

# The Impact of Austerity Measures on Government Borrowing in GIIPS

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## Abstract

The article investigates the effects of austerity measures on government debt in Greece, Ireland, Italy, Portugal and Spain (GIIPS) by employing panel cointegration test and using data between 1998 and 2014. The result of empirical analysis shows that tax rate increase on personal income did not result with decrease in government debt. Interest rate and wage that are control variables are also positively related with government debt levels. The result of this empirical analysis suggests that the impact of austerity measures on government borrowing in GIIPS is positive, despite the expectations of certain economic agents.

**Keywords:** austerity measures, tax rate, government debt, GIIPS countries, panel cointegration analysis

## 1. Introduction

The USA faced with subprime crisis in 2007, which had worldwide effects by 2008. The European Union is affected by the subprime crisis via its banks. European crisis which erupted in 2009 is called 'sovereign debt' crisis because of banks' high debts to mainly private sector which became government debt after the bail out of the banks. European sovereign debt crisis first began in Greece due to government budget deficit manipulation. The crisis emanated to other Eurozone countries especially to Italy, Ireland, Portugal and Spain. The origins of the crisis are debated by scholars. Some of them claim that crisis originated from Eurozone's structural weakness (De Grauwe et al., 2015) some of them suggest that crisis started because of systemic risk of banking (Black et al., 2016). Still some state that the failure results from the lack of fiscal coordination (Chamley, 2012). Yet the crisis increased the debt of GIIPS countries, as the graph below shows.

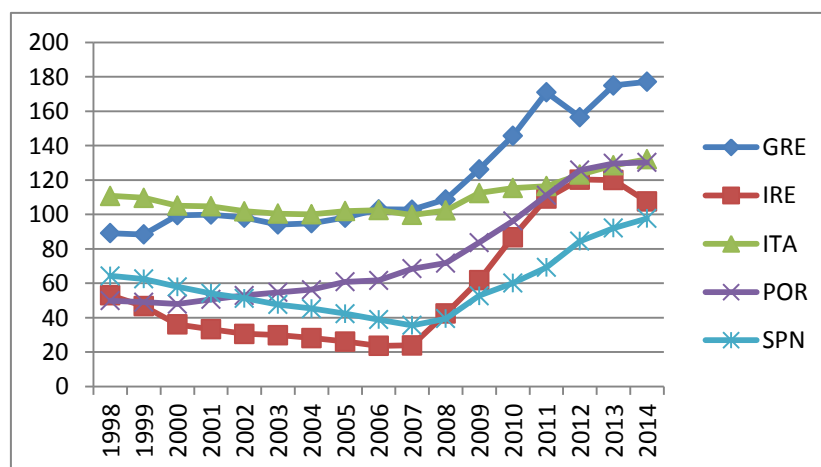


Figure 1. Debt to GDP ratio of GIIPS countries

Source: IMF Data.

GIIPS countries experienced dramatic increases in debt ratio during crisis. Ireland's debt ratio was quite low before subprime crisis in 2007 but began to increase drastically afterwards. The graph shows that Greece had the highest debt/gdp ratio after crisis. The graph also shows that Ireland succeeded to decrease debt ratio after crisis in 2013 whereas other countries could not. The other countries failed to decrease their debt ratios after the end of financial crisis.

After the eruption of the crisis, countries were forced to take measures in order to recover the economy by tightening their belts. Governments began to decrease expenditures and increase tax. These measures are called 'austerity measures' (Note 1) and they are applied by almost all European governments. Some countries applied strict austerity measures whereas some of them applied soft. For example Germany, UK and France applied austerity measures but those measures were soft and partial so measures affected only a part of the society. However austerity measures in GIIPS countries were hard and affected all parts of society. Greece made huge cuts on wages and pension expenditures after economic crisis. Austerity measures became the core issue of Greek politics after 2010 because of public's unrest. Greek personal income tax was 40% in 2009 with dramatic increase in 2010 it became 49%. The change was too dramatic in Greece. Ireland also increased its tax rate to 46% from 41% in 2008-2009 period. These examples show us that GIIPS countries made drastic changes in their tax regimes during economic crisis.

In this article we try to find the relationship between tax rate increase and government borrowing in GIIPS countries. To the best knowledge of the authors, the success of austerity measures in terms of impact on government borrowing has not been analysed empirically so far.

The rest of the paper unfolds as follows. Section 2 makes the literature review, section 3 explains the dataset and methodology, section 4 depicts the findings and discussion, section 5 concludes and makes policy recommendations.

## 2. Literature Review

There are some studies that have been carried about the effects of tax rate to economy. For example Akhmetova (2012) tries to depict if there is any connection between value added tax (VAT) and consumption. She concludes that the level of aggregate consumption is highly and negatively influenced by the increases of the effective VAT rate. She claims that if effective VAT rate increases one percent, consumption decreases by 0,81 percent. On the other hand one percent increase of personal income tax implies 6,8 percent decrease of household final consumption expense. Maşca et al. (2015) analyse the fiscal policy and growth in EU with 27 countries. They try to define the interaction between tax, consumption, transfers and real GDP. They conclude that both total taxes and taxes on labour have negative impact on growth in EU countries. According to the authors total government expenditure also have negative impact on growth.

Fiscal adjustments are useful tools to design economic activity. Fidrmuc et al. (2015) analyse short-term effects of fiscal adjustment, which implies changes on cyclically adjusted primary balance, on economic activity. Their findings demonstrate that growth responds negatively to cyclically adjusted primary balance but positively to lagged change. They claim fiscal adjustments (Note 2) have negative effect on output in the short term. Finally they state that spending based adjustments lead to smaller output losses than tax-based adjustments. This result implies that spending based policies are more useful for growth. Alesina et al. (2012) analyse effects of tax based and expenditure based fiscal adjustments (change on government revenue, expenditure) on output. Their analysis suggests that the fiscal adjustments, based upon spending cuts or tax increase decrease output but spending based adjustments are much less costly in terms of output losses. They reach the conclusion that tax-based adjustments are associated with deep and long recessions while expenditure-based adjustments are not. Alesina and Ardagna (2010) state that fiscal policies based on expenditure cuts are more effective than tax cuts to handle deficits and confine debt ratio. On the other hand according to their analysis, fiscal stimulus based on tax cuts is more effective to fight against recession.

The austerity measures are debated by scholars to see whether measures are useful or not. Krugman (2010, 2012) states that austerity is not a solution for European Union economic crisis. Expenditure cuts do not increase financial market confidence, which would help economic recovery. He asserts that if Europe imposes austerity measures it will hurt economic growth. Krugman (2012) states that on the contrary, as in the case of United States, EU should increase expenditure for economic recovery, as suggested by Keynes. Krugman gives the example of Spain to clarify why austerity measures are not essential (Note 3). Jordà and Taylor (2015), compare two sides of the austerity debate by using 'local projection' (LP) method, which is expansionary austerity as defended by Alesina-Ardagna (2010) and contractionary austerity as defended by Guajardo (2010). Their analysis consent Guajardo's study. In addition, Jordà and Taylor (2015) find that fiscal contraction prolongs the

pain when country's economy is weak but the cost is less if economy is strong. De Grauwe and Ji (2013) state that austerity programs have 'fallacy of composition' problem. They say if every country imposes austerity program at the same time it will be unsuccessful and increase the cost of program especially for the periphery countries. They claim that unsustainable debt regime of southern debtor countries will not end for years. De Grauwe (2015) tries to find relation between primary budget balance, austerity and interest rate. He says automatic stabilizers are seen as one of successful implementation during crisis times. During crisis GDP decreases while government spending increases automatically, so government debt to GDP increases. This automatic process affects the depth of the crisis negatively. De Grauwe (2015) concludes that panic induced austerity measures lessen the effect of automatic stabilizers in the government budgets in Eurozone.

As explained above, debt ratio is key factor of European economic crisis. Some scholars analysed effects of debt ratio. For example Boussard et al. (2013) simulate multiplier effect of fiscal consolidations on debt ratios. They investigate how fiscal adjustment's multiplier affects the debt ratio in EU countries. They simulate a model to define the effects of GDP multiplier to debt ratio. Their model concluded that multiplier effect is more in crisis times than normal times. And Julio et al. (2015), study relationship between fiscal adjustments (revenue based package and expenditure based package) and debt ratio, GDP, inflation and snowball effect in Euro area by using Dynamic Stochastic General Equilibrium (DSGE) model. Their findings suggest that fiscal consolidation effort in financial crisis times, to bring public debt to GDP ratio down is not effective. This effort on the contrary increases output losses with the increase of risk premium in the short term. On the other hand, fiscal consolidation efforts may decrease government debt to GDP ratio however, that results with large output losses, unfavourable budgetary and economic conditions. They point out that their finding cannot be generalized to the larger economies or to whole Euro area because the interest rate change and trade channels could be different in larger economies.

Even though there are some studies that are carried about the effects of fiscal adjustments on economy, the lack of empirical analysis on the impact of austerity measures on government borrowing renders the empirical analysis indispensable.

### 3. Methodology

In this study data for Greece, Ireland, Italy, Portugal and Spain, which are referred as GIIPS countries, are used. These countries are selected as they have applied austerity measures to decrease budget deficit and debt. This study tries to find out if austerity measures are useful tools to decrease government debt ratio in GIIPS countries.

Annual data is used from 1998 to 2014 (Note 4). We collect government debt to GDP data from IMF, tax rate (Note 5) of countries from the dataset of European Commission, interest rates from Eurostat and wages (Note 6) from OECD. Interest rate is long-term interest rate of 10 year bond rates which is also referred to as Maastricht bonds.

In terms of methodology first we employed Im-Pesaran-Shin (IPS) (Im et al., 2003) and Levin-Li-Chun (LLC) (Levin et al., 2002) panel unit root tests to detect if the data is stationary or not. The null hypothesis of IPS test is 'unit root' which means if we reject the null hypothesis, data is stationary and if we fail to reject the null hypothesis, data is unit root.

The second step of our methodology is a panel cointegration test. The most applied and prevalent cointegration test is Pedroni test. Pedroni (1999) names seven panel cointegration statistics. Basically, it employs four panel statistics and three group panel statistics to test the null hypothesis of no cointegration against the alternative hypothesis of cointegration. In the case of panel statistics, the first-order autoregressive term is assumed to be the same across all the cross sections, while in the case of group panel statistics the parameter is allowed to vary over the cross sections. The heterogeneous panel cointegration test advanced by Pedroni (1999, 2004) is performed as follows:

$$y_{it} = \delta_{0i} + \delta_{1i}t + x'_{it} \beta_{1i} + e_{it} \quad i=1, \dots, N \text{ and } t=1, \dots, t \quad (1)$$

where;

t is the number of observations over time and N is the number of individuals in the panel. The seven tests that are suggested by Pedroni (1999) are explained below;

The panel v-statistic:

$$T^2 N^{3/2} Z_{\hat{\theta}N,T} \equiv T^2 N^{3/2} \left( \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{1i}^2 \hat{e}_{i,t-1}^2 \right)^{-1} \quad (2)$$

The panel  $\rho$ -statistic:

$$T \sqrt{N} Z_{\hat{\rho}N,T} \equiv T \sqrt{N} \left( \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{1i}^2 \hat{e}_{i,t-1}^2 \right)^{-1} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{1i}^2 (\hat{e}_{i,t-1} \Delta \hat{e}_{it} - \hat{\lambda}_i) \quad (3)$$

The panel t-statistic (non-parametric):

$$Z_{tN,T} \equiv \left( \hat{\sigma}_{N,T}^2 \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{1i}^2 \hat{e}_{i,t-1}^2 \right)^{-1/2} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{1i}^2 (\hat{e}_{i,t-1} \Delta \hat{e}_{it} - \hat{\lambda}_i) \quad (4)$$

The panel t-statistic (parametric):

$$Z_{tN,T}^* \equiv \left( \hat{s}_{N,T}^{*2} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{1i}^2 \hat{e}_{i,t-1}^{*2} \right)^{-1/2} \sum_{i=1}^N \sum_{t=1}^T \hat{L}_{1i}^2 (\hat{e}_{i,t-1}^* \Delta \hat{e}_{it}^*) \quad (5)$$

The group  $\rho$ -statistic:

$$T N^{-1/2} \tilde{Z}_{\hat{\rho}N,T-1} \equiv T N^{-1/2} \sum_{i=1}^N \left( \sum_{t=1}^T \hat{e}_{i,t-1}^2 \right)^{-1} \sum_{t=1}^T (\hat{e}_{i,t-1} \Delta \hat{e}_{it} - \hat{\lambda}_i) \quad (6)$$

The group t-statistic (non-parametric):

$$N^{-1/2} \tilde{Z}_{tN,T-1} \equiv N^{-1/2} \sum_{i=1}^N \left( \hat{\sigma}_i^2 \sum_{t=1}^T \hat{e}_{i,t-1}^2 \right)^{-1/2} \sum_{t=1}^T (\hat{e}_{i,t-1} \Delta \hat{e}_{it} - \hat{\lambda}_i) \quad (7)$$

The group t-statistic (parametric):

$$N^{-1/2} \tilde{Z}_{tN,T}^* \equiv N^{-1/2} \sum_{i=1}^N \left( \sum_{t=1}^T \hat{s}_i^{*2} \hat{e}_{i,t-1}^{*2} \right)^{-1/2} \sum_{t=1}^T (\hat{e}_{i,t-1}^* \Delta \hat{e}_{it}^*) \quad (8)$$

The null hypothesis of Pedroni (1999) is 'no cointegration' which means that if we reject null hypothesis we may conclude that there is cointegration between government debt, inflation, tax rate and wage. The panel cointegration test proposes that there is long run relationship between variables.

As the third step we apply Fully Modified Ordinary Least Squares (FMOLS). Pedroni(1999) proposed FMOLS estimator suggested by Philips and Hansen (1990) to get estimates for homogenous cointegration vector. There is a common value for the cointegrating vector in the null hypothesis of FMOLS. The alternative hypothesis of FMOLS the cointegrating vector needs not to be common. We use FMOLS test to get coefficients of panel cointegration test. The FMOLS test is formulated as;

$$\hat{\beta}_{ij} = \frac{1}{N} \sum_{i=1}^N \hat{\beta}_{ij} \quad (9)$$

Where  $\hat{\beta}_{ij}$  is the FMOLS estimator.

To analyse the effects of austerity measures on countries we suggest a model that consists government debt, interest rate, personal income tax rate and wage. The panel cointegration test allows for cross-sectional interdependence with both different individual effects and deterministic trends and can be defined as:

$$Govdebt_{it} = \alpha_{it} + \delta it + Int_{it} + Taxrate_{it} + Wage_{it} + \epsilon_{it} \quad (10)$$

where  $i = 1, \dots, N$  represents the panel member,  $t = 1, \dots, t$  refers to the time period, Govdebt represents the total government debt to GDP ratio, Int represents the long term interest rate, Taxrate represents the personal income tax rate and wage represents the average wage of citizens in GIIPS countries.

#### 4. Results and Discussions

In this study we employ long-term interest rates, tax rates and wages as regressors of GIIPS countries' government debt. We use IPS and LLC unit root test to analyse whether these data are unit root or stationary. The result of IPS and LLC unit root test is shown at Table 1 below.

Table 1. Unit root tests

	- 95%CI			
	IPS Test		LLC Test	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
GOVDEBT	0.22791 (0.5901)	0.48226 (0.6852)	-1.45954 (0.0722)	-2.44668 (0.0072)
INT	-1.97094 (0.0244)	1.51759 (0.0646)	-0.85773 (0.1955)	0.03868 (0.5154)
TAXRATE	2.28145 (0.9887)	2.28270 (0.9888)	2.15665 (0.9845)	-0.55853 (0.2882)
WAGE	-0.83587 (0.2016)	0.85143 (0.8027)	-1.25545 (0.1047)	-0.04987 (0.4801)

Source: own calculations.

Note. The values shown in brackets are p values.

We fail to reject the null hypothesis of unit root, since the probability values given in the brackets are higher than % 5 significance level. After we find out that the data are unit root then we can employ cointegration test.

Table 2. Pedroni Cointegration test

Tests	95%CI	
	Pedroni Cointegration Test	
	Statistic	Probability
Panel v-statistic	2.830631	0.0023
Panel rho-statistic	1.424112	0.9228
Panel pp-statistic	-2.040941	0.0206
Panel ADF-statistic	-2.949116	0.0016
Group rho-statistic	1.916742	0.9724
Group PP-statistic	-8.831564	0.0000
Group ADF-statistic	-3.725730	0.0001

Source: own calculations.

Table 2 shows that we reject the null hypothesis of no cointegration because five of seven statistics are below % 5 significance level. It means that there is cointegration between the variables defined as GOVDEBT, INT, TAXRATE and WAGE. After detecting cointegration, we employ FMOLS test in order to find out coefficients. The results of FMOLS test are shown at table 3 below.

Table 3. FMOLS test

Variable	95%CI		
	Coefficient	t-Statistic	Prob.
INT	1.209160	2.966259	0.0043
TAXRATE	1.747501	3.260033	0.0018
WAGE	0.001854	1.746917	0.0856

Source: own calculations.

Note.  $R^2=0.97$ .

The results imply that interest rate and tax rate positively and significantly affect government debt in GIIPS countries at 95% confidence level. In parallel to our expectations we found out that increases in interest rate automatically impacts the level of government debt. Our second anticipation was that tax rate increase causes lower government debt. However in GIIPS countries we find out that personal income tax increases cause government debt increases. Wage increase does not affect government debt at 5% confidence level but it affects positively the government debt at 10% confidence level. Results concerning wages are also consistent with our expectations since governments may finance wages of workers with debt.

Tax increase has not decreased government debt so we could say that tax increase did not result with decrease of government debt. Our analysis shows that Krugman's (2012) suggestions about the nonusefulness of austerity measures as a solution for economic crisis in Europe is to a certain extent proven empirically.

## 5. Conclusion and Policy Implications

Austerity measures effected people's daily life in Europe and effects of austerity measures on government debt levels have not been so far analysed. We analysed the effects of personal income tax increase, interest rate increase and wage increase to government debt to GDP ratio by panel cointegration test. Empirical findings show that there is a positive relationship between tax, interest rate and wage increase with government debt increase. This means that the tax increase did not decrease government debt level, as one would have predicted.

Fiscal measures, besides monetary policy, are important policy tools to overcome economic crisis. Fiscal measures concern tax and expenditure regime. Despite the fact that IMF and ECB forced GIIPS countries to apply hard austerity measures, our empirical analysis show that increasing tax and decreasing wage do not effect government debt negatively.

The result of our analysis suggests that austerity measures should be revised for low indebtedness of GIIPS countries. Sometimes fiscal adjustments do not end up with intended results. Austerity measures applied by GIIPS countries are a good example of this, as tax increase did not cause a decrease in government debt.

Policy makers should take into consideration that traditional policies, which are applied by problematic countries, do not always end up with good results. Our analysis shows that application of austerity measures end up with high indebtedness of governments. The results of empirical analysis suggest that GIIPS countries should not have increased their personal income tax in the context of austerity measures. It seems increasing personal income taxes is not an appropriate decision to lower government debt since austerity measures cause low growth, which in return decrease the tax collected.

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## Notes

Note 1. Austerity measures consist of reducing government expenditures including welfare payments, reducing wage of government employees, decreasing pension payments, increasing personal and corporate tax etc.

Note 2. There are two type of fiscal adjustments spending based and tax based. Spending based means changes on government spending. Tax based consists tax rate change.

Note 3. Krugman examples Spain because Spain did not have high debt ratios before crisis.

Note 4. 2015 data could not be used because of lack of available.

Note 5. Tax rate is defined as personal income tax rate.

Note 6. Wage data is used in Euro for constant prices in 2014.

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