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The Effect of Sovereign Debt on Economic Growth and Economic Development

SUMMARY: Researches focusing on the effects caused by growing sovereign debt of developed countries on economic growth gained new momentum in the past few years. One half of the empirical studies concludes that the rising debt slows down the pace of economic growth, while the other half of the analyses says this rule works only above a fix rate of the proportion of debt to GDP. Our linear regression study based on the most recent data of EU-27 countries reveals that a one percentage point increase in the debt to GDP rate causes a slowdown of 0.027 percentage point in the rate of the economic growth, while in new member states joining the EU in 2004 or later the degree of such an effect is higher (0.041 pp). However, with respect to long-term effects of public debt on economic development we realise that in the years preceding the economic crisis the 'optimal' rate of sovereign debt to GDP was 68 per cent, which has risen to 86 per cent by 2012. According to our calculations the cut in the GDP-proportionate rate of the expenditures on education sets back economic growth.¹

KEYWORDS: sovereign debt, economic growth, economic development, education, EU-27

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Theoretical economics papers studying the effect of GDP-proportionate sovereign debt on the dynamics of economic growth date back to the middle of the 20th century, with three distinctive approaches concluding different directions of the effect. The neoclassical school found that increasing public debt had a negative effect on economic growth, while according to Keynesian economics its effect is positive (during economic recession), and the Ricardian equivalence proposition assumed the effect to be neutral or irrelevant.

In the past decades, the primary focus of empirical studies in this subject was on emerging economies with a main direction into the examination of external debt in addition to sovereign debt. Only after the crisis

had reached a global scale in 2008 was more attention paid to developed economies, and in particular to the relation between public debt and economic growth in the member states of the euro area in the context of the sovereign debt crisis of the eurozone. Some of the most recently published empirical research papers have concluded that a rising debt ratio slows down economic growth (for example, Schclarek, 2004; Kumar – Woo, 2010). Nevertheless, in the relevant literature an increasing number of studies call attention to a connection, other than a linear relationship, whereby GDP-proportionate sovereign debt has an optimal ratio, greater than zero, both under and over which the rate of economic growth is lower (Reinhart – Rogoff, 2010; Checherita – Rother, 2010; Padoan et al., 2012; Égert, 2012).

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In line with researches conducted so far, our study assesses the estimated growth prospects of European Union member states for 2013–2014 using sovereign debt ratios of the period between 2008–2011, while reaching beyond the analysis of the effect on economic growth it also examines the implicit, long-term impact of sovereign debt on economic development. The significance of the latter has been noted in only a few analyses (including Caner et al., 2010), and as far as one can tell, empirical studies in the matter seem to have numerous shortcomings; therefore, one of the objectives of our paper is to fill such gaps while we also wish to call the attention of Hungarian economists to the importance of the issue. Our study, however, does not aim at analysing how economic growth impacts sovereign debt, or in other words, the examination of a system of reverse relations.

FINDINGS OF THEORETICAL APPROACHES

As we have mentioned: theoretical economics literature studying issues related to the impact of state indebtedness on economic growth may be divided into three major branches – the Keynesian and the neoclassical schools, and the position deduced from the Ricardian equivalence proposition.

BASED ON THE KEYNESIAN APPROACH, an expansive fiscal policy resulting in growing budget deficit and public debt increases the aggregate demand through the budgetary multiplier mechanism (Haavelmo, 1945; Baumol – Maurice, 1955) and hence results in a greater growth rate. Additionally, indebtedness may also lead to investments (for instance infrastructural developments) which may expand aggregate supply, as well.² It must be noted that while on the one hand Keynes suggested that the proportion

of roles assumed by the state should be increased during an economic recession to replace dropping aggregate demand, on the other hand, it is not debt and deficit which directly lead to accelerated economic growth but – as it may be concluded from the new growth theory, for instance – it is the suitably structured fiscal stimulus (expanding mainly human and other infrastructure) which results both in the deterioration of debt and deficit indicators, and in the acceleration of economic growth.

IN CONTRAST WITH THE KEYNESIAN VIEW, THE NEOCLASSICAL THEORY (Modigliani, 1961; Diamond, 1965; Saint-Paul, 1992) argues that increasing public indebtedness is indeed detrimental, because a loose fiscal policy boosts current consumption, which in turn leads to the decline of the savings rate. As a result, the interest level needs to rise, which in turn will lead to a decline in investments and a deceleration of growth.

IN CONTRAST WITH THE ABOVE TWO THEORIES, THE RICARDIAN EQUIVALENCE PROPOSITION emphasizes that indebtedness does not affect economic growth (Barro, 1989). The hypothesis proposes that at the time when fiscal stimulus takes place and thus the budget deficit is growing and government indebtedness is accelerating, market players prepare for a future period of austerity measures and tax rises, and consequently they shift their focus from consumption and investment to increasing savings, which neutralises the impact of the demand stimulating fiscal policy.

Empirical studies examining the relation between debt and growth (Schclarek, 2004; Checherita – Rother, 2010; Kumar – Woo, 2010; Égert, 2012) fundamentally agree on the specific effect mechanisms and channels (taxes, bond yields, inflation, uncertainty) through which indebtedness sets back economic growth.³ In the following, we will examine the key findings of certain studies

in the subject matter which primarily rely on cross-sectional analyses and as a consequence, generally disregard country-specific factors.

The acceleration of public indebtedness often leads to tax rises, which in turn reduces available income and savings, and ultimately results in a drop of private investments and a weakening dynamics of economic growth.

A growing debt ratio inevitably raises returns on the government securities market, as with an increasing sovereign bankruptcy risk creditors are only willing to finance the debt at higher prices. This, on the one hand, increases government interest expenditures and makes less funds available for development purposes (e.g.: for the improvement, expansion of the infrastructure, for the increase of human capital), while on the other hand, and this is of higher significance, the elevated interest rate level crowds out a part of private investments.

A relatively simple way to ‘outgrow’ public debt is through artificially boosted inflation, particularly in economies with a weak monetary authority, albeit this again adversely affects investments and economic growth.

A common feature of the instruments implemented to lower or manage the elevated debt ratio (tax rises, acceleration of inflation) is that they produce higher levels of uncertainty among investors, make the business environment less predictable, and ultimately result in the postponement of investments.

It is not a circumstance to be ignored that a rising volume of government debt limits the room for manoeuvre of anti-cyclical economic policy action, which implies that in the event of a deceleration of economic growth or a fall back into recession, the budget will only be sufficient for a lower-volume fiscal stimulus, which further deteriorates the sense of secu-

rity among economic operators and may lead to the postponement of private investments in the present.

AN OVERVIEW OF EMPIRICAL LITERATURE

Empirical studies examining the relation of debt and economic growth in developed countries gained new momentum only after the economic crisis reached a global level in 2008, as earlier the focus of such studies was on emerging economies (Kumar – Woo, 2010; Checherita – Rother, 2010; Baum et al., 2012). This was partly due to the fact that until the outbreak of the global economic crisis, public debt was not a severe, unmanageable problem in developed countries where an abundance of liquidity was available on the markets, external financing opportunities could be exploited at relative low prices, and indebted countries, with only a few exceptions, had much better credit ratings. In addition, member states of the European Union (EU) did not strictly control compliance with effective fiscal regulations (the Maastricht Criteria, Stability and Growth Pact),⁴ while welfare systems, continuously accumulating huge debts, could be easily financed from cheap market sources.

This environment, highly favourable to the accumulation of sovereign debt, fundamentally changed after 2008 when during the crisis bond markets kept ‘drying up’ for varying periods, downgrades, formerly thought impossible in credit ratings, had to be faced, and the European Union introduced increasingly stringent controls over fiscal policies.⁵ Several EU member states asked for external help (from the IMF, European Union, Russia) to ensure that their enormous and unmanageable debts (Greece) or their financing problems (Portugal,

Ireland, Hungary, Romania, Spain or Cyprus) be resolved, while other member states (Belgium, Slovenia, Italy, among others) came close to applying for international financial aids on several occasions.

Empirical works investigating the effect of debt on economic growth after the turn of the millennium may be fundamentally divided into two, significantly different groups. Some of these studies focus on linear connections, while the other approach explores, to an extent not to be ignored, non-linear mechanisms applying the threshold regression framework methodology developed by *Hansen* (1999).

The study of *Schclarek* (2004), which falls in the first category, examined a panel of 59 developing countries and 24 industrial countries with data averaged over five-year periods between 1970 and 2002. His findings revealed that a rise in external debt, and in particular the rise in external public debt, plays a major role in setting back economic growth. These findings, however, are only valid to the group of developing countries, as calculations applicable to developed economies do not support any relation between public debt and economic growth.

The estimates of *Kumar* and *Woo* (2010) suggest a 0.02 percentage point decline in the growth rate if the debt-to-GDP ratio increases by one percentage point. Their findings were concluded from a panel of advanced and emerging market economies over the period of 1970–2009. The paper revealed some evidence of non-linearity, whereby in economies with higher debt ratios the decline in economic growth is accelerated.

Panizza and *Presbitero* (2012) could not find strong evidence for the proposition of their research paper for a structural break in the negative correlation between public debt and economic growth in developed countries after studying a sample of 17 OECD countries for the period 1980–2005.

In the school examining non-linear connections, the paper of *Reinhart* and *Rogoff* (2010) is considered a milestone. The authors investigated 3,700 annual observations from a database on 44 countries (20 advanced countries and 24 emerging market economies) spanning the period of 1790–2009. They have found that in the group of advanced economies where the ratio of public debt to GDP was above 90 per cent, median growth (1.9 per cent) is 0.9–2.0 percentage points lower over the whole period than in the group of countries with a lower debt burden (with a debt ratio of 0–30, 30–60, and 60–90 per cent). Upon the examination of the data series, they also found that average growth in economies with higher debt levels is 1.3–2.0 percentage point lower (1.7 per cent). The gap was even wider in the group of emerging economies. For the period 1900–2009, median and average growth (2.9 and 1.0 per cent) was 1.5–1.6 percentage points, and 3.1–3.3 percentage points lower in countries with a debt/GDP ratio above 90 per cent than in economies with public debt of 0–30, 30–60, and 60–90 per cent. As it was a common feature of the findings across both advanced and emerging economies that there was a sharp fracture at the 90 per cent threshold, the results suggested a general correlation between growth dynamics and public debt. This was later adjusted by empirical studies, which applied a more sophisticated methodology, the threshold regression framework, mentioned earlier in several analyses.

Following the publication of the paper by *Reinhart* and *Rogoff* (2010), an increasing number of studies were prepared investigating a threshold, seen as a turning point in the impact of growing public debt on economic growth, most of which came to more or less the same conclusion. The threshold over which additional debt has a negative impact on economic growth was estimated by *Baum*

et al. (2012) for 12 euro area countries over the period 1990–2010 to be 95 per cent, by *Checherita and Rother* (2010) for the same economies over the period 1970–2011 to be between 90–100 per cent, by *Misztal* (2010) for the EU-27 over the period 2000–2010 to be 65 per cent, by *Cecchetti et al.* (2011) for 18 OECD member states over the period 1980–2010 to be 86 per cent, by *Padoan et al.* (2012) for 34 OECD member states over the period 1960–2011 to be around 90 per cent, by *Caner et al.* (2010) for 101 advanced and emerging economies over the period 1980–2008 to be 77 per cent (and 64 per cent for emerging economies), and by *Greenidge et al.* (2012) for Caribbean countries to be 55–56 per cent.

Égert (2012) warns analysts that when using the traditional linear regression methodology, we can easily find a negative correlation between the public debt ratio and economic growth, as he himself did when he reproduced the calculations of Reinhart and Rogoff (2010), with an insignificant effect of the accumulation of debt on growth. With a 10 per cent additional debt, annual economic growth declines by only 0.1–0.2 percentage points on average, which confirms the findings of Kumar and Woo (2010), while the statistical significance level shows significant variance, depending on the composition of the sample. The calculations of *Égert* (2012) conducted on a number of different samples suggest that the 90 per cent threshold does not always indicate a ceiling. In some partial samples the effect of the public debt ratio shifts and its positive correlation with economic growth turns into negative at a range of 20–60 per cent.

Numerous papers revealed not two but more fractures in the examination of the debt/GDP ratio, which supports the assumption of *Panizza and Presbitero* (2013) that the non-linear relation shall be treated in a complex

manner, and that there may as well be more than one turning points in the debt ratio. The estimations of *Greenidge et al.* (2012) for Caribbean countries for instance suggest that the impact of the debt ratio on economic growth weakens over 30 per cent, and the correlation becomes negative over 55–56 per cent. The study of *Reinhart and Rogoff* (2012) is also challenged by *Minea and Parent* (2012), claiming that the former failed to pay attention to the group of countries with a debt/GDP ratio of over 90 per cent.⁶ While the findings of *Minea and Parent* (2010) were consistent with those of *Reinhart and Rogoff* (2010) inasmuch as they found that debt damages growth in countries with debt levels between 90 and 115 per cent, they also found that the effect of the debt ratio on economic growth is positive for countries with public debt above 115 per cent (although they fail to give an explanation why), and concluded that there is a fracture in the upper range, as well.

The findings of *Presbitero* (2010) give a more subtle approach to empirical experiences: pursuant to the analysis, additional debt has a positive effect on GDP growth below a 10 per cent debt ratio, and has a negative impact between 10–90 per cent, while its effect is irrelevant over the 90 per cent threshold. This assumption is in contrast with the findings of *Reinhart and Rogoff* (2010), at least with regard to the 90 per cent threshold, but the composition of the sample was also different: in his paper, *Presbitero* (2010) focused on a panel of 92 low- and middle-income countries over the period 1990–2007, and found that in countries with inadequate institutional structures a rise in debt is detrimental, and that in emerging countries this negative impact can be statistically detected beyond a lower debt ratio of around 10 per cent.

In connection with the inverted U- or V-shaped relationship that *Reinhart and Rogoff* (2010) found to exist between the debt/

GDP ratio and economic growth, it may be noted that according to *Greiner* (2012) a debt-to-GDP ratio on the horizontal axis is fundamentally a synonym of tax rate (and claiming that he essentially points out a theoretical analogy with a Laffer-curve): a certain increase of the marginal tax rate through the expansion of community investments has an optimal impact on economic growth shown on the vertical axis, but if the tax rate is increased beyond a certain threshold, it may reduce the income of private actors to such an extent which is harmful to economic activity.

In summary of the foregoing, we should point out three assumptions. First, researches driven by the goal to identify thresholds have been gaining importance and have almost become the prevalent approach (while the nature of such studies often remains technical, lacking in-depth explanations) partly due to most recent conclusions from the experiences of the crisis and partly due to the refinement of analysis methods.

Second, the results of empirical literature to date clearly suggest that the thresholds identified for advanced and developing countries are different, and that such a per cent threshold is somewhat lower for emerging economies. A possible explanation may be that in developed countries those purchasing government securities may be more tolerant to the rise of the debt ratio, as such investors have already gained positive experience about the repayment of government debt, they believe in the future performance of the indebted country, they trust that the repayment of public debt remains continuous, and therefore they are more willing to lend to these countries, and to their consumption or investments indirectly, so they ultimately finance economic growth. Moreover, a relatively larger proportion of countries with a higher per capita GDP are democratic states whose institutional structure may better handle higher levels of

the debt/GDP ratio (*Beaulieu et al.*, 2012). Since in such democratic countries the system of checks and balances operating through political institutions and elections ensure a form of control over the government and is suitable for improving foreign investor confidence, indebted democratic countries may be lent funds at lower interest rates, while such countries also have much better credit ratings, which on the whole explains why the impact of the debt ratio on growth turns from positive to negative at a much higher threshold value.⁷

Third, the conclusion we may draw from the papers published to date is that the findings and robustness of the literature published in this subject matter are, pursuant to the assessment of *Presbitero* (2010), *Égert* (2012), *Panizza and Presbitero* (2013), sensitive to the size of the selected sample, the composition of the economies included in the panel, as well as to the period under review, and therefore any economy policy conclusion drawn from them shall be carefully interpreted.⁸

LIMITS OF EMPIRICAL STUDIES

When discussing empirical papers we shall challenge three areas where our empirical research may contribute to the current strand of literature. First, despite covering longer time spans the analyses focus on short-run effects (debt/GDP ratio of any given year is compared with economic growth Charts of only a few subsequent years), which implies that the impact of the debt ratio on economic development (may be reflected by per capita GDP) is not aimed to be covered in these studies. This problem of the literature has been highlighted by many (e.g.: *Dedák*, 1998; *Caner et al.*, 2010). According to *Caner et al.* (2010) if public debt stays above the optimal threshold in an economy for a few years, it

does not in itself necessarily affect economic growth adversely; nevertheless, if debt stays at elevated levels for an extended period, say for decades, it may indeed damage GDP growth and as a result of cumulative effects, economic development may also lag behind forecasts.

Another weakness of the analyses is that government securities market yields are considered constant in terms of empirical evidence, while the issue is covered in theoretical studies. Having said that, the volume of literature on the relation of debt-to-GDP ratio and yields is growing: Checherita and Rother (2010) argue that excessively high public debt may damage economic growth through rising bond yields and increasingly expensive financing. Their calculations suggest that a one-percentage point rise in the public debt ratio results in an 11 basis point increase of the long-term nominal interest rate, and a 7 basis point increase of the long term real interest rate. From the data series of 19 OECD countries over the period 1970–2004, *Kinoshita* (2006) estimated the effect to be 2–5 basis points. *Laubach's* (2010) calculations from American data do not largely differ; he estimated that the rise in the ten-year government bond yields is around 3–4 basis points. *Ardagna et al.* (2004) reviewed 16 OECD countries over the period 1960–2002 and to some extent their research led to similar conclusions when they found that public indebtedness increases long-term interest rates only in countries with above-average levels of debt.

Moreover, these studies tend to disregard the structure of debt (indebtedness for raising welfare or human capital). Within this context, after the new growth theory was introduced (Mankiw et al., 1992; Barro – Sala-i-Martin, 1995) the focus of researchers shifted towards healthcare and in particular to education. Building on this, for instance Greiner (2006) or in the Hungarian literature

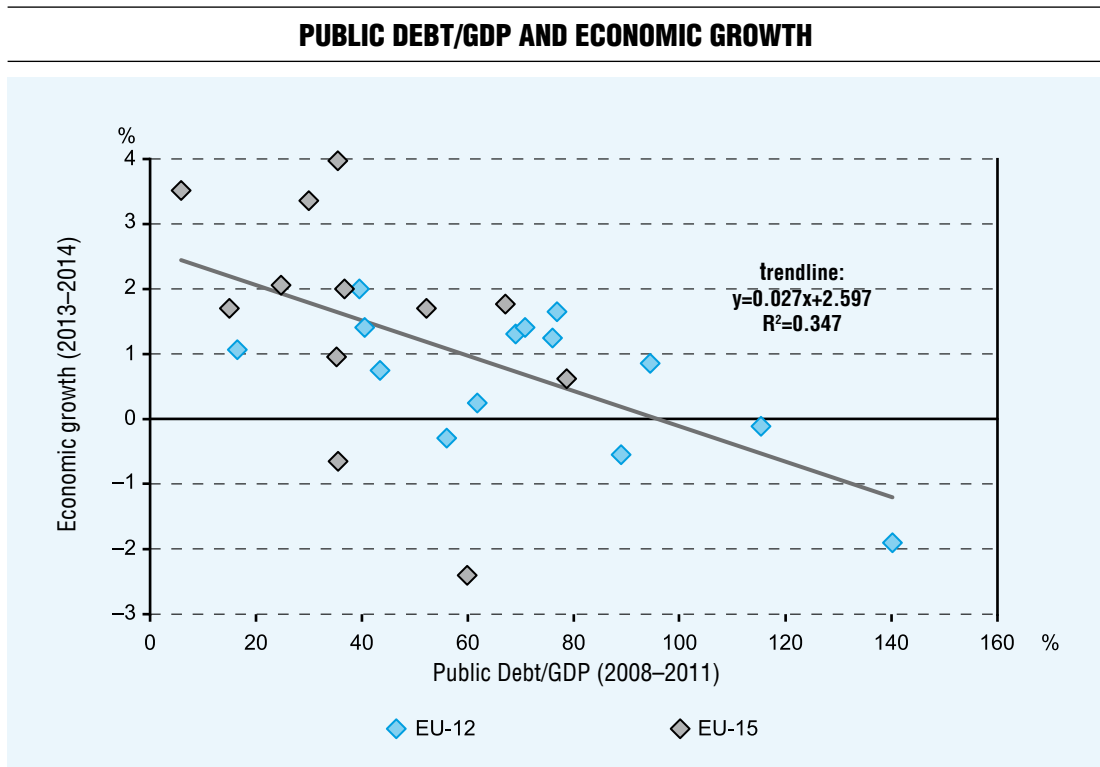
Dedák (1998) were among the first to argue that government spending on human capital may also explain the differences in the development levels of countries. The ultimate conclusion of these studies is a form of fiscal consolidation which inhibits the expansion of human capital, and adversely affects both the growth prospects and the future development level of a particular country.

Public Debt and Economic Growth

As a first step in our empirical study, we shall investigate the impact of the debt ratio on economic growth in the member states of the European Union. We based our test on the forecast growth paths of EU member states for the period 2013–2014, and public debt ratios in the period 2008–2011 released by the European Commission in February 2013.⁹ We applied mathematical averaging to both data series, in order to mitigate varying data fluctuations.

The comparison of the data of 27 member states based on linear regression for which SPSS programme was used suggests linear relations, where a one percentage point increase of the debt ratio results in a 0.027 percentage point decrease of the annual economic growth (*see Chart 1*). The t-test performed for the explanatory variable predicts that the effect of the debt ratio on economic growth is still significant at 1, 5 and 10 per cent levels.

If we break down the sample into two groups – founding members and member countries acceding the EU before 2004 (EU-15), and economies whose accession was in May 2004 or later (EU-12) – we still find a negative linear relation in both groups, but with a one percentage point increase of the debt/GDP ratio, economic growth decelerates by 0.021 percentage points in the EU-15, and by 0.041 percentage points in the EU-12. All



Source: Own calculations based on Eurostat data

of the values thus reached are close to the 0.02 percentage point value calculated by *Kumar and Woo* (2010), but they exceed the 0.01–0.02 percentage point value found by *Égert* (2012). Furthermore, our findings suggest that in former member states (in the group which includes mostly developed countries) those who purchase government securities seem to be more tolerant to public indebtedness, while in new member countries, they are more sensitive to the rise of the debt ratio.

The existence of a linear relation may imply a connection different from that in the conclusions of popular studies of recent years which focused on detecting threshold values. In addition to the different methodology applied, deviations may also be explained by the fact that we fundamentally concentrate on a short period (in contrast with most

of the studies mentioned herein) when following fiscal stimulus in several areas and an unmanageable surge in public debt in numerous countries over the first phase of the crisis, a low public debt ratio is assessed much more favourably than before by economic policy makers and investors alike, which in turn allows for cheaper financing and leads to higher growth.

AN EMPIRICAL STUDY WITH A FOCUS ON ECONOMIC DEVELOPMENT

In the following section we will examine, reaching beyond growth, what indirect effects sovereign debt levels had on economic development within the European Union over the period 2008–2011, which we will

Table 1

DESCRIPTION AND SOURCE OF VARIABLES

Variable	Unit	Source	Time scale
GDP/person	euro	Eurostat	2011
Activity rate	%	Eurostat	2008–2011
Education expenditures	education expenditures/GDP, %	Eurostat	2008–2010
FDI/GDP	foreign direct investment (inflow)/GDP, %	UNCTAD	2008–2011
Bond yield (ten-year yield, %)	ten-year government bond yield, annual average, %	Reuters	2008–2012
WEF index	competitiveness index, 1-7 scale	World Economic Forum	2012–2013
Export/GDP	%	Eurostat	2008–2012
Foreign trade balance/GDP	%	Eurostat	2008–2012
EU Export	proportion of exports to the EU, %	Eurostat	2008–2011
Government revenues/GDP	%	Eurostat	2008–2011
Public debt/GDP	%	Eurostat	2008–2011

Source: own calculations

illustrate through per capita GDP in 2011. In our work we use both linear and non-linear methods. Our starting point is the implicit assumption that economies with a higher per capita GDP could historically achieve higher average growth rates, and that the impression, the result of fiscal policies of earlier years or decades are apparent in the volume of public debt.

Linearity testing

In the first step we used the linear regression methodology to investigate some factors which affect economic development and which we tried to collect from a wide range, also relying on the findings of the new growth theory. We applied variables that can be divided into five groups (see Table 1), and which take into consideration the role of capital and labour regarding economic growth (in connection with the latter our model incorporates not only the size of the workforce

but also a variable approximating the human capital of employees), and thirdly institutions which contribute to growth as a ‘software’ component in addition to the hard growth components, and which affect the growth potential achievable from other production coefficients through ‘total factor productivity’. Our model, furthermore, incorporates variables related to the openness of countries, as well as coefficients approximating the proportion and the structure of roles assumed by the government.

We used the following linear regression estimator:

$$\text{GDP/capita} = \beta_0 + \beta_1 \times \text{activity rate} + \beta_2 \times \text{education expenditures} + \beta_3 \times \text{FDI/GDP} + \beta_4 \times \text{bond yield} + \beta_5 \times \text{WEF index} + \beta_6 \times \text{export/GDP} + \beta_7 \times \text{foreign trade balance/GDP} + \beta_8 \times \text{EU export} + \beta_9 \times \text{government revenues/GDP} + \beta_{10} \times \text{public debt/GDP}$$

We use explanatory variables on average during a period of several years partly due to a shortage of data we encountered at times, and partly to mitigate extremely high values

in certain years. Most of the independent variables are a few years earlier than the dependent variable, which is how we tried to ensure that the impacts on development (i.e. on dependent variable) may prevail. The period under review covers only a few years as our particular focus was on the effects experienced in the period of the crisis.

Prior to performing the regression test, we investigated correlations between specific explanatory variables. Of the 45 paired correlations 18 had correlation with at least 10 per cent significance level, carrying the risk of multicollinearity. It is a relatively positive result, however, that – using the rule of thumb of *Sajtos* and *Mitev* (2007) – the absolute value of the Pearson correlation coefficients exceeded the magnitude of 0.7, often considered a ceiling value, only for the coefficients of the government securities yields and the WEF index (–0.735), the GDP-proportionate foreign trade balance and GDP-proportionate exports (0.811), the FDI and the GDP-proportionate export (0.732), and GDP-proportionate government revenues and export ratio of EU markets (0.856); and it was only for the coefficient of the WEF index and the GDP-proportionate government revenues (–0.673), that the magnitude was close to the 0.7 threshold. As we are investigating in particular the impact of the reviewed factors on development, we will not disregard any of the variables, and we will perform multiple types of regressions in our test, while we will also use the condition index¹⁰ for several test phases to assess multicollinearity.

The assumptions of regression testing include the normal distribution of residuals (error terms) which is ensured by the method of ordinary least squares (OLS) in itself, as well as a constant value, in other words homoscedasticity, of the variance of residuals, which we will verify one by one. The outcome of regression runs is shown in *Table 2*. In the table

we included equations where on the one hand, the global F-test values of regression equations indicate that the strength of explanatory variables is significant at 1, 5 and 10 per cent level, and on the other hand, where the *t*-test used for the particular independent variables also indicates that the effect of such explanatory variables on economic development, tested as dependent variable, is significant at 1, 5 and 10 per cent level.

Instead of listing regression functions individually, we will focus on the roles assumed by the state, debt and government securities yields to establish the following conclusions.

■ With respect to the government revenue-to-GDP ratio as a proxy variable for the role of state, we can conclude that a one percentage point rise in revenues increases the GDP/capita ratio by EUR 785–2344. The direction of the relation may be interpreted as a result of historical development, which was contributed to, besides several other factors, by the improved efficiency of tax collection, rising social and welfare spending resulting from economic development, expenditures in relation to ageing societies, and aspects necessary for the long-term sustainability of the development level, including among others, the priority of expenditures on education and health care, as well as the related revenues. The outcome thus achieved, however, must be treated carefully: beyond a certain level excessive taxes imposed by the state divert resources from market players, jeopardising economic growth and consequently economic development in the long run. Literature is divided as to the impact of the size of the state on economic growth (*Hansson – Henrekson, 1994*) but there is more or less consensus about the structure of government spending being of higher significance than the size of the state. It is the economic policies which focus on education that can reach the

Table 2

CROSS-SECTIONAL REGRESSION ESTIMATES USING THE OLS METHOD FOR ESTIMATING PER CAPITA GDP IN 27 COUNTRIES OF THE EUROPEAN UNION, IN THE PERIOD OF 2008–2012

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)				
Constant	-67296.5*** (-6.264)	-74502.9*** (-8.862)	-84512.9*** (-4.647)	-75198.7*** (-4.333)	-78119.5** (-2.168)	-70349.6*-116673.9*** (-2.052) (-3.598)	-51172.9** (-2.369)	-35556.0* (-1.859)	-51149.9 (-1.403)	-68836.9** (-2.356)	-68806.6***-114696.1*** (-3.218) (-4.305)	-102364.5*** (-3.724)	-94916.2*** (-3.006)						
WEF index	16253.1** (-6.022)	15663.8** (-7.7554)	20315.7** (-5.349)	19899.1** (-5.438)															
Education expenditures	2309.0* (-1.722)	2794.3* (-2.701)																	
public debt_gdp		124.1*** (-4.141)			224.3*** (-3.101)	157.1** (-2.364)	133.8* (-1.824)												
bond yields					-2573.8** (-2.778)	-2339.2** (-2.559)		-1915.6** (-2.094)	-2086.9** (-2.397)	-2080.2* (-2.060)									
Foreign trade_balance_per_gdp										1172.2*** (-4.460)	1039.1*** (-4.586)								
Export_per_gdp			209.6*** (-3.355)		314.7*** (-4.25)			266.1*** (-3.979)											
Gov_revenue_gdp								2344.3*** (-3.766)	2221.8*** (-3.764)		784.8*** (-3.17)	2021.4*** (-3.331)	995.1*** (-2.991)						
EU-export_ratio								-3087.7** (-2.392)	-3071.5** (-2.471)										
Activity_rate_15_64					1190.7** (-2.771)	1285.2*** (-2.998)	1762.1*** (-4.098)			1128.8** (-2.434)	1100.7*** (-3.201)	773.7** (-2.504)	974.5** (-2.482)	1091.2** (-2.649)	1574.0*** (-3.600)				
FDI_flow				1156.4*** (-3.764)		1578.5*** (-4.429)	1874.9*** (-4.994)		1386.4*** (-4.303)	1429.5*** (-3.721)	736.4* (-2.045)	778.9** (-2.551)	1759.6*** (-5.491)	1626.4*** (-4.892)	1713.1*** (-4.483)				
R-squared	0.76	0.86	0.64	0.67	0.67	0.68	0.58	0.68	0.70	0.60	0.74	0.82	0.71	0.66	0.52				
Adjusted R-squared	0.74	0.85	0.61	0.64	0.61	0.62	0.53	0.62	0.65	0.54	0.71	0.79	0.65	0.61	0.48				
Observations	26	26	27	27	27	27	27	27	27	27	27	27	27	27	27				
Global F-test	36.166***	46.751***	21.623***	24.399***	10.956***	11.595***	10.698***	11.815***	13.044***	11.336***	22.249***	25.766***	13.320***	14.615***	13.111***				
Condition index	23.9	27.1	22.2	20.8	50.7	48	37.3	38.6	35.5	42.2	33.8	39.4	41.8	37.1	31				

Note: *F*-statistics in brackets, * = significant at 10 % level, ** = significant at 5 % level, *** = significant at 1 % level.

Source: own calculations

highest growth, while increased spending on government consumption or social transfer overall negatively influences economic growth (Hansson – Henrekson, 1994; Mo, 2007; Afonso – Furceri, 2008). These issues will be discussed in a later section on education. Relying on a different approach (Alesina – Wacziarg, 1997; Rodrik, 1998; Aiginger – Falk, 2005) we can state that an expanded government is often characteristic of less closed economies, where the larger state using a wider range of fiscal instruments develops to counteract the negative effects of economic opening, as the positive effects of the openness counterbalance the negative externalities arising from the larger size of the state and curbing economic growth. On the whole, we believe that the relation between the size of the state and economic development is not direct, therefore it would be misleading to expect that growing government revenues will result in a higher level of economic development.

■ On the basis of the regression results reviewed, a one percentage point increase in the public debt/GDP ratio increases per capita gross domestic product by EUR 124–224. This relation will be analysed again later on in this study using a non-linear method, since – as in the case of taxes imposed by the state – this outcome in itself would lead to false conclusions.

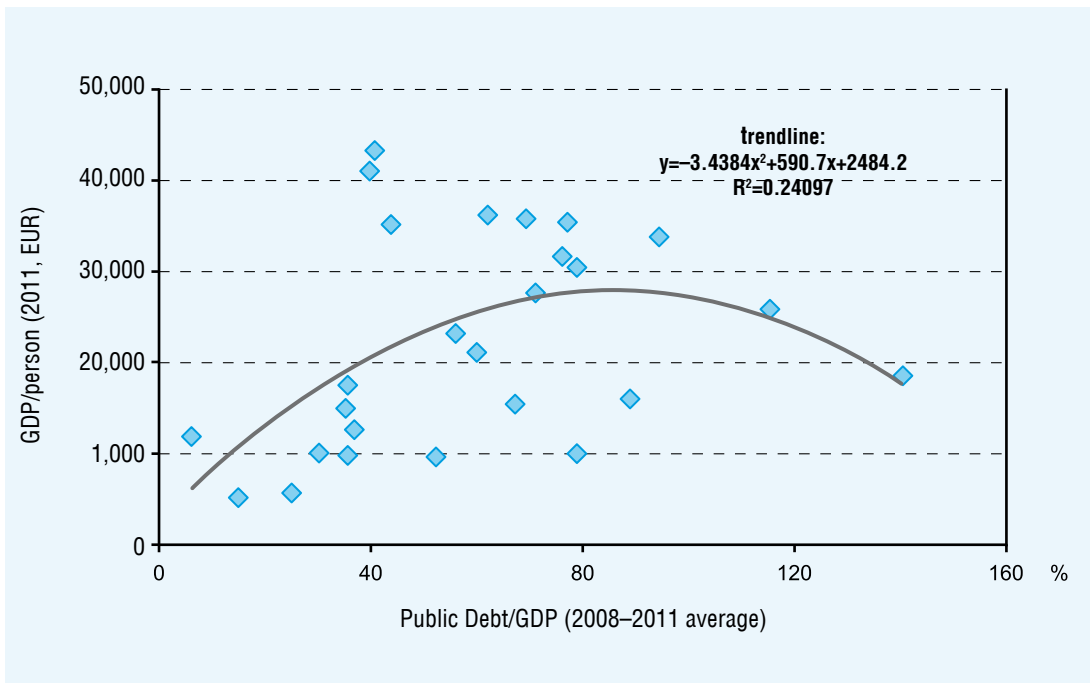
■ With respect to GDP-proportionate education expenditures, used as the proxy variable or proxy of human capital, we can conclude relying upon the regression functions at a one percentage point increase in government expenditures, spent on education in proportion to the gross domestic product, increases the per capita GDP by EUR 2309–2794. This result is in line with the assumptions of the new growth theory as well as with the latest empirical data (Gyimah-Brempong et al., 2006; Mimoun – Raies, 2009; Björnskov – Méon, 2012).

■ Based on the connection between government securities yields and economic development, the price at which the economy has access to funds seems crucial: the performed calculations revealed that a one percentage point increase in the ten-year government bond yields decreases the per capita GDP by EUR 1916–2578. This finding is fundamentally in line with the expectations: economies with stable institutions and a predictable environment have relatively easy access to credits which they can use to finance their budget and economic stimulus programmes at lower prices, which in turn facilitates higher welfare.

With respect to the assumptions we made in connection with the regression correlations, we must add several restricting comments. First, our calculations were performed on a group of relatively small size, so while it would be an obvious error to consider our conclusions relevant for economies outside the European Union, and the small number of elements also warns us to be careful when applying such conclusions to EU member countries. In the test we disregarded the currency of the public debt of countries under review as well as the proportion of their foreign currency indebtedness, and we also disregarded the differences in the range of monetary policy manoeuvres. In addition to the absence or shortage of data, the reason for this was our intention to strive for simplicity; that said, we understand that each of the disregarded factors may have serious relevance for certain economies. Neither did we intend to deeply analyse causality, so basically we relied on the assumptions of the literature whereby indebtedness affects economic growth, and as a result economic development in the long term, but we did not try to explain how economic growth and development impacts indebtedness.¹¹ We have not covered total external debt or the debt of market players,

Chart 2

PUBLIC DEBT AND ECONOMIC DEVELOPMENT*, 2011



*excl Luxemburg

Source: Own calculations based on Eurostat data

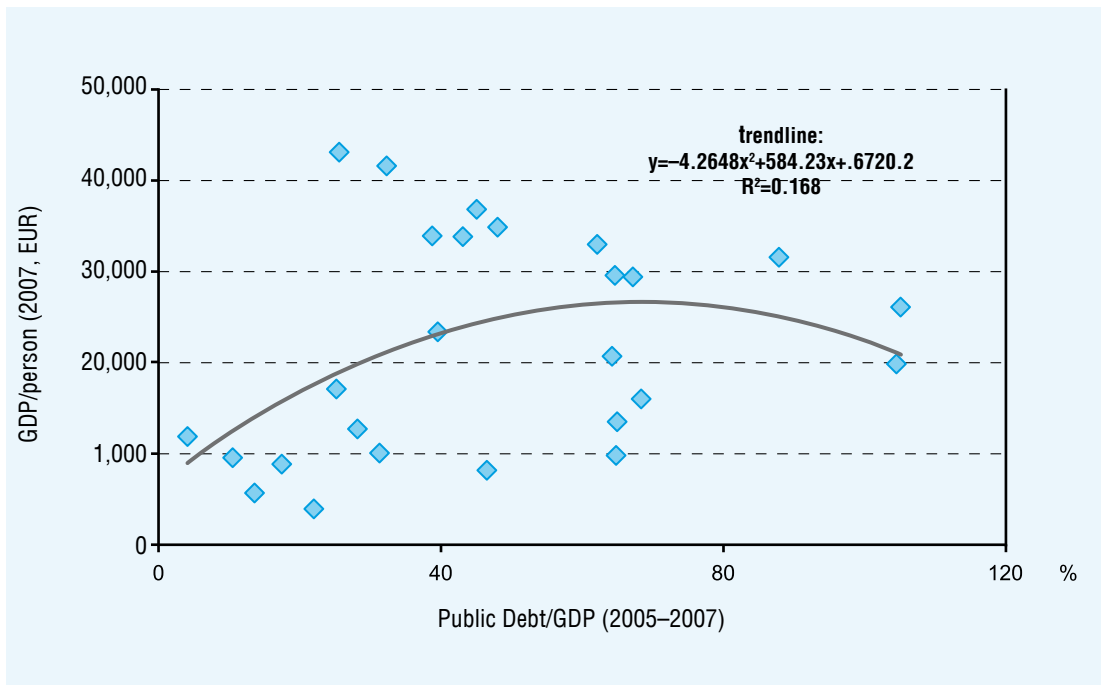
as our study aimed to answer questions specifically about public indebtedness.¹² Eventually we must emphasize again that in the foregoing we were seeking a linear relation between debt/GDP and GDP/capita data, which we will attempt to resolve in the following section.

Testing non-linear relations

A detailed investigation and graphical analysis of the correlation between the sovereign debt of EU Member States and their per capita GDP reveals that the relation of debt and development is not linear, but is similar to an inverted U-shaped curve peaking at a 86 per cent debt-to-GDP ratio (see Chart 2),¹³ which seems to be analogous with the non-linear relationship described in connection

with public debt and economic growth.¹⁴ The outcome of the test suggests that with relatively small and excessively large public debt, the per capita GDP is relatively low. Its explanation is similar to the one we gave for the effect of debt on economic growth; in other words, with a relatively low debt-to-GDP ratio, government spending on the development of human capital or the expansion of the infrastructure was proportionately low in the years, decades preceding the period under review compared to the opportunities inherent in the money market environment. Nevertheless, in the case of relatively high public indebtedness, it is excessive interest expenses which represent an increasing burden on the funding of the budget, and which ultimately get government funds diverted from areas that largely contribute to economic development.

PUBLIC DEBT AND ECONOMIC DEVELOPMENT*, 2007



*excl Luxembourg

Source: Own calculations based on Eurostat data

The non-linear trendline added to the scatter plot reveals that under an 86 per cent debt ratio, additional debt still has a positive effect on economic development, whereas in the range above this value, the impact is negative. The value thus calculated corresponds to the threshold value defined by Cecchetti et al. (2011) through a comparison of debt ratios and economic growth and does not differ significantly from the threshold estimated by Reinhart and Rogoff (2010).

A further finding of our study – which we did not analyse in greater detail – implies that non-Keynesian effects expected from fiscal adjustments are weaker under the debt range of 86 per cent and are stronger above it.

To confirm the previous results, we note that if the sample of 26 elements, excluding Luxembourg, is divided into two sets with 13 elements each, separating countries with low

public debt and those with high state debt, the relationship we see will be once again indicative of an inverted U-shaped relation, or of a connection implying a threshold value to be more exact, since the steepness of the linear curve representing the trend is positive for the first group, and is negative for the other one.

We have assessed the pre-crisis relationship between public debt ratios over the period 2005–2007 and the GDP/capita Charts for 2007 for the 27 member countries of the EU, as we were also curious to find out whether or not non-linear relations equally apply, and if they do, what is the debt-to-GDP ratio where the per capita GDP reaches the maximum value. Upon examining the trend modelled by a quadratic equation we have found again that the relation between the two variables is not linear but inverted U-shaped,¹⁵ and in this case the GDP/capita data peaked when

the public debt/GDP ratio was 68 per cent (see *Chart 3*).

The comparison of the two periods under review reveals that public debt ratios rising in most member countries as a result of the crisis¹⁶ pushed up the level where per capita GDP is peaking, and while the non-linear relation, or in more precise terms, the inverted U-shaped relation may have changed, its underlying concept has not transformed. We can also conclude that the 60 per cent public debt/GDP ratio, specified as a threshold in the Maastricht convergence criteria as well as in the Stability and Growth Pact drawn up in 1997 is close to the ideal value of 68 per cent estimated from data for the years following the turn of the millennium but preceding 2008. Accelerated government indebtedness triggered by the crisis may require some flexibility in the present and future compliance with regulations, otherwise growth, in several member states, may easily fall victim to the efforts to reduce the debt ratio to 60 per cent.

SUMMARY

The investigation of the impact of public debt on economic growth and economic development in advanced countries has been a new, yet dynamically improving field of economics, within the context of accumulating sovereign debt.

Upon examining 27 member states of the European Union, the findings of our study have revealed that additional debts are indeed detrimental to economic development (a one percentage point increase in the debt-to-GDP ratio decelerates economic growth by 0.027 percentage points). Moreover, economic growth appears to be more sensitive to rising public debt in member states which acceded to the European Union in 2004 or later (mainly post-socialist countries) than

in more developed, older member states. While linearity differs from that of empirical experiences crystallized over recent years with their focus on non-linear relationship aiming to estimate threshold values, the findings thus revealed are not unprecedented in the literature (Kumar – Woo, 2010).

Yet, our analysis of debt and economic development (still a less researched field of economics) suggested the existence of a non-linear connection which overall very well complements the literature examining the inverted U-shaped relation of debt and economic development. In the early 2000s the hypothetical threshold of the debt ratio considered to be most favourable for achieving high-level economic development was 68 per cent, the same in 2012 was 86 per cent. This implies that growth in economies which strive to reduce their debt to GDP ratio to the 60 per cent level prescribed by Brussels, may seriously fall victim to such efforts in the coming years. Findings of our study suggest that non-Keynesian effects expected from fiscal adjustments are weaker under the 86 per cent threshold and are stronger above it. Nevertheless, one should not ignore the fact that the causality relationship between indebtedness and economic development is not direct; the debt and government spending structure is rather a reflection, an intersection of the former and present economic policy path of a country, which also implies an in-depth explanation for economic development. Our calculations suggest that a rise in long term government securities yields and cuts in GDP-proportionate education expenditures have a negative impact economic development, which also indicates that the consolidation of the budget, entailing tightened education expenditures, together with the reduction of public debt seem to weaken the fundamentals of economic development in the long run.

NOTES

- ¹ I would like to offer my special thanks to Erzsébet Gém, Álmos Mikešy, Barbara Szabó-Lovas, and to the anonymous editor for their valuable comments on the study.
- ² We also note that in recent years there has been a growing number of research studies published on the examination of non-Keynesian effects of fiscal policy changes (Párkányi, 2006; Benczes, 2008). The latter is an all-encompassing term describing the effects when following a fiscal adjustment certain mechanisms (including the improving credibility of the economic policy, decreasing spreads, improving consumer expectations, positive profit outlook and the resultant acceleration of operating capital inflow) become effective simultaneously with a contraction in aggregate demand, and slow down or offset the decrease in demand, and contribute to the expansion of economic output.
- ³ A detailed overview of the relation of budgetary policy and economic growth is provided in Györfi's paper (2010).
- ⁴ When in November 2003, the Economic and Financial Affairs Council (Ecofin) provisionally ended the excessive deficit procedure initiated against France and Germany (the two largest economies of the euro area) under the provisions of the Pact, the case created a precedent and was an encouragement to other member states.
- ⁵ See for instance the downgrade of the sovereign credit rating of the United States, Great Britain and France.
- ⁶ Note that the methodological reason for that most probably lies in the fact that in accordance with our calculations only 15.2 per cent of the database for advanced economies, and merely 8.1 per cent of the database for emerging economies belonged to the group with a debt ratio of over 90 per cent, and results from breaking down this category into further segments may have weakened the relevance of the original assumptions of Reinhart and Rogoff (2010) due to a lower number of elements.
- ⁷ Within this context, we must note that some representatives of the sub-school of new political economy (e.g.: Alesina – Tabellini, 1990) recommend the implementation of certain mechanisms which could prevent overspending and strengthen the control over government finances, which could also be suitable for counterbalancing the absence of democratic controls over governments.
- ⁸ The study which stirred up the largest storm in this respect was that of Herndon et al. (2013). On the one hand, the authors found that the paper of Reinhart and Rogoff (2010) contained a careless spreadsheet calculation error, while they were also accused of using a debatable method to compile their database which could fundamentally bias and substantially reduce average growth rate in the group of countries with a debt-to-GDP ratio of over 90 per cent. In their response to the criticism Reinhart and Rogoff (2013) acknowledged that a spreadsheet error had slipped into their paper despite their best effort to be careful, but they adamantly denied the other accusations related to a manipulation of the database, and on the whole they insisted on their original conclusions about the 90 per cent public debt threshold.
- ⁹ For another aspect of the subject, see Gém et al. (2013).
- ¹⁰ According to the rule of thumb, if the condition index is over 15, it indicates a problem, while if the condition index is over 30, the independent variables are said to have significant multicollinearity (Kovács, 2006).

¹¹ For more details, see e. g.: Ferreira (2009), Kumar – Woo (2010), Panizza – Presbitero (2012), (2013).

¹² Note that the latter is also covered in literature (Checherita – Rother, 2010).

¹³ The value of R-squared is 0.0957 for a linear trendline, and 0.2409 with a quadratic equation and for an inverted U-shaped trend, which suggests that agreeing to the linear relation would be unreasonable.

¹⁴ Note that this time we excluded Luxembourg from the test, since its 16.8 per cent debt ratio and 82,100 per capita GDP, as outlier data, would weaken the assumptions we made. If we also excluded the Danish and Swedish economies both with per capita GDP of over 40 thousand euros, the value of the R-squared

with a quadratic equation would further increase (0.3908) while the threshold would grow to 93 per cent.

¹⁵ The value of R-squared is 0.0785 for the linear trendline, and 0.1680 with a quadratic equation and for an inverted U-shaped trend, which again suggests that accepting the linear relation is unreasonable. Luxembourg was once again excluded from the test, as its extremely high data would mitigate the established assumptions.

¹⁶ Between 2007 and 2011, of the 27 EU Member States only Sweden and Bulgaria succeeded in reducing their public debt to GDP ratio by 1.8 and 0.9 percentage points, respectively, while the debt ratio of the EU-27 grew by 23.5 percentage points, and its unweighted arithmetic mean increas

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