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The Public Debt as Handicap to Economic Growth

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Abstract

The impact that public debt has on economic growth is increasingly a topic of interest and it has been since the most recent economic and financial crisis of 2008 that it has come to occupy a prominent place in the literature. In this context, it becomes extremely important to understand the impact that the increase in public debt has on the growth of economies. Thus, the purpose of this research paper is to assess the effect that debt may have on the economic growth of countries. We analyse the relation in three countries: Estonia, Greece and Portugal. Our findings suggest that the public debt of these countries don't directly affect the growth.

Keywords: Public debt; Economic growth; Correlation; Estonia; Greece; Portugal

1. Introduction

This paper aims to understand the relationship between the variables, public debt and economic growth. The economic policy of a country is designed and developed with a view to achieving sustainable economic development, reducing poverty and developing and improving infrastructure, for example. However, when revenues from this growth are not enough to cover expenses, public debt arises, to which the government is financed by creditors, such as companies, banks, among others (Dey & Tareque, 2020).

The research addresses the perspectives of various actors regarding the relationship between public debt and economic growth. Next, in the methodology, a theoretical framework of the three countries under study will be carried out and a comparison will be made in order to be able to answer the starting hypothesis: Is public debt an obstacle to the economic growth of a country?

The objective of this paper is to understand to what extent public debt can have a positive or negative impact on a country's economic growth through the comparison between public debt and real GDP.

2. Literature Review

The literature review was developed in order to understand the knowledge acquired by several authors regarding the subject to be analysed, as well as the gaps and the research contribution to the knowledge and development of the study under analysis.

Reinhart and Rogoff (2010), are responsible for the elaboration of one of the main articles analysing the evolution of public debt and the real GDP growth rate. These authors, through correlation statistics, in a total of 20 countries, concluded that at "normal" debt levels, the relationship between growth and debt seems relatively weak. However, when public debt is above 90% of GDP, the authors concluded that there is a negative correlation with GDP, thus hindering economic growth. One of the countries analysed in this study was Portugal between the years 1851 and 2009, where it was possible to verify that there is an average growth of 4.8% when debt levels are low (30%), an average growth of 2.5% when the debt is between 30 and 60% and an average growth of 1.4% when the debt level is between 60 and 90% (Reinhart & Rogoff, 2010).

According to the data presented by the European Central Bank (NA), it can be seen that public debt has increased significantly over the years and, according to Checherita-Westphal & Rother (2012), this trend has been accompanied by a growth in GDP (Gross Domestic Product).

Another study that takes into consideration the variables growth and public debt was prepared by Kumar & Woo (2010) who analysed the threshold and non-linearity achievements of the variables. The results from this study suggest an "inverse relationship between initial debt and subsequent growth after controlling for certain determinants of growth: on average, a 10 percentage point increase in the initial debt-to-GDP ratio is associated with a deceleration in annual growth in real GDP per capita of about 0.2 percentage points per year, with the impact being somewhat smaller in advanced economies." (Kumar & Woo, 2010:1). That is to say that only high levels of debt (above 90% of GDP), for emerging and developed countries, there is a significant negative effect on economic growth [(Eberhardt & Presbitero, 2015), (Kourtellos et al., 2013); (Kumar & Woo, 2010)].

According to Pattillo et al. (2011), there is a great impact of public debt on economic growth, since, high levels of public debt can contribute negatively to the development of countries, where resources from investment and other gains from productivity are used for debt servicing (Oji & Afolabi, 2022). This may lead not only to an increase in long-term interest rates, but also to higher inflation and greater uncertainty and vulnerability to crises (Kumar & Woo 2010).

Herndon et al. (2014) questioned the findings made by Reinhart and Rogoff (2010) and published a paper criticising the findings of the latter two authors. Thus, Herndon et al. (2014), found that the omission of data led to a decrease in the average GDP growth rate in countries whose public debt is high (Myronova et al., 2022). The authors carried out

an analysis for the same countries as Reinhart and Rogoff (2010), but with the appropriate corrections, where they concluded that the real GDP growth rate is 2.2% (and not -0.1% as concluded by Reinhart and Rogoff (2010)) for countries whose debt is above 90%. Regarding Portugal, these authors argue that there is a 4.5% growth when debt levels are below 30%, a 3.5% growth when debt is between 30 and 60% and a 1.9% growth when debt is between 60 and 90%.

Pescatori et al. (2014) state that there is no debt threshold that significantly compromises a country's economic growth in the medium term. The authors argue that countries with high but declining debt appear to grow as fast as countries with lower debt, thus concluding that the existing relationship between growth and public debt is influenced by the debt trajectory. They also concluded that high debt levels appear to be associated with greater volatility with respect to economic growth [(Pescatori et al., 2014); (Panizza & Presbitero, 2014a); (Panizza & Presbitero, 2014b); (Panizza & Presbitero, 2013)].

Baum et al. (2012) also studied the impact of debt on GDP growth for 12 eurozone countries, where Portugal was included. In the course of the study, these authors concluded that "the short-term impact of public debt on GDP growth is positive, but declines to close to zero and loses significance when public debt-to-GDP ratios are around 67%" (Baum et al., 2012:17). On the other hand, when public debt-to-GDP ratios are above 95%, there is a negative impact on economic growth. The authors further suggest that "the positive short-term economic stimulus from debt decreases dramatically when the initial debt level is high, and may even become negative (Bhouri, 2021). On the other hand, when the debt ratio is very high, its reduction would have beneficial effects on year-on-year growth. In the case of low debt levels, reducing debt further would tend to reduce growth in the short run (...)"(Baum et al., 2012:17).

According to Dritsaki (2013), public debt can have a positive or negative impact on a country's economic growth. In turn, this debt can positively affect the economy when it is used for projects such as investments, infrastructure, energy and the agricultural sector. On the other hand, it can also have a negative impact when it is used for private and public consumption. Dritsaki (2013) also states that in general, a lower level of public debt positively affects economic growth, but this relationship becomes negative when debt levels are high.

Through the literature review we can see that the impact of public debt on economic growth is not unanimous for the authors described above in that, for some, after a certain level of public debt, it is harmful for growth, while others state the opposite. Thus, resulting from the literature review and based on the question presented of whether public debt is a real obstacle to economic growth, the following hypotheses were defined and will be analyzed during the study:

- Hypothesis 1: Public debt negatively influences the economic growth of a country.
- Hypothesis 2: With public debt above 90% of GDP, there is a negative correlation between public debt and GDP.

- Hypothesis 3: According to Herndom et al. (2010), when public debt is above 90% of GDP, there is a 2.2% economic growth.

3. Research Methodology

Numerous authors have studied and evaluated the relevance of public debt as a handicap to a country's economic growth. However, the conclusions in real, temporal, or sectorial terms are not conclusive with the results being disparate. The same can be concluded about the acceptable or desirable value of the public debt ratio as a percentage of GDP.

In this context, this research aims to study the relationship between public debt and economic growth of three European countries (Estonia, Greece and Portugal), through GDP. Therefore, the following starting question was first identified: Is public debt an obstacle to economic growth?

The choice of European countries, Portugal, Greece and Estonia, relies on the fact that they are countries with similar monetary economy characteristics, but with quite different levels of public debt. Estonia and Greece had the most extreme levels of public debt-to-GDP ratios among European Union countries (2nd quarter 2021), while Portugal ranked 3rd, above the European average of 98.3%¹. According to data made available by the Strategy and Studies Office (2021), Greece is the European Union (EU) country with the greatest public debt as a percentage of GDP, corresponding to 207.2%. In what concerns Portugal, although it is lower, 135.4%, it is still quite high when compared with the public debt of Estonia, which has the lowest ratio of the European countries, 19.6%.

The methodology used for the elaboration of the work has as variables public debt and economic growth of the various countries through real GDP. The data for the variables identified above were taken from the European Union Statistics Office, Eurostat. The time series to be used are annual time series with finite samples. In order to understand how the variables are related, the gretl software is used to estimate numerous economic and statistical procedures. As the aim of this study is to understand the relationship between two variables, we will use the method of least squares. The time horizon for the least squares method analysis is 22 years, starting in the year 2000 and ending in the year 2021.

The method of least squares studies the relationship between two variables, one being called the dependent variable and the other the regressor. In the specific case of the study under review, we will use GDP as the dependent variable, denoted as γ , and public debt as the regressor, denoted as χ . The equation that best relates χ and γ is the following:

¹ <https://www.gee.gov.pt/pt/indicadores-diarios/ultimos-indicadores/31587-eurostat-divida-publica-zona-euro-e-uniao-europeia-20> assessed on May 2022.

$$\gamma = \beta_0 + \beta_1\chi + \varepsilon$$

The β_0 is a constant and the β_1 corresponds to the coefficient of the regressor variable χ . If β_1 is different from zero, it means that there is a relationship between the two variables.

Thus, one can see that if β_1 is positive, there is a direct relationship between GDP and public debt, since when one increases, the other also increases and vice versa. However, in theory, if β_1 is negative, the relationship could be direct or inverse, since if the sum of the constant, β_0 , and the error, ε , is greater than the modulus of $\beta_1\chi$, we are in the presence of a direct relationship, so whenever public debt increases, GDP decreases. On the other hand, if $\beta_0 + \varepsilon$ are lower than the modulus of $\beta_1\chi$, the relationship between the two variables is inverse. Whenever debt increases or decreases, GDP decreases or increases, respectively. O β_0 é uma constante e o β_1 corresponde ao coeficiente da variável regressora χ .

4. Data Analysis

Through the least squares model it was possible to see that there is a relationship between GDP and public debt in Estonia, Greece and Portugal. A significance level of 0.01 was used.

4.1.Estonia

Model 1: OLS, using observations 1-22				
Dependent variable: PIB				
	coefficient	std. error	t-ratio	p-value
const	13424.6	631.957	21.24	3.41e-015 ***
DividaPublica	2.05536	0.355108	5.788	1.16e-05 ***
Mean dependent var	16249.83	S.D. dependent var	3004.971	
Sum squared resid	70887706	S.E. of regression	1882.654	
R-squared	0.626173	Adjusted R-squared	0.607481	
F(1, 20)	33.50065	P-value(F)	0.000012	
Log-likelihood	-196.0579	Akaike criterion	396.1157	
Schwarz criterion	398.2978	Hannan-Quinn	396.6298	

Table 1: Least Squares Model applied to Estonia

As can be seen, in the case of Estonia, the coefficient of public debt is 2.05536, so it is significantly different from zero.

Estonia is the country with the lowest public debt in the EU that results from consistent fiscal policies that ensure balanced budgets and low debt. The policies adopted by Estonian governments are quite different from the ones applied in other European

countries and a clear example is taxes. In Estonia the maximum Corporate Income Tax (CIT) rate is 20% and the highest Personal Income Tax (PIT) rate is also 20%. Companies also do not pay corporate income tax for retained or reinvested earnings, which makes it really an incentive for investment and business creation. As a result, Estonia has increased GDP from 6172 million euros in 2000 to 30660 million euros in 2021. Estonia thus presents a success story of its economic and political model.

National statistics show that public debt as a percentage of GDP has been increasing over the years, but the increase is not significant. In 2021, there was the largest increase in public debt in the country, just as there was the largest increase in GDP.

4.2.Greece

Model 2: OLS, using observations 23-44 (n = 22)					
Dependent variable: PIB					
	coefficient	std. error	t-ratio	p-value	
const	243636	19619.3	12.42	7.40e-011	***
DividaPublica	-0.148413	0.0720212	-2.061	0.0526	*
Mean dependent var	204453.2	S.D. dependent var	24363.54		
Sum squared resid	1.03e+10	S.E. of regression	22673.90		
R-squared	0.175136	Adjusted R-squared	0.133893		
F(1, 20)	4.246428	P-value(F)	0.052579		
Log-likelihood	-250.8056	Akaike criterion	505.6111		
Schwarz criterion	507.7932	Hannan-Quinn	506.1252		

Table 2: Least Squares Model applied to Greece

Regarding Greece, it can be observed that the coefficient of public debt is negative and significantly different from zero, -0.148414.

To try to understand this negative relationship, it is necessary to understand the history behind the public debt and the economic growth of the country. Greece, for many years had more expenditures than revenues and in order to finance these excessive expenditures it resorted to borrowing. Problems of corruption, tax evasion and weak fiscal policy measures were also central to the increase in public debt. However, it was only with the arrival of the global financial crisis that the public debt problem became more serious.

The crisis limited Greece's access to credit and so the solution was to finance itself with other eurozone countries, which ended up further worsening its financial situation. It should be noted that Greece, of the countries that were intervened by the troika, is the one that has maintained a level of debt as a percentage of GDP greater than 100% since 2000.

An analysis of national statistics shows that public debt as a percentage of GDP until 1992 remained below 90% and in 2020 it had the highest rate, 206.3%. Over the years, the public debt has been increasing and so did the GDP until 2008. From 2008, with a GDP of 241990 million euros, it started to decrease until today, which counts with a GDP of 182830 million euros.

4.3. Portugal

Model 3: OLS, using observations 45-66 (n = 22)					
Dependent variable: PIB					
	coefficient	std. error	t-ratio	p-value	
const	169377	3445.72	49.16	2.46e-022	***
DividaPublica	0.0396734	0.0186575	2.126	0.0461	**
Mean dependent var	176157.4	S.D. dependent var	6621.349		
Sum squared resid	7.51e+08	S.E. of regression	6127.480		
R-squared	0.184392	Adjusted R-squared	0.143611		
F(1, 20)	4.521581	P-value(F)	0.046111		
Log-likelihood	-222.0201	Akaike criterion	448.0402		
Schwarz criterion	450.2223	Hannan-Quinn	448.5542		

Table 3: Least Squares Model applied to Portugal

Finally, the coefficient of Portugal's public debt, like Estonia, has a positive value (significantly different from zero) of 0.0396734.

Portugal, in order to meet the strict Maastricht criteria for joining the euro, had a clear trend in the growth of public debt as a percentage of GDP. Up to 1992 there was a decline in debt as a result of strong nominal GDP growth, as well as primary surpluses and privatisation receipts. During 1992 and 2000, the public debt showed a constant behaviour as a result of the reduction in interest rates and privatisation revenues. However, it was from 2001 onwards that the public debt increased significantly due to the weak growth of the economy and the high primary deficits. In turn, in 2010, due to the sovereign debt crisis, Portugal, due to budgetary imbalances, lack of competitiveness and high levels of unemployment, thus had to make a bailout request to the European Union, the European Central Bank and the International Monetary Fund.

Once again, an analysis of national statistics shows that public debt as a percentage of GDP was below 90% until 2009. In the following years, it has had a significant increase and today Portugal has a percentage of 127.40, with a debt of 269232 million euros and a GDP of 211278 million euros.

5. Discussion and Results

Through the least squares model, it was possible to conclude that the public debt influences in different ways the economic growth of the countries, measured through the GDP.

Taking into account the data obtained through the method of least squares, it was also possible to draw up the following table, which relates the hypotheses presented in the research methodology with the data obtained in the analysis carried out previously.

Hypotheses	Hypothesis confirmed	Unconfirmed hypothesis
H1: Public debt negatively influences the economic growth of a country.		√
H2: With public debt above 90% of GDP, there is a negative correlation between public debt and GDP.		√
H3: When public debt is above 90% of GDP, there is a 2.2% economic growth.		√

Table 4. Confirmed, unconfirmed and inconclusive hypotheses
Source: Authors

Hypothesis 1 (Public debt negatively influences the economic growth of a country) was not confirmed. As mentioned earlier in the research methodology, in theory, when the least squares method is performed and β_1 is positive, a direct relationship is expected between the variables, whenever one increases or decreases, the other also increases or decreases respectively. If the coefficient β_1 is negative an inverse relationship is expected, whenever one increases or decreases, the other increases or decreases. However, none of these relationships was confirmed. If we check the case of Portugal, which in the least squares method had a direct relationship, we realize that in the years from 2008 to 2009 there was an increase in public debt, but, however, GDP decreased instead of increasing. In Estonia we also see that, from 2009 to 2010, there was a decrease in public debt and economic growth. This means that there are other variables that were not considered in this study that have an impact on the analysis and therefore this hypothesis does not hold.

Regarding hypothesis 2 (With public debt above 90% of GDP, there is a negative correlation between public debt and GDP) it was not confirmed since the negative correlation between the two variables is not dependent on the level of public debt as a

percentage of GDP. As we can see from the above equation on the method of least squares, it is the value of public debt and other variables not analysed that determine the behaviour of GDP. As we can see from tables 2 and 3 in the appendix for Greece and Portugal, we can see that in the case of Greece, there began to be a decrease in economic growth in 2009. In that year, the percentage of debt in GDP was approximately 126% and the exact value of public debt was 301062 million euros. If we now look at the table for Portugal, we see that even with a public debt as a percentage of GDP higher than 126%, there is still an increase in GDP, that is, economic growth. In the same way that, in Portugal, in 2009, with a public debt as a percentage of GDP of 87.8%, there was a decrease in GDP. Therefore, it can be concluded that there is another factor that was not analysed in this study that influences the economic growth of a country.

Finally, hypothesis 3 (When public debt is above 90% of GDP, there is an economic growth of 2.2%) is also not verified. In the case of Greece, if we look at table 2 in annex, we see that there are years in which the public debt is above 90% of GDP and economic growth varies a lot, and has even been negative. In the case of Portugal it is exactly the same, with negative and positive values different from 2.2%.

Reinhart and Rogoff (2010), are the authors best known for their work and performance in studying the evolution of public debt and the growth rate of real GDP. These authors and many others have concluded that there is a threshold, of public debt as a percentage of GDP, beyond which public debt harms economic growth. On the other hand, other authors, such as Herndon et al. (2014), consider that there is no debt threshold that significantly compromises the economic growth of a country.

So, based on our findings is not clear that Pattillo et al. (2011) affirm that high levels of public debt can harm a country's development if its resources from investments and other productivity improvements are utilized to pay down the debt and is questionable where this has a significant influence on economic growth (Oji & Afolabi, 2022).

6. Conclusions and Limitations

This paper aims to analyse the relationship between public debt and the economic growth of three countries, Estonia, Greece and Portugal. The levels of public debt have increased considerably with the economic and financial crisis that has been felt throughout the world and to cope with this increase, the governments of the countries have had to apply various contractionary measures to stagnate this trend. Thus, it becomes fundamental to understand the behaviour of these two variables and how they interact with each other in order to mitigate the adverse effects that may arise from economic crises.

In order to try to understand the possible relationship between the variables, public debt and GDP, the method of least squares was carried out. This method was applied to the three countries under analysis where it was concluded, through the coefficient of the

variables, the existence of a relationship between both. In the case of Estonia and Portugal, this relationship is positive and in the case of Greece, the relationship is negative. This negative relationship is conditioned by the political, fiscal and economic measures developed by the governments of the countries. However, we also conclude that the direct or inverse relationship between public debt and GDP is dependent on external variables that determine economic growth.

Considering the results obtained throughout this study, the research question - Is public debt an obstacle to economic growth? - it was possible to present a conclusive answer, since it was shown that, although the public debt is related to the economic growth of a country, it is not sufficient to explain the increase or decrease of the GDP.

Finally, as future work it would be important to analyse other variables such as exports that may have a more significant impact on economic growth. On the other hand, it would also be important to analyse a larger number of countries and a longer time horizon in order to be able to draw more assertive conclusions.

Despite the effort made to go as far as possible, this research work has some limitations. One of the limitations of this study is the fact that the sample, for the use of the least squares method, is small and, therefore, does not have a long time horizon. Another limitation is the fact that the series may not be stationary, resulting in spurious regressions. Thus, it is not possible to extrapolate the conclusions to other similar situations (universe). Another very important aspect to note is that we didn't isolate the external context of these countries, so we cannot guarantee that the effects that political (international or local) decisions and other relevant variables can contribute for the effect we got in the study.

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