

THE IMPACT OF PUBLIC DEBT ON ECONOMIC GROWTH

Lect. Maria Letitia Andronic (Brătulescu) Ph. D
Transilvania University of Braşov
Faculty of Economic Sciences and Business
Administration
Braşov, Romania

Abstract: The general upward trend of public debt at global level is perceived to have a significant economic impact. This paper analyses the degree in which the public debt evolution in the European Union countries over the last two decades influences economic growth. The average results show moderate to low levels of correlation degrees. The modest impact between the two measures might be the consequence of the budgetary policies implemented in the EU with respect to the limits imposed to the public amounts borrowed especially in times of crises. The increased discipline in the use of public loans led to a more rigorous spending and to a more accurate analysis of the real needs bringing forward public investments. Nevertheless, the correlation in the countries with high public debts, as in the case of Greece, is more obvious, leading to the conclusion that economic recessions are also consequences of higher indebtedness levels.

JEL classification: H63, F43, E62

Key words: public debt; economic growth; correlation analysis; financial crisis; budget deficit

1. INTRODUCTION

In the economy of a country, there may be situations when the domestic financial resources are not sufficient to meet the demand. In order to solve this problem, imports of goods, services or capital are being used. In the most frequent cases, the available resources are insufficient to pay all these imports and, thus, the payment obligations appear. They will subsequently lead to the so-called indicator of indebtedness.

The main cause that generates public debt is the general government budget deficit resulted mainly from the increased costs of the economic and social actions of the Government as compared to the financial resources mobilized mainly in the form of the fiscal revenues provided by the taxpayers. Public debt's upward trend recorded in some countries brought about the need to refinance the existing debt through different forms of new loans including government bond issue.

In the opinion of Dincă and Brătulescu (2010, p. 138), the usefulness and efficiency in spending the public financial resources that lead to the creation of budgetary deficits is the real matter of concern. If a certain country invests in education, research, health or infrastructure, resulting in temporary budgetary deficits, the situation can be acceptable if the respective policies are well founded and the overall result creates better conditions for human and economic development. Nevertheless, when the countries spend money on social protection and social assistance, they have to be careful not to go over their real possibilities of offering such services and to avoid

compromising the level of competitiveness of the national products and services by the mean of higher taxes needed for funding.

Economic growth is the key factor from the perspective of human progress. The evolution of a nation is very much influenced by macroeconomic performance. Moreover, global power differences across countries are primarily due to the inequality of global economic growth. Economic growth is the process of upward evolution of economic results in a certain time and space. It is often associated both with innovation and technological change, but also with the improvement of the citizens' standard of living, offering to a nation both an increase in the living standards and a reduction of poverty. A larger production capacity generates more jobs and, therefore, more sources of income for households. As a family's income grows, family members are tempted to consume more and improve their quality of life. If the existing income needs to be redistributed, the standard of living of some individuals should decrease. However, when there is economic growth and the additional income is redistributed, a reduction in income inequality and a discouragement of social polarization are more likely to occur.

This research paper studies the correlation between public debt and economic growth of the European Union member countries and is structured into five chapters. In the introduction, a series of theoretical and conceptual aspects of the two indicators are addressed. The second section presents some of the most important papers found in the specific literature with respect to the measurement of public debt and economic growth and the correlation established between them. The paper also describes the methodological part of the analysis, underlying the steps undertaken and the formulas used to reach the objectives of the paper. After clarifying the general theoretical and methodological aspects and reviewing some of the papers found in the literature, in the next part of the paper, based on the Eurostat database, the correlation coefficient and the indebtedness levels are identified for the 1998-2017 period for the EU countries. The study is performed over 20 years to capture both the pre-crisis and post-crisis periods. Chapter five develops the main conclusions of the research paper and offers some possible alternative analysis to be addressed in future studies.

2. LITERATURE REVIEW

Economic growth models have interested economists since the classical period. Adam Smith's famous "invisible hand" still helps to harmonize particular interests with the general ones. Hence, the idea that a government that is less involved in economic activity is a better government. Adam Smith's work has transformed the economy into a modern academic science and the well-known metaphor of the "invisible hand" reinforced the belief that each person indirectly influences the economy. According to Crăciun (2012, p. 66), Adam Smith's idea may be explained by the fact that any economic agent pursuing his own purpose will also promote that of the society, being led by this "hand" that does not even exist in his direct intention. For example, on the real market, when an economic agent finds a way to reduce costs, competition is forced to try to achieve the same goal.

Being such a desired objective for each country, two economic problems arise: what are the factors which might influence economic growth and how could a country achieve a sustainable economic growth?

There are numerous approaches in the national and international literature regarding the classification and prioritization of economic growth factors. These factors were elaborated according to the possibilities of measuring the direct and indirect contribution of the budgetary and monetary policies. Depending on the degree in which

each element is involved in the process of economic growth, at global level, the factors of influence are generally classified into:

1. Direct factors: labor resources, financial resources and accumulated production equipment, information and technological factors.

2. Indirect factors: the investments made in research and development, the financial, monetary, budgetary and fiscal policies of the state, the absorption capacity of the internal market, the environment protection policy, the international exchanges etc.

In order to perceive the economic advantages of an increased economy, one should also be aware of the costs involved. The economic growth policy requires great attention in terms of the volume of expenditures. A significant volume of financial, technological and informational resources are immobilized in order to increase the social conditions, to improve the quality of life and to maintain the financial balance. The cost includes the expenses necessary to develop, design and implement the growth policy. They may refer to the legislative and institutional framework application and functioning expenses or to the expenses reflecting the implementation of different strategies and programs. In addition to these direct costs, there are also many indirect costs, called residual costs, such as the expenses caused by externalities, environmental pollution, delays in solving the challenges of the education and health systems.

With respect to the idea of achieving sustainable growth, even since 1992, during a conference of the United Nations it was stated that “the sustainable development is designed in view of reconciliation between economy and the environment, a new development path to support human progress not only in some places and for some years, but for the entire planet and for distant future” (The Brundtland Report, 1992). Sustainable economic growth is a new type of human strategy, which meets the needs of the present, without compromising the fulfillment of the future generations’ needs (Macari, 2012, pp. 27-28).

During the Great Recession and in the following years, intense public debates took place regarding the effect of the public debt on economic growth. Many researchers described the potential risk that large debts will discourage capital accumulation and reduce economic growth. This might be caused by increasing long-term interest rates, higher distorted taxation in the future, higher inflation, greater uncertainty and macroeconomic volatility. There are a number of important and influential contributions on this topic including Woo and Kumar (2015), Lof and Malinen (2014), Cecchetti *et al.* (2011) and Reinhart and Rogo (2010).

The paper of Woo and Kumar (2015) underlines that high public debt is significantly associated with slower subsequent growth. Their analysis took into consideration the last four decades and is conducted for a large panel of countries across the world. The slower capital accumulation is identified as the main factor of influence for the slowdown in labor productivity.

Although at moderate levels debt improves welfare and enhances growth, Cecchetti, Mohanty and Zampolli (2011) proved that high levels of indebtedness are damaging. Their dataset included three levels of debt: governmental, non-financial corporate and household. The observations refer to a selection of 18 OECD countries studied from 1980 to 2010 and the main results show that only beyond a certain level, debt becomes a real danger for economic growth. The threshold is around 85% of GDP for public debt and household debt and 90% of GDP for corporate debt.

Reinhart and Rogoff (2010) showed a negative correlation between sovereign debt and economic growth and argued that countries could be confronted with a considerable decline in their growth potential if the debt to GDP ratio exceeds 90%.

The paper of Dincă and Dincă (2015) also explores the relationship between the two macroeconomic variables by taking into account, on the one hand, the ratio of government debt to GDP and, on the other hand, the per capita GDP growth rate. Ten former Communist countries were studied for a period of twelve years, covering the 1999-2010 period. The authors found a statistically significant non-linear relationship between the two variables for all the countries included in the analysis, the government debt turning point being around 50%.

Nevertheless, as compared to the previous papers identified in the literature and discussed before, Lof and Malinen (2014) discovered in their study that there is no causality between debt and economic growth. After estimating the effects between the two variables in both directions, the two researchers found no evidence that high indebtedness suppresses economic growth.

In addition, Ash *et al.* (2017) provided in their paper a comprehensive assessment of the relationship between public debt and GDP growth in the postwar advanced economies and found little evidence of a negative correlation. The three economists agree that the prior papers which describe the existence of a substantial negative relationships may be the result of peculiar parametric specifications of nonlinearities or the result of the small samples used for analysis, which amplify the influence of outliers.

When comparing different countries from a sample most authors agree that a similar ratio between public debt per capita and the GDP growth has different meanings from one country to another. According to Văcărel *et al.* (2007, p. 304), the lower the degree of economic development of a certain country, the higher the burden of public debt that it has to bear.

In this research paper, in order to establish the cause-effect relationship between public debt and economic growth, the Pearson correlation coefficient analysis and a unifactorial regression model were used. To a certain extent, from a methodological perspective, the paper of Ash *et al.* inspired the current paper.

3. METHODOLOGY

For measuring the relationship between public debt per capita and the GDP growth, the correlation coefficient was first used. Data was retrieved from the Eurostat database on a yearly basis starting with 1998 until 2017 for all the current EU members (28 countries).

The absolute value of the correlation coefficient gives information about the relationship strength. The higher the value of the module, the stronger the correlation between the variables.

One of the most common formulas used to express the correlation (r) is the Pearson coefficient:

$$r = \frac{cov(PD, GDP)}{n * \sigma_{PD} * \sigma_{GDP}}$$

Where:

cov (PD, GDP) - the covariance of public debt per capita (PD) and the gross domestic product growth rate (GDP)

n - the number of years in which the variables were observed

σ_{PD} - the standard deviation of public debt per capita

σ_{GDP} - the standard deviation of the economic growth rate

The formula returns a value between -1 and 1. A correlation coefficient of 1 or closer to 1 signifies that for every positive increase in one variable, there is a positive increase in the other. A negative value and closer to -1 means that an increase in one variable brings about a decrease in the other variable. A null or very small value above or below 0 proves that an increase in the values of one indicator does not influence in a significant proportion the upward or downward evolution of the other one.

Covariance is a measure of the joint variability of two variables. It may be positive or negative according to the higher or lower degree of correspondence between the two measures. The magnitude of the covariance is not easy to interpret because it is not normalized and depends on the magnitude of each of the two indicators. Nevertheless, the correlation coefficient, which is the normalized version of the covariance, is the proper instrument to measure the strength of the linear relationship.

Covariance may be expressed using the following formula:

$$cov(PD, GDP) = \frac{\sum_{i=1}^n (PD_i - Average PD)(GDP_i - Average GDP)}{n}$$

The standard deviation is a measure of the amount of variation or dispersion of a set of values and it is expressed as the square root of its variance. A low standard deviation shows that the values tend to be close to the mean of the set, while a high standard deviation indicates that the values are spread out over a wider range.

Cărbunaru-Băcescu and Condruz-Băcescu (2014, pp, 3-4) discuss in their paper that the correlation analysis cannot prove a cause-effect link between variables. However, interdependence can be functional. The fact that two variables tend to be associated, meaning that the increase in the values of one of them tends to be accompanied by an increase of the second and vice-versa, does not prove that the first influences or has a direct effect on the second and the other way round. The qualitative analysis based on the in-depth knowledge of the nature of the variables is necessary for the correct interpretation of the correlation coefficient and intensity.

4. THE RELATIONSHIP BETWEEN PUBLIC DEBT AND ECONOMIC GROWTH

Even the most powerful and sustainable economies were affected by the last financial crisis. As a result, at the end of 2009 the EU and, in particular, the Euro Zone entered the first stage of a strong public debt crisis. If in the last decade before the crisis, most EU member states recorded debt values below the level of 65% of GDP, after 2008 the debt level increased significantly, so that in 2014 it reached an average value of about 88% of GDP.

4.1 Correlation Analysis between Public Debt and Economic Growth

Due to serious structural problems, the lack of competitiveness represented the primarily factor which led to the sharp deterioration of European public finances. The Southern European countries were the most affected countries in Europe by the crisis, their average level of indebtedness exceeding 100% of GDP starting with 2011.

Table no. 1 presents the main correlation analysis results for all the European Union countries.

Table no. 1 The correlation coefficient between public debt per capita and economic growth in the EU, 1998-2017

Country	Covariance	Standard deviation (DP)	Standard deviation (GDP)	Correlation Coefficient	R-squared
Austria	-5404.72	6275.9059	1.6910	-0.5093	25.94%
Belgium	-2445.39	4740.2167	1.3932	-0.3703	13.71%
Bulgaria	-55.56	386.3524	3.8384	-0.0375	0.14%
Cyprus	-8535.50	5159.1246	3.2154	-0.5145	26.47%
Croatia	-2600.27	2651.9447	3.1618	-0.3101	9.62%
Czech Republic	-773.20	2039.6465	2.7336	-0.1387	1.92%
Denmark	-1961.88	2392.2169	2.1810	-0.3760	14.14%
Estonia	-658.70	506.6199	5.6791	-0.2289	5.24%
Finland	-4849.08	5056.4930	3.0210	-0.3174	10.08%
France	-4517.85	6852.5080	1.4612	-0.4512	20.36%
Germany	662.47	4722.0317	2.0435	0.0687	0.47%
Greece	-19830.81	6660.2026	3.9023	-0.7630	58.22%
Holland	-3631.40	4645.4226	2.0205	-0.3869	14.97%
Hungary	-2420.93	2194.8600	2.6727	-0.4127	17.03%
Ireland	4806.77	15029.8407	6.0484	0.0529	0.28%
Italy	-3111.60	5014.6601	1.9532	-0.3177	10.09%
Latvia	-4902.77	1968.3638	5.8445	-0.4262	18.16%
Lithuania	-2350.51	1894.0541	5.2949	-0.2344	5.49%
Luxembourg	-6719.70	6842.6327	3.1165	-0.3151	9.93%
Malta	1390.42	2253.6475	2.7195	0.2269	5.15%
Poland	-337.43	1606.1598	1.4920	-0.1408	1.98%
Portugal	-4565.03	6335.6526	2.1736	-0.3315	10.99%
Romania	-82.66	1108.9198	3.7841	-0.0197	0.04%
Slovakia	-1575.65	2350.8466	3.2389	-0.2069	4.28%
Slovenia	-3205.68	4792.1917	3.2179	-0.2079	4.32%
Spain	-5368.63	5998.5162	2.5337	-0.3532	12.48%
Sweden	1795.80	1835.8191	2.4171	0.4047	16.38%
United Kingdom	-1763.80	8515.4954	1.6709	-0.1240	1.54%
EU	-1518.32	3907.0749	1.7309	-0.2245	5.04%
Euro Area (EA)	-2284.18	4716.7326	1.7736	-0.2730	7.46%

Source: data processed by the author based on Eurostat

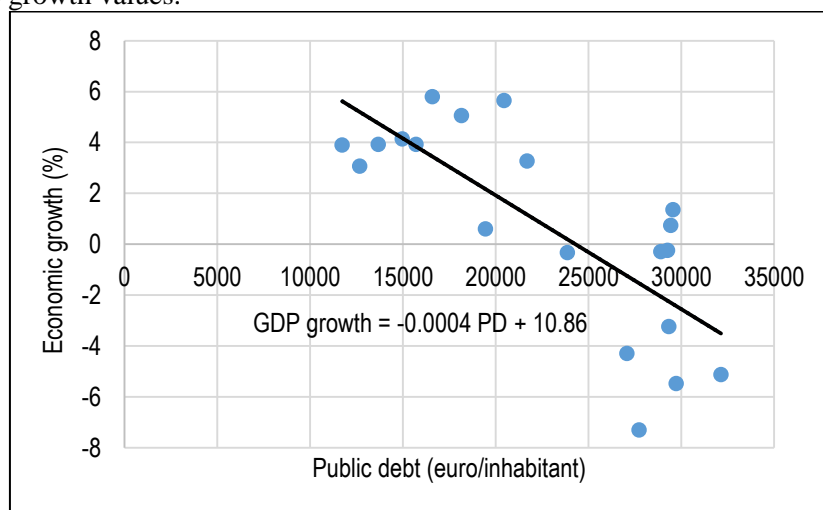
As seen in Table no. 1, most EU member states have a weak correlation between public debt per capita and economic growth.

Only 4 out of 28 countries were identified with a surprisingly positive correlation between the evolution of public debt and economic growth. If in Germany and Ireland, the above 0 coefficient is of little importance as it does not underline the existence of any relationship between the two variables, in Malta and Sweden there is a weak positive link. It might be the result of a coherent investment policy, the amounts borrowed being used more efficiently to create significant added value for the economy.

The other 24 countries prove an opposite direction evolution of the two measures, although, as mentioned before, in most states (16), the GDP growth is weakly influenced by the public debt per capita evolution. There are also 5 countries where public debt does not seem to be connected at all to the dynamics of GDP, 80% of them, namely Romania, Bulgaria, Czech Republic and Poland, belonging to the Eastern and Central part of Europe. However, in countries like Austria or Cyprus the negative bound between the variables is

more visible, while Greece is the only country characterized by a strong intensity relationship between the two indicators, the Pearson correlation coefficient being of -0.7630.

The correlation analysis presented in Figure no. 1 in the case of Greece pinpoints the existence of a strong, inverse and linear connection between the variables. Thus, the linear model is quite good, the regression trend line passing relatively close to all points of economic growth values.



Source: the author

Figure no. 1 The correlation diagram between public debt and GDP growth rate in Greece, 1998-2017

The simple correlation coefficient is not the only indicator proving the existence of a strong relationship, but also the coefficient of determination. According to Table no. 1, the linear model explains in a proportion of 58.22% the variation of the economic growth in Greece. In other words, public debt accounts for almost 60% of the GDP evolution between 1998 and 2017.

The regression equation in Greece shows that a 1% increase in public debt per capita leads to a 0.0004% decrease in GDP. If debt decreases by 1%, GDP will grow by 0.0004%. As a result of the numerous public loans made by the Greek state during 2008-2011, the level of debt per capita has increased significantly by about 10,000 euros. Greece's GDP went down by 7.3% in 2012 as compared to the previous year. The high and above 0 value of the free term reveals that the factors that were not included in the model have a positive and rather important influence on the endogenous variable, i.e. economic growth. Table no. 2 highlights the basic regression statistics.

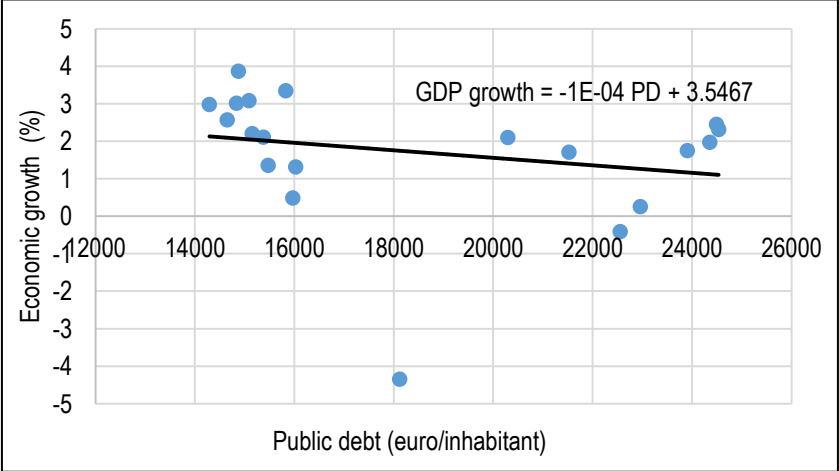
Table no. 2 Student's t-test, p-value and the confidence intervals of the regression model

	Student's t-test	p-value	Confidence intervals	
			Lower 95%	Upper 95%
Free term	5.162824945	0.000065	6.4407671	15.27942078
Public debt per capita	-5.008284902	0.000091	-0.0006346	-0.00025952

Source: data processed by the author

As the probability value is below the default level of 0.05 and the confidence intervals do not include the null value, public debt per inhabitant is considered significant from a statistical point of view and it represents a major factor of influence for economic growth in Greece.

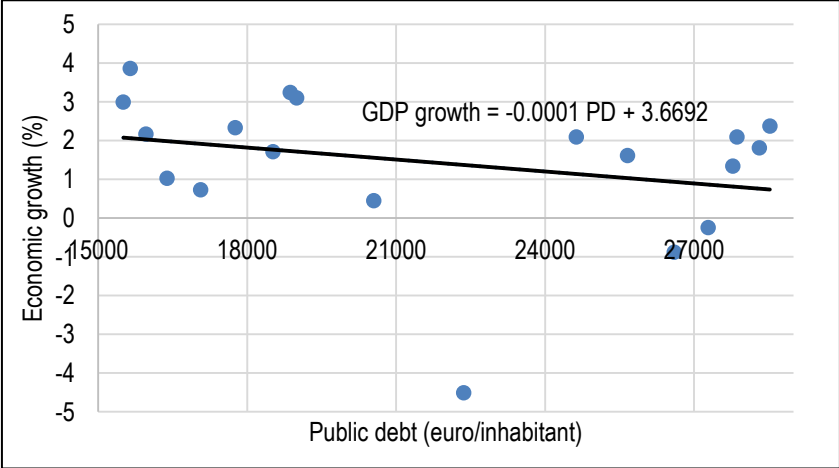
The particular case of Greece is not reflected at EU and EA level. The correlation analysis conducted for the whole EU and EA describes a very weak, but negative influence of public debt on economic growth.



Source: the author

Figure no. 2 The correlation diagram between public debt and GDP growth rate in the EU, 1998-2017

The scatter diagram correlations presented in Figure no. 2 and Figure no. 3 prove the weak linear correlation and the downward trend line for both structures.



Source: the author

Figure no. 3 The correlation diagram between public debt and GDP growth rate in the EA, 1998-2017

For many countries belonging to the Euro Zone, this weak correlation proves that economic growth has many sources of influences and depends on multiple macroeconomic evolutions. Nevertheless, keeping public debt at high levels is a source of vulnerability,

especially in EA, even though most of these countries have a developed economy. High levels of public debt make the economy less resilient to shocks and may further restrain the country's long term growth potential.

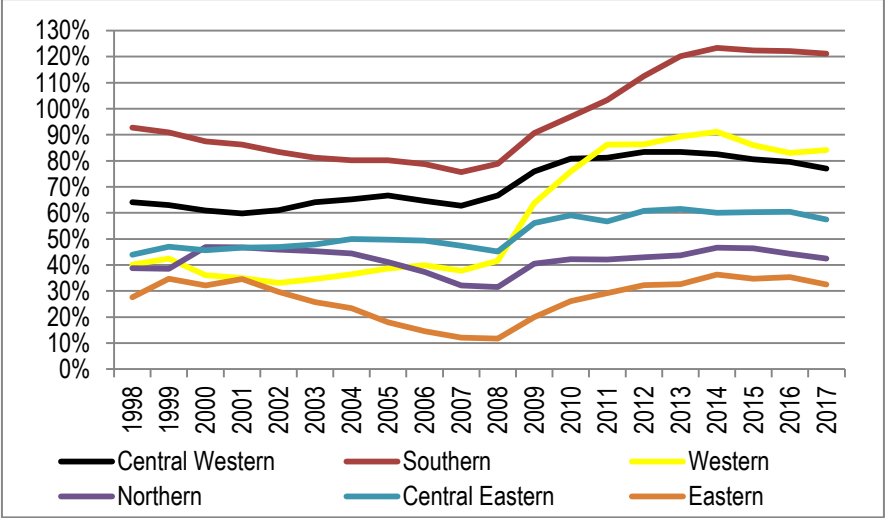
In this context, a deeper analysis regarding the indebtedness levels is necessary to create a more accurate image of the specific macroeconomic context of different (group of) countries.

4.2 The Indebtedness Level of the EU Member States

As mentioned at the beginning of sub-section 4.1, the Southern group of states, where Greece is included, is the most indebted. Throughout the whole period, the average indebtedness value of this group of six countries (Cyprus, Greece, Italy, Malta, Portugal and Spain) maintained well above the EU average. However, the ratio of public debt into GDP decreased from 1998 until 2007 by 17 percentage points, from 92.78% to 75.72%. The decrease in the amounts borrowed by the government is the result of joining the Euro Area in 1999 by Portugal, Italy and Spain and in 2001 by Greece. The states began to take advantage of this fact as a result of the disappearance of the exchange rates between national currencies. The issue of state or corporate bonds has increased after 1999 due to the significantly lower interest rates, which no longer encompassed exchange rate risk, and to the due date, which was much more permissive.

Starting from 2008, the indebtedness level of the Southern group of states had a general upward trend, so that the last five years studied were characterized by above 120% weight of debt into GDP. Such a level has doubled the limit imposed in the convergence criteria, none of these countries fulfilling anymore the Maastricht requirement. The increase in debt is due to the mismatch between revenues and expenditures, the budget deficit reaching 15% of GDP in Greece, for instance. Despite the austerity measures taken by the Greek authorities, international aid has been granted to stabilize the economic situation and prevent the spread of irrational public debt throughout the Euro Zone.

Figure no. 4 highlights the public debt to GDP ratio of the 28 countries grouped according to their geographic position in Europe.



Source: data processed by the author

Figure no. 4 The indebtedness level in Europe, 1998-2017

The Central Western European countries are also recording high indebtedness levels, with an average value of 71.17%. For this group of countries (Belgium, France, Germany, Holland and Luxembourg), the problem of taking excessive loans by the state and local authorities was not expressly generated by the global economic crisis. High values of indebtedness were encountered also in 1998 and probably before, but had been ignored. Belgium had the highest share of indebtedness of 119.02% in 1998, while Luxembourg was the state with the lowest share of debt into GDP, falling from 9% in 1998 to 7.38% in 2005, with budget surpluses averaging over 2%. Luxembourg has high income level, low unemployment and high degree of innovation; it is also the largest investment center after the United States and the most important banking center in the Euro Area.

Both the Western (Ireland and The United Kingdom - UK) and the Central Western group include countries which joined EU before 2004, most of them being also part of the Euro Zone. They are considered to be economically developed countries able to gradually reduce their deficit and to have a good management of the loans taken for investment projects which bring about economic growth. In the case of Belgium, having euro as a national currency was an advantage because the country managed to reduce its public debt ratio in GDP by about 32 percentage points until 2007. The 2009 crisis affected these countries as well, recording consistent increases of over 3 percentage points in budget deficits. The UK and Ireland, the "Celtic Tiger", were both strongly affected by the economic crisis, their average degree of indebtedness increasing by 20 percentage points in 2009 as compared to the previous year. Since 2008, both countries have entered into the procedure applicable to excessive budget deficits. The UK had a budget deficit of 10.1% of GDP in 2009 and a public debt of 90.05% of GDP in 2014, while Ireland reached in 2008 a 13.2% deficit in GDP and a 61.54% public debt ratio in GDP.

The Council of Europe issued recommendations back in 2009 referring to implementing reforms to reduce spending, to reconsidering investment priorities in line with changes in the economic environment, increasing the tax base to create more sustainable revenue streams and reforming the social security system.

The Eastern countries (Romania and Bulgaria) and the Central Eastern states (Austria, Czech Republic, Croatia, Hungary, Poland, Slovakia and Slovenia) had an average debt to GDP ratio of almost 40% for the entire period of analysis of 20 years. The average level of indebtedness of Romania and Bulgaria was of only 27.17%, while the Central Eastern group had an average level of 52.6%, with Austria and Hungary having the largest contribution. Except for Austria, all the other countries are new members of EU (joined EU in 2004 or later) and were constrained to keep their indebtedness below the limit of 60%. The reduction of foreign direct investments in Romania and Bulgaria has led to the deterioration of the financial conditions of the internal credit, to the high cost of financing the economy and to the further deterioration of the economic outlook. These elements have forced the banks to limit lending to Bulgaria and Romania. As their GDP growth was largely fueled by inflows of foreign capital, the two countries suddenly recorded a decline as they relied very much on the capital coming from outside the country. Since 2015, the percentage of public debt in GDP of the Eastern countries has recorded a downward trend due to the economic growth.

In the northern part of Europe, the average share of public debt in GDP is relatively low as compared to the other regions (except for the eastern ones). Estonia is the state with the smallest debt, registering a percentage of less than 7% between 1998 and 2007. The low degree of indebtedness was the result of the measures taken by the Estonian government which decided to cancel the taxation of reinvested profit in order to simplify

the methods of collecting taxes and stimulate investments. In Denmark, the decrease of the public amounts borrowed occurred through consolidation measures, both of the revenues and of the expenses, in particular by restricting the increase of the public consumption.

The only EU country that has reduced its public debt during the crisis was Sweden. In order to stimulate the economy, the Swedish authorities have lowered the taxes for population, cut the corporate profit tax, created new jobs and, most importantly, imposed strict limits on public spending.

5. CONCLUSIONS

The objectives of ascertaining the influence of public debt on the economy and of analysing the economic bound between public debt per inhabitant and the GDP growth rate are very important nowadays as all countries are preoccupied in identifying and implementing the right policies, especially the budgetary and monetary ones, which are absolutely necessary to reach the much desired real economic growth.

One of the most important lessons of the last financial crisis for all the states that are part of a monetary union or want to enter into such a structure is the sustainability of public debt, which is becoming an essential condition. Reducing the high public debt levels requires a menu of reforms, including further consolidation and structural reforms. Looking beyond, further institutional changes are needed to make the EU and, in particular, the European Monetary Union more resilient to future debt crises. More precisely, maintaining debt at a sustainable level depends on certain factors like: the ability of a national economy to generate primary surpluses, the interest rates of the markets where money is lent to the state and the rate of economic growth.

Economic growth is brought about not only by an increase in production capacities, but also by the activities carried out by each citizen, as individuals represent an active part of the economy. In addition, economic growth is desired in any country because it gives the population the opportunity to consume more goods and services and, at the same time, it contributes to ensuring a greater quantity and a better quality of social services like health and education, which are the basic elements for a wealthy nation.

All in all, following the correlation analysis carried out in this paper, it turned out that there is a general negative correlation between public debt and economic growth, and its size differs from state to state. It is expected that the level of indebtedness will decrease in most EU member states in 2020 as budget deficits will remain relatively constant and the nominal GDP will be higher than the average interest rate on outstanding debt. If the current social policies are maintained, the share of public debt in GDP will be reduced from 81.5% in 2018 to 80.2% in 2019 and 78.8% in 2020. As for the Euro Zone, the degree of indebtedness is expected to decrease from 87.1% in 2018 to 85.8% in 2019 and 84.3% in 2020. The EU budget deficit is projected to increase from 0.6% of GDP in 2018 to 1% in 2019 and 2020. The deficit is also expected to increase at the Euro Zone level, from 0.5% of GDP in 2018 to 0.9% in 2019 and 2020. The EU member states wishing to enter the Euro Zone (Romania, Bulgaria, Czech Republic, Croatia, Poland, Hungary and Sweden) fulfill the convergence criteria regarding the degree of indebtedness and the budget deficit, except for Hungary and Croatia which exceed the level of 60% of public debt in GDP.

Further studies might extend the analysis to other countries as well, especially from Asia and South America to explore whether in such countries the negative cause-effect relationship between public debt and economic growth is more visible. An extended

research might also refer to the number of years taken into consideration, the longer the period, the more accurate the results.

REFERENCES

1. Ash, M. Public Debt and Growth: An Assessment of Key Findings on Causality and Thresholds. UMass Amherst Economics Working Papers, 226, 2017.
Basu, D. https://scholarworks.umass.edu/econ_workingpaper/226/
Dube, A.
2. Cărbunaru- Băcescu, A. Analiza seriilor interdependente prin metoda corelației / Using the Correlation Method for the Analysis of Interdependent Series. Romanian Statistical Review - Supplement no. 2, 2014.
Condruz- Băcescu, M.
3. Cecchetti, S. G. The real effects of debt. Bank for International Settlements Working Papers, 352, 2011
Mohanty, M. S.
Zampolli, F.
4. Crăciun, L. Viitorul și noua față a economiei / The Future and the New Face of Economy. Theoretical and Applied Economics, XIX, 1(566), 65-72, 2012.
5. Dincă, G. Public Debt and Economic Growth in the EU Post-Communist Countries. Romanian Journal of Economic Forecasting, XVIII(2), 119-132, 2015
Dincă, M. S.
6. Dincă, G. The Management of Public Deficit and Debt in EU Balkan Countries. Brașov: 5th International Conference Business Excellence, 138-141, 2010
Brătulescu, M. L.
7. Lof, M. Determinants of the growth and sovereign debt correlation. VOX EU, 2014
Malinen, T. <https://voxeu.org/article/growth-and-sovereign-debt-correlation>
8. Macari, V. Sustainable and Qualitative Economic Growth and Development. Economy and Sociology, no 1, 23-33, 2012
9. Reinhart, C. M. Growth in a Time of Debt. American Economic Review: Papers and Proceedings, 100(2), 573-578, 2010
Rogoff, K. S.
10. Văcărel, I. *et al.* Public Finances, 6th edition, Bucharest: Didactic and Pedagogical Publishing House, 2007
11. Woo, J., Public Debt and Growth. *Economica*, 82(328), 705-739, 2015
Kumar, M.
12. ***United Nations The Brundtland Report: Our Common Future. Rio de Janeiro, 1992