic and Moerec, 2012) and a stable economic environment (Cecchetti, Mohanty and Zampolli, 2010; Onofrei and Lupu, 2012). This consequently leads to a situation known as a debt trap in which these countries are facing the simultaneous occurrence of adverse effects due to high and growing fiscal deficits and debt levels, as well as sharp rises in risk premia on sovereign bonds that tend to lower economic activity (Padoan, Sila and Van den Noord, 2012).

The relationship between economic growth and fiscal policy is complex and critically important for policymakers. Fiscal policy holds crucial implications for economic growth in both the short and long run. In particular, a persistent high level of public debt can consequently trigger detrimental effects on capital accumulation and productivity, which potentially has a negative impact on economic growth (Kumar and Woo, 2010). Cecchetti, Mohanty and Zampolli (2010) argue that, without changes in fiscal policy, debt accumulation will continue to rise due to the persistent growth of government expenditures in comparison to declining revenues. They suggest that the higher risk premia for issuing government bonds and the rapidly ageing population may lead to unstable debt dynamics. They conclude in particular that these structural problems without corrective actions by government will lead to persistent fiscal deficits even during a cyclical recovery.

Therefore, the current debt crisis has revived the academic and policy debate on the economic impact of public debt. Despite the upsurge of related studies on the relationship between public and economic activity, the empirical literature on this topic is quite scarce and shows a lack of systematic evidence on the impact of public debt on potential growth (Kumar and Woo, 2010; Checherita and Rother, 2010). In the past the problem of high and persistent public debt was mainly associated with developing countries, whereas today's high debt levels are causing disruptions to financial cycles for advanced economies leading to an unsustainable credit-fuelled boom followed by a default-driven bust (Cecchetti, Mohanty and Zampolli, 2010).

Therefore, our main aim is to empirically explore the transmission mechanism regarding the short-term impact of public debt and growth. We will examine and evaluate the direct effect of higher indebtedness on economic growth for countries in the EU which are in the epicentre of today's sovereign debt crisis. Our examination will shed light on the current debt problem by identifying a possible non-linear relationship between the level of public debt and economic growth, with an explicit focus on countries that are part of the EU. In

comparison to similar empiricalstudies, our research will add to the existing literature by extending the sample of countries and providing the latest empirical evidence of a non-linear and concave (i.e. inverted U-shape) relationship (Clements, Bhattacharya and Nguyen, 2003; Reinhart and Rogoff, 2010a, b; Kumar and Woo, 2010; Pattillo, Poirson and Ricci, 2002; 2004 etc.).

The paper is structured as follows. In the next section we provide a literature review on the relationship between public debt and economic growth focusing solely on empirical studies. Then we describe the applied methodology and the data used in the estimation models for evaluating the direct impact of public debt on growth. In the fourth section of the paper, we present the results and determine the debt turning point for a particular group of countries. The last section concludes with the main findings and limitations.

1. Literature review

When considering the theoretical literature about the connection between public debt and economic growth we found a lack of empirical evidence to investigate and confirm the theoretical findings and discussions. According to Abbas and Christensen (2007), there are several reasons for this lack of interest in formally investigating the impact of public debt on growth. The most important ones are: (1) weak and inadequate availability of reliable and comparable datasets for public debt among countries; (2) the consideration that the public debt variable is an endogenous rather than an exogenous variable which can be used as an instrument to control and affect the macro-financial outcome; and (3) the fact that public debt has so far not been regarded as problematic due to its relatively small size in most developed countries. Namely, previous theoretical and empirical studies focused on the external debt issue in emerging and countries and countries with low income due to their dependency on foreign capital investment (see Clements, Bhattacharya and Nguyen, 2003; Krugman, 1988; Schclarek, 2004).

The research addresses the issue of the latest accumulation of public debt and its direct impact on economic conditions in the short run within the EU. The empirical evidence shows that beyond a certain threshold higher public debt lowers potential growth, which may indicate a non-linear and concave (inverted U-shape) relationship between government debt and economic growth (Cecchetti, Mohanty and Zampolli, 2011; Checherita and Rother, 2010; Clements, Bhattacharya and Nguyen, 2003; Kumar and Woo 2010; Reinhart and Rogoff 2010a; b etc.). This means that low levels of public debt enhance and at the same time increase economic growth. When debt reaches a certain level, an additional increase in its impact on economic growth may mean that it turns to negative. Although more developed countries are facing the problem of an excessive and unsustainable level of government debt, the empirical evidence on the transmission channels through which high debt is likely to have adverse effects on growth is relatively scarce.

Among recent studies, Clements, Bhattacharya and Nguyen(2003) find support for a non-linear relationship between external debt and economic growth using a panel dataset of 55 low-income countries over the time period 1970–1999. Theauthors estimated that the critical threshold turning point in the net present value of external debt is in the range of 20%–30% of GDP (considering the nominal value of external debt, the critical value is higher at around 50%).The conclusion is associated with the debt-overhang hypothesis defined by Krugman (1988), whereby after exceeding a certain level of a threshold value

debt has adverse effects on growth due to growing uncertainty to meet a country's debt servicing obligations. Altogether, this consequently has deleterious effects on investment incentives which, together with lowering the solvency of a country's repayment ability, reduces potential growth (also see Imbs and Ranciere, 2004). Similarly, Pattillo, Poirson and Ricci(2002) confirmed a non-linear, Laffer-type relationship between the level of external debt and economic growth using a large panel dataset of 93 developing countries over the period 1969–1998. The findings suggest that the key channel through which excessive external indebtedness depresses growth is via the reduced effectiveness of investments rather than the level of investment. This is consistent with other empirical studies showing that total factor productivity explains most variations in output (Checherita and Rother, 2010; Clements, Bhattacharya and Nguyen, 2003). In addition, Pattillo, Poirson and Ricci(2004) estimated that the critical value when external debt has a deleterious effect on growth is between 35–40% of GDP for the considered panel of developing countries.

A recent influential paper by Reinhart and Rogoff (2010a) analyses the impact of different levels of government debt on the long-term real GDP growth rate by considering a sample of 20 advanced and 24 emerging countries over a period of nearly 200 years (1790–2009). They obtained similar results with simple correlation statistics as previous studies, namely that below a threshold of 90% of GDP debt has a positive but weak impact on the long-term GDP growth rate, whereas the effect of debt above 90% is negative and significant. Likewise, Kumar and Woo (2010) also confirmed a nonlinear relationship between the initial level of government debt and subsequent GDP growth behaviour based on panel data of 38 advanced and emerging economics countries over a period spanning around four decades (1970–2010). To examine the effects of debt on growth in the medium and long term, the research takes into account reliable determinants of growth as well as some methodological issues like the problem of reverse causality (i.e. the potential impact of low economic growth on higher indebtedness) and the problem of endogeneity, respectively. In particular, large public debts are likely to have detrimental effects on capital accumulation, as well as productivity, which potentially produces an adverse impact on economic growth.

Further, Checheritaand Rother (2010) and Cecchetti, Mohanty and Zampolli (2011) are closely related to our research by focusing on the impact of total public debt on economic growth in advanced countries. To our knowledge, Checherita and Rother (2010) is so far the only empirical study based explicitly on data for euro area countries. Like previous studies, both studies confirm a non-linear relationship between public debt and economic growth and find a debt turning point at about 85%–100% of GDP, beyond which the debt has a deleterious effects on growth. Kumar andWoo (2010) stress a variety of channels through which high debt is likely to have adverse effects on growth, including higher long-term interest rates, higher future distortionary taxation, higher inflation, greater uncertainty and vulnerability to crises (Dobrescu, 2011).

To summarize, the existing literature on this topic shows that the relationship between public debt and economic growth is nonlinear and concave (an inverted U-shape) (Clements, Bhattacharya and Nguyen, 2003; Kumar and Woo, 2010; Reinhart andRogoff, 2010a; b etc.). This implies that public debt can either have a positive or negative effect on economic growth. Moreover, the literature review reveals that the academic literature on the effect of public debt on economic activity in developing countries is scarce and that there is a lack of consensus. In contrast with previous studies, the focus of our research is to

examine the critical threshold for public debt and its impact on economic growth in EU countries, thereby distinguishing between the 'old' and 'new' member states.

2. Methodology and Data

In order to account for the impact of the level of the debt-to-GDP ratio on the real growth rate of GDP, we employ a generalized theoretical economic growth model augmented with a debt variable. Following the estimation strategy by Checherita andRother (2010), we are particularly interested in the existence of a non-linear impact of government debt on the behaviour of GDP growth. Therefore, we use the quadratic equation in the debt-to-GDP ratio. As noted in earlier studies, the process of estimation encounters the problems of heterogeneity and endogeneity which give inconsistent and biased estimates with the pooled OLS estimator (Kumar and Woo, 2010; Pattillo, Poirson and Ricci, 2002; 2004). Namely, the regression model using pooled OLS does not account for unobserved country-specific effects that vary across countries. Thus, the result may be affected by an omitted variable bias (Pattillo, Poirson and Ricci, 2002; 2004; Yilanci, 2012). First, the solution of the heterogeneity problem could be avoided by using a fixed effects (FE) panel regression that allows us to control all time-invariant country-specific factors, whether observable or unobservable. In previous empirical studies, they corrected the problem of heterogeneity by introducing a lagged explanatory variable of the initial level of GDP per capita in a dynamic panel specification. However, the presence of a fixed effects panel estimation is likely to impose a correlation between the lagged endogenous variable and the residuals, which makes the results of the coefficient of the lagged initial level of GDP per capita negatively biased (Pattillo, Poirson and Ricci, 2004).

Second, we use an instrumental variable (IV) approach to address the problem of endogeneity resulting from the issue of reverse causality between the economic growth and level of public debt ratios. Namely, the reserve causality problem derives from the possibility that lower economic growth may lead to higher debt build ups for reasons unrelated to debt (Kumar and Woo, 2010; Pattillo, Poirson and Ricci, 2004). To account for the possibility of the endogeneity issue influencing the debt variable, among a variety of methodologies in the panel context we employ the instrumental variable (IV) estimation techniqueproposed by Checherita and Rother (2010). In particular, the estimator used in our research is the two-stage GMM estimator with instrumental variables. Following earlier studies, we implemented the lagged debt-to-GDP ratio and the lagged debt-to-GDP ratio squared as instruments (Checherita and Rother, 2010; Pattillo, Poirson and Ricci, 2002; 2004).

Thus, we employ two different models to empirically assess the impact public debt has on potential growth, thereby identifying the debt turning point, where the negative effect of public debt on growth prevails. First, the non-dynamic baseline fixed effects (FE) panel regression specification to control the heterogeneity is as follows:

$$g_{i,t} = \alpha_i + \beta \ln(GDP\ per\ capita)_t + \gamma_1 debt_{i,t} + \gamma_2 debt_{i,t}^2 + \delta X_{i,t} + \eta_i + \varepsilon_{i,t} \quad (1)$$

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

$$g_{i,t} = \alpha_i + \beta \ln(GDP\ per\ capita)_{t-1} + \gamma_1 debt_{i,t} + \gamma_2 debt_{i,t}^2 + \delta X_{i,t} + \varepsilon_{i,t} \quad (2)$$

where $g_{i,t}$ and are the annual change of GDP per capita and initial government debt as a share of GDP (note that subscripts *i* and *t* denote the country and time). Against this background, we assume a non-linear relationship between government debt and growth and thus the model is augmented with the quadratic equation in debt ($\mathbf{debt}_{it}^2$).Based on the theoretical assumption that the relationship is non-linear, we expect that the coefficient of the debt variable will be positive whereas the coefficient of the debt variable squared will be negative. This would imply that public debt at lower levels has a positive impact on growth, while at higher levels a negative impact prevails (concave functional form). In addition, represents a vector of explanatory variables to take account of the determinants of economic growth and other economic and financial factors including the initial level of GDP per capita, gross government savings as a percentage of GDP, gross fixed capital formation as a share of GDP to cover the level of investment, the population growth rate, the gross secondary school enrolment rate as a proxy for human capital, trade openness as a percentage of GDP as an indicator of an economy's competiveness, initial inflation measured as a GDP deflator, general government structural balance as a fiscal indicator to examine the impact of fiscal policy on economic growth. In this regard, we will consistently follow the core determinants associated with growth in the related literature to obtain robust results (see Sala-i-Martin, Doppelhofer and Miller, 2004; Kumar and Woo, 2010; Checherita and Rother, 2010; Clements, Bhattacharya and Nguyen, 2003). The model (1) also includes country-fixed effects η_i to control the heterogeneity for unobserved country-specific effects and the unobservable error term ε_{it}.

The empirical analysis primarily includes a panel dataset of 25 sovereign member states of the EU. Our sample of EU countries is divided into subgroups distinguishing between so-called 'old' and 'new' member states, respectively. The former subgroup includes a sample of 15 'old' member states of the EU, namely,Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom, covering the period 1980–2010. The latter sample is composed of 10 'new' EU member states, including Czech Republic, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia, Bulgaria and Romania[2], covering the period 1995–2010 since data for most of the control variables are not available before then for that subgroup of countries.

The data used for estimating both models come from various sources. Data on the levels of public debt are primarily drawn from the OECD's Economic Outlook database. For the purpose of the empirical research we used gross central government debt[3] as a percentage of GDP (henceforth "public debt"). Openness as a ratio of GDP is obtained from the Penn World Table (PWT) version 7.1 of Heston, Summers and Aten (2012). Data on government

[2]We excluded Estonia and Cyprus because comparable data were unavailable.

[3]The narrow concept of government debt at the central level based on the European System of Integrated Economic Accounts (ESA-95) covers the entire stock of direct government fixed-term contractual obligations to others outstanding on a particular date, excluding state and local government debt and social security funds. It includes marketable and non-marketable central government debt instruments, including domestic and foreign liabilities such as currency and money deposits, securities other than shares, and loans (OECD, 2010; Eurostat, 2011; IMF, 2011).

structural balances (referring to the general government cyclically adjusted balance as a share of potential GDP) is drawn from the IMF's Wold Economic Outlook database, while the real exchange rate isobtained from the European Commission's AMECO database. All other data were taken and calculated from the Word Bank's World Development Indicator (WDI) database.

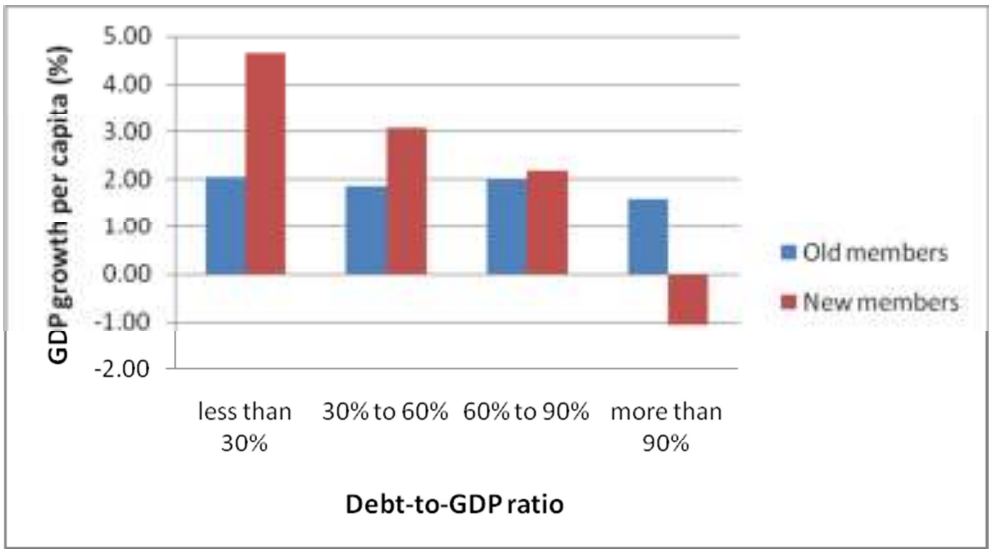
In particular, our aim is to identify the turning point beyond which the debt-to-GDP ratio has deleterious effects on growth. Given the existing literature, we expect that the threshold level will be between 80% and 100% of GDP. The available literature suggests that the critical debt-to-GDP ratio value will lie in the interval between 80–100% for 'old' EU member states and between 40–70% for 'new' EU member states, respectively. Accordingly, these hypotheses will be applied to and tested on both EU sub-regions. The obtained results will provide us with important understanding of differences in the short-term effects of public debt on economic activity in both subgroups.

3. Empirical results

Before presenting the empirical results, we provide some stylized facts that higher levels of public debt clearly have negative effects on potential economic growth in our sample of countries. Figure no. 1 provides a preliminary summary of average GDP growth rates across varying levels of public debt for a particular subgroup of countries. It follows that the annual observations are classified in four categories according to the debt-to-GDP ratio during that particular year. Referring to the interpretation in the literature, the groups distinguish the years when the debt-to-GDP ratio was at low levels (below 30%), middle-low levels (between 30% and 60%), middle-high levels (between 60% and 90%) and high levels (more than 90%) (seeReinhart and Rogoff, 2010a; b). The bars show the average GDP growth per capita rates for each of the four debt categories, thereby distinguishing between the 'old' and 'new' member states of the EU. Note that all calculations for 'old' member states cover the period 1980–2010, whereas for the 'new' member states we took the period 1995–2010. Figure no. 1 shows an obvious negative link between public debt and growth already at a lower level of debt-to-GDP ratios, especially for the subgroup comprising the new member states[4].Figure no. 1 implies that the threshold value for new member states is lower than for the 'old' member states as a group of countries. As shown below, this pattern is consistent with the results obtained using an econometric analysis.

[4]However, note that the negative effect of public debt on growth exceeding a 90% threshold presents just one observation at a particular point in time (Bulgaria), which enables us to draw a significant inference of the pattern.

Figure no.1: Relationship between GDP growth per capita and different levels of public debt for old and new EU member states



Sources: WDI, 2012; OECD, 2013; own calculations

As noted in the previous section, to evaluate the direct relationship between public debt and economic growth for our subgroup of countries, we estimated both panel growth regression models augmented with a debt variable. Specifically, we considered all potential explanatory variables in order to control the impact on economic growth. This allowed us to obtain statistically significant robust results on the short-term relationship between public debt and economic growth regarding both subgroups of countries. Thus, in addition to the debt and debt squared variable our final set of control variables in economic growth models with statistically significant coefficients is the following: GDP per capital, inflation, population growth, government total expenditures, gross fixed capital formation, lagged initial GDP per capita and government structural balance. Table no. 1 shows which control variables are included in panel regressions estimated with respect to the estimation procedure and sample of countries.

The empirical results for both subgroups of countries are displayed in (Table no. 1). Columns 1 and 2 show the estimations for the FE regression model and IV model with the GMM estimators regarding the old member states. In addition, statistically significant results for the new member states are presented in column 3. As shown in (Table no. 1) by the first-stage Shea partial R-square statistics, both instruments (the lagged levels of debt and debt squared) used in the IV estimation approach in models 2 and 3 may potentially satisfy both required conditions of instrument validity, such as that the endogenous variables are highly correlated with the instrument, and exogeneity so that the instruments are not correlated with the error term (Cameron and Trivedi, 2010; Checherita and Rother, 2010). All the coefficients of explanatory variables are in line with expectations according to economic theory(Clements, Bhattacharya and Nguyen, 2003; Checherita and Rother, 2010; Kumar and Woo, 2010;Dragos and Dragos, 2012).

Table no.1:Panel regression on 'old' and 'new' EUmember states

	Old Member States		**New Member States**
	(1) FE	(2) GMM IV	(3) GMM IV
Dependent variable	GDP growth per capita	GDP growth per capita	GDP growth per capita
ln(GDP per capita)	-1.2171***		
	(0.2439)		
Debt	0.1592***	0.0753**	0.4063**
	(0.0287)	(0.0280)	(0.1342)
Debt squared	-0.0010***	-0.0004*	-0.0038*
	(0.0002)	(0.0002)	(0.0015)
Government	-0.3242***	-0.0760**	-0.5070***
total expenditures	(0.0325)	(0.0290)	(0.0847)
Population growth	-2.1679***		
	(0.4664)		
Inflation	-0.1494***		
	(0.0275)		
Gross fixed	0.4509***	0.1252**	0.4638**
capital formation	(0.0610)	(0.0482)	(0.1422)
Lagged GDP		-0.6102*	-1.7104**
per capita		(0.2477)	(0.5443)
Government		0.2343***	
structural balance		(0.0467)	
Constant	17.0988***	6.8134*	20.5976***
	(3.3838)	(2.7791)	(4.5911)
Number of observations	342	303	130
R-squared	0.383	0.158	0.247
Shea partial R-squared:		0.89	0.75
Turning point	**79.6**	**94.1**	**53.5**

Sources: OECD, 2013; IMF, 2013; WDI, 2012; EC, 2013, own calculations

To summarize, the results across all models indicate a statistically significant non-linear impact of public debt ratios on the annual GDP per capita growth rate for the 'old' and 'new' member states included in our sample. Namely, the coefficient of the quadratic debt-to-GDP variable is negative, indicating a concave (i.e. inverted U-shaped) 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, 1999). Further, the calculated debt-to-GDP turning point[5], where the positive effect of accumulated public debt inverts into a negative effect, is roughly between 80% and 94% for the 'old' member states when we consider both models. The results are comparable with the estimated threshold values for developed countries in previous

[5]Note that we obtained it as a maximum of quadratic function.

empirical studies (Kumar and Woo, 2010; Checherita and Rother, 2010; Reinhart and Rogoff, 2010a; b etc.). For the 'new' member states the debt-to-GDP turning point is lower, namely between 53% and 54%. Therefore, we can confirm our previously stated hypothesis that the threshold value for the 'new' member states is lower than for the 'old' member states.

However, we should note that the estimated threshold values do not provide the level to be targeted to support the growth projections. In fact, 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. The obtained 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 (Cecchetti, Mohanty and Zampolli, 2010). Hence, the research may contribute to a better understanding of the problem of high public debt and its effect on economic activity in the EU. As a result, the knowledge gained could be used to tackle the problem in a timely fashion so as to preserve a stable macroeconomic environment in the future.

Conclusion

Our paper empirically explores the transmission mechanism regarding the short-term impact of public debt and growth. Weexamined and evaluated the direct effects of higher indebtedness on economic growth for EU countries which are in the epicentre of today's sovereign debt crisis. Our examination shed light on the current debt problem by identifying a possible non-linear relationship between the level of public debt and economic growth, with an explicit focus on countries that form part of the EU.

In order to account for the impact of the level of the debt-to-GDP ratio on the real growth rate of GDP, we employed a generalized theoretical economic growth model augmented with a debt variable. The process of estimation encounters the problems of heterogeneity and endogeneity which give inconsistent and biased estimates. First, the solution of the heterogeneity problem could be avoided by using a fixed effects (FE) panel regression that allowed us to control all time-invariant country-specific factors. Second, we used an instrumental variable (IV) approach to address the problem of endogeneity resulting from the issue of reverse causality (i.e. the potential impact of low economic growth on higher indebtedness) between the economic growth and level of public debt ratios.

Our results across all models indicate a statistically significant non-linear impact of public debt ratios on the annual GDP per capita growth rate for the 'old' and 'new' EU member states included in our sample. Namely, the coefficient of the quadratic debt-to-GDP variable is negative, indicating a concave (i.e. inverted U-shaped) relationship between economic growth and public debt. The 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. Further, we calculated that the debt-to-GDP turning point, where the positive effect of accumulated public debt inverts into a negative effect, is roughly between 80% and 94% for the 'old' member states. Yet for the 'new' member states the debt-to-GDP turning point is lower, namely between 53% and 54%. Therefore, we can confirm our hypothesis that the threshold value for the 'new' member states is lower than for the 'old' member states.

Nevertheless, we must point out some limitations and further avenues for research. First, our model specification was not subject to robustness tests which could confirm the validity of our results. It would also be desirable to calculate the confidence intervals for the critical threshold values and control for other potential variables. Second, we did not take the possibility of outliers in the data into account, which may bias the results. Finally, our research could be extended to determine the channels through which the impact of public debt is indirectly transmitted to growth.

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