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The Recent Dynamics of Public Debt in the European Union: A Matter of Fundamentals or the Result of a Failed Monetary Experiment?

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ECONOMICS AND MANAGEMENT

The Recent Dynamics of Public Debt in the European Union: A Matter of Fundamentals or the Result of a Failed Monetary Experiment?

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Abstract

The idea that the present euro-zone sovereign debt crisis was caused by structural weaknesses degenerating into fundamental macroeconomic imbalances in the peripheral countries prevails among economists and politicians alike. We use quarterly data from 2000 to 2011 from the 27 European Union countries to uncover the main factors explaining the debt to GDP ratio dynamics. We also examine three possible determinants of that crisis: *i*) weak fundamentals; *ii*) inappropriate fiscal policies adopted by the governments at the beginning of the crisis; *iii*) unfavorable debt dynamics due to a sharp GDP contraction, coupled with substantial increases in the interest rates on government bonds. Except for the current account to GDP ratio, we fail to find any significant relationship between the fundamentals prior to the financial crisis, and the ensuing dynamics on both public debt to GDP, and interest rates on government bonds. We also reject any association between the initial fiscal policy response to the crisis and the following debt crisis. We conclude that the immediate explanation for the adverse debt dynamics unraveling after 2007 was the sharp GDP contraction which, in turn, induced unfavorable expectations by creditors causing higher interest rates charged on peripheral countries' debt and a liquidity crisis.

Keywords: eurozone; macroeconomic imbalances; sovereign debt crisis

JEL Classification: H2, H5, H6

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1. Introduction

The peripheral euro-zone countries are going through a most severe crisis in their public finances. Greece, Ireland and Portugal have already been intervened by the European Commission, the European Central Bank (ECB), and the International Monetary Fund (IMF), following a sharp increase in their sovereign bonds' yields. On the other hand, in the financial markets investors show increasing doubts about the ability of Spain and Italy to go on without a similar intervention.

From the first quarter of 2000 to the second quarter of 2008, the data shows that the debt to GDP ratio fell in most of the European Union countries, most probably as an outcome of the Treaty of Maastricht (see Figure 1 and 2). In spite of a high average initial debt to GDP ratio, Portugal, Ireland, Italy, Greece and Spain, also experienced that same downward movement as a group (see Figure 1). Actually, there was a sharp reduction of the public debt to GDP ratio in Spain, Ireland, and also in Greece, a downward trend with some ups and downs in Italy; whereas in Portugal there is no downward trend and the best one observes is a stabilization of the variable between 2005 and the public assertion of the crisis, after an upward trend dating back from 2000 (see Figure 2). In addition, the growth of the public debt to GDP ratio after 2007 is not a phenomenon limited to the peripheral countries, but rather an international event observed in many EU economies, however, without the same repercussions (see Figure 2). In the period from the second quarter of 2008 to the second quarter of 2011, on average in the EU, sovereign debt went from 42.76% of the GDP to 63.20% (see Figure 1), whereas the primary surplus to GDP ratio decreased from 0.89% to -2.12%.[2] Given the severity of the financial and economic crises starting in August 2007, that sudden and substatial increase in the debt to GDP ratio can be directly linked to the sudden slowdown of GDP growth in the European Union (see Figure 4), and the parallel rise in the unemployment rate (see Figure 5). It is worth noting that the behaviour of the average values of the debt to GDP ratio, primary surplus to GDP ratio, GDP growth and average unemployment rates among peripheral and non-peripheral EU countries are very similar prior to 2010, and quite dissimilar thereafter.

The observed increase of sovereign debt as a proportion of GDP might be rationalised under three possible reasons. Firstly, GDP adjusts far more quickly than

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[2] The distribution of the increase in the government bonds interest rates was, however, uneven, implying that the EU faced a major asymmetric shock.

debt, in such a way that in the face of a GDP contraction governments have no means to lower debt in the same proportion. *Ceteris paribus,* that ratio would necessarily go up but, on top of this, automatic stabilisers lead to a decrease in fiscal revenues and to an increase in primary expenditures, mainly in the form of social transfers related to unemployment subsidies and the alike, implying a deterioration of the budget balance. This transmission mechanism is, indeed, in line with the findings by Carmen and Rogoff (2009a, b) according to whom public debt increases on average 86% after a financial crisis due to a slower real growth rate, or even recession. Therefore, a drop in the real growth rate can explain why debt stocks sustainable under the previous growth regime become unsustainable under a low growth regime (Easterly, 2001).[3] Second, the discretionary fiscal policies executed at the beginning of the financial crisis to stimulate real GDP,[4] and promote bank rescues also added to the public debt to GDP ratio, (see *e.g.*, Dadush, 2010). Finally, this dynamic was exacerbated by real interest rate increases on sovereign bonds, mainly among Southern European countries, but also in Ireland.

The association between large stocks of public debt, due to irresponsible fiscal and budgetary policies, and key structural weaknesses has become the mainstream explanation for the problems of the peripheral countries. According to the proponents of this view, the solution is to adopt austerity measures to quickly consolidate public budgets, even if at the expense of a recession and of a substantial increase in the unemployment rate, matched by structural reforms, especially in the labour market, in order to regain the trust of the financial markets, and as a pre-condition for renewed sustainable real growth. Instead, economists like De Grauwe (2011) and Krugman (2012) believe that the European crisis is a consequence of the euro being a failed monetary experiment, and not from a failed welfare state and excessive public indebtedness. The problem is that the euro-zone member states issue debt in a currency that they don't control, and for which they have no lender of last resort. Rational creditors experiencing increased default expectations on any given country would recompose their portfolios of assets in order to regain their optimum risk levels; thus,

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[3] This is line with the European Commission (2009b) that concludes that the increase in public debt following crisis periods can be attributable, in a great extent, to the effects of the crisis itself, irrespective of the problems in the banking sector or the fiscal stimulus packages applied by governments.

[4] Accordingly the European Commission (2009b, p. 148) about one third of the deterioration of the fiscal balance was due to discretionary fiscal measures, and the rest attributable to the automatic stabilisers. The European Commission (2009b) added that over the short-term, interest payments were expected to increase only slightly (which obviously didn't happen for many EU countries)

one expects them to sell those bonds, driving interest rate up, and investing in alternative assets (in German bonds, for example).[5] When a country doesn't control the currency's issuing central bank, the total available supply of liquidity shrinks, and the country faces a liquidity crisis which prevents it to roll over its debt at reasonable interest rates, forcing significant losses on banks, and eventually degenerating into a bank crisis, further aggravating the liquidity crisis in a vicious circle. Therefore, a market confidence crisis on a country's ability to fulfill its commitments as a debtor may actually lead to its default and, in so being, expectations are self-fulfilling like in Greece and Portugal (De Grauwe, 2011a, b, Krugman, 2012).[6] *In some sense, members of a monetary union are downgraded to the status of emerging economies* [that issue debt in a foreign currency]. *This makes the monetary union fragile and vulnerable to changing market sentiments. It may also makes it possible that self-fulfilling multiple equilibria arise.* (De Grauwe, 2011, p. i). Moreover, in times of high uncertainty, investors typically prefer safer and more liquid assets (the flight-to-safety effect). In such cases, countries can become entrapped in a bad debt equilibrium meaning that the increased debt service due to a higher risk premium, with everything else equal, implies a higher probability of default or repudiation of sovereign debt (Calvo *et al*, 2006). A different path leading to the same self-fulfilling outcome considers that a government pre-determined number of bonds have to be sold at lower prices, in such a way that the implied lower government revenues force them to reduce investment expenditures, impacting negatively on the country's future ability to grow in real terms and repay bondholders. Even if government economic policies produce improved external accounts, this might well worsen the country's creditworthiness if achieved at the cost of a severe recession. This sort of problems can't happen in countries like the U.S.A., Japan or the UK, simply because national Central Bank steps in, acting as a lender of last resort. To summarize, ultimately at the heart of this issue is the country's creditworthiness which, in turn, is a positive function of appropriate real GDP growth rates or, alternatively, of the availability of a lender of last resort.[7]

From the first quarter of 2000 to the second quarter of 2008, the euro-zone peripheral countries' debt to GDP ratio trend was similar to that of the non-peripheral

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[5] Barrios *et all*. (2009) documented that general risk perception plays a major role in explaining government bond yields differentials.

[6] In Ireland the crisis was triggered by banking crisis that evolved to a debt crisis.

[7] The creditworthiness of governments is also dependent upon some characteristics of the debt stock; *a*) its amount; *b*) its maturity structure and, *c*) the time pattern of its maturing.

countries. Moreover, the data reveals that, at least in some cases, their maximum observed values in the first quarter of 2011 are below or close to those of member states where a sovereign debt crisis did not unfold. For example, Spain's ratio of 65.68% was below that of Belgium (114.13%), Austria (74.82%), Germany (83.24%), France (85.36%), the UK (79.98%), and close to Sweden's (61.61%) and Denmark's (56.09%). The same with Italy in comparison to Belgium. These relationships are even more evident when we look at the mean values for the period under consideration (see Table 1). Then the question arises: why did such a crisis blew up among those now known as peripheral countries and spared others with similar debt to GDP ratios? Even if the structural weaknesses viewpoint is accepted, why did the crises happened at that very moment and not before 2010, exclusively affecting countries that have adopted the euro and sparing EU countries which haven't done so?

Our answer to the above questions is as follows. The insistence of the euro-zone in keeping the deficit rule consecrated by the Treaty of Maastricht, in spite of fundamental changing conditions engineered by the financial crisis of August 2007 and the following economic contraction in the USA, deepened the recession, as well as high unemployment rates, deteriorating budget balances and increasing debt to GDP ratios with special emphasis in the peripheral countries (see Figures 2-5). Coupled with reputational problems arising from past irresponsible management of their public finances (see Fernandes and Mota, 2012), these countries fell in a crisis zone. This crisis zone was next enlarged by the programme of assistance signed by Greece, Ireland, and Portugal, while at the same time both Spain and Italy pursued similar contractionary measures even though they haven't signed similar agreements (see Figures 2-5 and 7). Lower GDP levels, consistently declining tax revenues in spite of increasing tax rates and a general removal of fiscal benefits, higher primary government expenditures due to the functioning of the automatic fiscal stabilizers, and continuous primary deficits promoted bondholders' negative expectations with respect to the creditworthiness of these countries. The sudden and sharp increase in the risk premium payed by these countries on their sovereign debts after 2009 (see Figure 6) is evidence of a crisis of confidence, followed by a liquidity crisis, ultimately transformed into a solvency crisis. The attempts of some countries, like Portugal, to go beyond what was demanded to them by the agreements signed with the IMF, ECB and UE have the potential to make

things worse by enlarging and deepening that crisis zone because that strategy only reinforces their GDP's recessionary trends.[8]

The goals pursued by this paper are to provide: *i)* a better understanding of the public debt dynamics in the EU in the period from yje first quarter of 2000 to the second quarter of 2011, covering both prior and subsequent time periods to the recent financial crisis that started in August 2007; *ii)* the empirical evidence in support of our arguments for the questions we have asked for the unfolding of the current Euro Zone debt crisis. In order to accomplish these goals we star by breaking down the changes in the public debt to GDP ratio into its macroeconomic components attributable to primary fiscal deficits, real interest rates, and real GDP growth, and we study the relative contributions of each one of these factors to the debt dynamics. Then, we analyse the relationship between a broad set of potential fundamental determinants of the debt crisis and the behaviour of the debt to GDP ratio from 2007 to the present. We use indicators of a) solvency; b) liquidity; c) structural weakness, and d) external competitiveness. Finally, we study the relationship between the initial fiscal response to the crisis and the debt to GDP ratio dynamics, and the real long-term interest rate on government bonds after 2007.

The paper is organized as follows: section 2 describes the model to be tested and the data set used; section 3 presents and discusses the estimated results concerning the public debt dynamics. Section 4 accesses the relationship between fundamentals and the debt crisis, and section 5 studies the role of the initial fiscal response of the European governments in the period between 2008 and 2010. Finally, section 5 draws some final conclusions.

2. Model and Data Set

The background of our empirical model for debt dynamics is the government budget constraint equation in each period *t*:

$$B_t = (G_t - T_t) + (1 + i_t) \times B_{t-1} - \Delta BM_t \tag{1}$$

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[8] In spite of this, yield's on Portuguese sovereign debt have been falling for some time now. This is explained by the fact that the markets are assured that Portugal is guaranteed a lender of last resort, since it is publicly known that Germany is commited to renew assistance to Portugal in case it has no effective conditions to go back to the markets by 2013, as initially envisaged.

According to equation (1) total public debt at period t, B_t, is a function of the period's primary budget balance, of the public stock of debt at the beginning of t, B_{t-1}, plus interest payments on it, and of changes of the monetary base, ΔBM_t.

It is standard to write the government budget constraint in terms of changes in the debt to GDP ratio from one period to the next. After dividing both sides of equation (1) by nominal GDP, neglecting debt monetization,[9] and defining lower case variables as their corresponding upper case variables in proportion to GDP, we write equation (2) as the public debt dynamics equation:

$$b_t - b_{t-1} = (g_t - t_t) + (i_t - \pi_t - y) \times b_{t-1} \qquad (2)$$

where i_t is the nominal interest rate, π_t the inflation rate, and y_t the real GDP growth rate.

Equation (2) splits the change in public debt to GDP into three components: *i*) the primary budget balance, $g_t - t_t$; *ii*) the real interest rate, $i_t - \pi_t$; *iii*) the real GDP growth rate, y_t. Accordingly, the public debt to GDP ratio increases whenever the primary balance deteriorates, or/and as the result of the 'automatic debt dynamics' determined by the real interest rate on public debt and the real GDP growth rate.

Based on equation (2), we estimate a panel data model, controlling for countries' and time fixed effects. Since the data set includes all the European Union countries, it is preferable to use the fixed effects estimation. Besides, Hausman test (Hausman, 1978) indicates that fixed effects specification is preferable to a random effects model:

$$\Delta DEBT_{i,t} = \alpha_i + \omega_t + \beta_1 DEBT_{i,t-1} + \beta_2 PSURPLUS_{i,t} + \beta_3 RIR_{i,t} + \beta_3 GDPGR_{i,t} + \gamma \mathbf{X}_{i,t} + \varepsilon_{i,t}$$

$$(3)$$

where $\Delta DEBT_{i,t}$ is the variation of total amount of public debt as a percentage of GDP in country i at period t, $DEBT_{i,t-1}$ is the public debt as a percentage of GDP at the end

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of the previous period, $PSURPLUS_{i,t}$ is the primary government surplus as percentage of GDP, $RIR_{i,t}$ is the real average interest rate paid on public debt, $GDPGR_{i,t}$ is the real rate of GDP growth, $\mathbf{X}_{i,t}$ is a vector of other control variables, and ε_t is a random disturbance term. The vector of control variables includes: the degree of openness of the economy at current prices, measured as total trade (sum of imports and exports) as a percentage of GDP, $OPEN_t$; the net foreign direct investment as percentage of GDP, FDI_t; and a dummy variable, $ELECT_{i,t}$, that is (1) if there is a parliamentary election in country i at a quarter that belongs to an election year, and (0) otherwise. Trade openness is a variable very often present in fiscal policy models since early times (see, *e.g.*, Cameron, 1978; and Myrdal, 1960). Openness should have a positive effect on economic growth which contributes to the reduction of the debt to GDP ratio (Berg and Krueger, 2003). The reason to include FDI_t is that it supposedly improves the fundamentals, mainly leading to an increase of productivity and consequently to a decrease of the debt to GDP ratio. Reinhart and Rogoff (2008), *e.g.*, found that this variable is relevant to explain the debt to GDP ratio in low and middle income countries. The election dummy is included to verify the so called political budget cycles where fiscal variables are manipulated for political purposes (Alesina and Roubini, 1992; Rogoff, 1990; Shi and Svensson, 2006). The empirical literature on this hypothesis remains, however, rather inconclusive (see Schneider, 2010).

Following Barro (1979) and Bohn (1998), we further assume that the primary budget balance is a function of temporary government expenditures, and of the cyclical state of the economy. To capture this effect we replace $PSURPLUS_{i,t}$ in Equation (3) by changes in the unemployment rates, $\Delta U_{i,t}$, and in public expenditures as a percentage of GDP, $\Delta EXP_{i,t}$. The output gap is an alternative to the unemployment rate. However, the unemployment rate has several advantages (Fernandes and Mota, 2011): it is more objective in its quantification; it is available to the public in general on a monthly basis; and it is waited for by the markets as a good indicator of the state of the economy and of the ensuing economic policy decisions. Moreover, since it directly affects voters' well-being and their opinions on the government, politicians feel compelled to respond to it by means of appropriate discretionary fiscal policy measures.

To account for the structural break after 2007 caused by the recent financial crisis, we add an interaction term between the explanatory variables and a dummy

variable, $CRISIS_{i,t}$, that takes the value of (1) for the all the quarters after 2007, and (0) for the quarter before 2007.

Finally, given that the so-called PIIGS: Portugal, Ireland, Italy Greece and Spain have experienced seriously unbalanced public finances and face actual or market anticipated insolvency crises, in order to test for the possibility of a different reaction of the debt to GDP ratio in this group of countries, we have introduced in the model a multiplicative dummy variable, $PIIGS_{i,t}$, which takes the value of (1) for Portugal, Ireland, Italy, Greece and Spain, and (0) for the remaining countries.

The quarterly data from the first quarter of 2000 to the second quarter of 2011 is taken from IMF – International Financial Statistics, and covers all the 27 European Union countries. In so being, the sample covers both prior and subsequent time periods to the recent financial crisis that began in August 2007. The panel is balanced, and all variables are seasonally adjusted.

The summary descriptive statistics are reported in Tables 1-6. The dynamics of the public debt to GDP ratio are displayed in Figures 1-2. The determinants of the public debt are displayed in Figures 3-7.

3. The Estimated Results

3.1. Public Debt Dynamics

Table 7, column I reports the estimated effect of the primary budget balance to GDP ratio, real interest rates, real GDP growth rates and the one period lagged debt to GDP ratio on the public debt to GDP ratio changes from one period to the next, in addition to the chosen control variables (Equation 3). This is our baseline model. The regression is overall significant and the signs of the main explanatory variables are as expected: when the primary budget balance, and the real GDP growth rate improve, and real interest rates decline the debt to GDP ratio falls. The one period lagged debt has no effect on the dependent variable, similarly to what happens with respect o the control variables. Then, we replace the primary budget balance to GDP ratio by changes in the unemployment rate and in public expenditures as a percentage of GDP (see Table 7, column II). Both these estimated coefficients are significantly positive implying debt

financing in periods of rising unemployment, as well as of expenditures in general. The coefficients of the other explanatory variables are quite stable.

Based on these results we split the public debt dynamics into its significant components[10] (see Figure 8). Our results show that real GDP growth rate contributed to a reduction of the debt to GDP ratio until the beginning of the financial turmoil. However, in the most severe time of the crisis it contributed to an increase of the debt to GDP ratio. Also, unemployment rate changes contributed to the reduction of the debt ratio before the crisis, but the situation reversed markedly in the two years after the beginning of the crisis. The same happened with the variation of public expenditures. The real interest rate on public debt was an important determinant of the variation of the debt to GDP ratio over the whole period, and this result didn't change very much after 2007.

Model III tests the hypothesis of a structural break in these relationships caused by that financial crisis. The results are reported in Table 7, column III. We find that the coefficient of the lagged public debt to GDP ratio turns positively significant after 2007, whereas it was not significant before 2007. We do not find a different reaction of changes in the debt to GDP ratio to the other explanatory variables after 2007.

Finally, we looked at the hypothesis of a different debt to GDP ratio response to the explanatory variables in PIIGS comparatively to non-PIIGS (see Model IV in Table 7). We find that while among non-PIIGS countries the variation of the debt to GDP ratio reacts negatively to the one period lagged debt to GDP ratio, it reacts positively among PIIGS countries. The reaction of changes in the debt to GDP ratio in PIIGS is the sum of the estimated coefficients of $DEBT_{i,t-1}$ and $DEBT_{i,t-1} \times PIIGS_{i,t}$ (-0.028 +0.047 = 0.019). This shows that PIIGS have a tendency to not correct budget imbalances. Even though the variation of the debt to GPD ratio responds negatively to the real rate of growth in both groups of countries, this reaction is much stronger among PIIGS (-0.040 – 0.322 = -0.362). Therefore, we come to the very important conclusion that the debt to GDP ratio is much more sensitive to real economic growth among PIIGS.[11] Moreover, we observe political budget cycles among PIIGS, even though not

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[10] We follow the methodology of the World Bank (2005).
[11] Hardly we can interpret the causality on the other way round, *i.e.*, it was the increase in the public debt to GDP ratio that caused the decline of the GDP growth rate. Actually, Figures 2 and 4 show

among the other group, which offers an explanation for their lower relative credibility and reputation levels.

Figure 9 shows the results of breaking down the public debt dynamics in PIIGS into its significant components. Our results show that the real interest rate on public debt remains important, and its contribution to the increase of the debt variation increased after the financial crisis. Nonetheless, the contribution of the real GDP growth rate is higher, emphasising the high importance of the economic recession for the severe deterioration of the public finances of this group of countries.

3.2. The Relationship between Fundamentals and the Debt Crisis

This section provides evidence about the impact of macroeconomic fundamentals on the sovereign debt crisis of the euro-zone. We use indicators of *a*) expected solvency; *b*) liquidity; *c*) external competitiveness; *d*) and structural weaknesses.

We consider solvency as a fundamental determinant of a debt crisis. A deteriorated fiscal position captured by indicators like the debt to GDP ratio, the budget balance, or the total external debt to GDP ratio, are a source of vulnerability to debt crisis (see *e.g.*, Eaton and Gersoutz, 1981, MacFaden *et al.*, 1985, Hemming and Petrice 2000, Manasse *et a*l. 2003, and Lausev *et al*. 2011). Macroeconomic variables such as the real growth rate of output have been the focus of attention by authors like MacFaden *et al*. (1985), and Feder (1985). Their argument is that high growth countries are expected to be more creditworthy, everything else constant. In the same line, Reignhart and Rogoff (2009b) defend that a sustainable level of economic growth is a very important determinant of a country's borrowing capacity. In this paper we focus on three indicators of solvency: *i*) the stock of debt to GDP ratio in the second quarter of 2007, which preceded the crisis; *ii*) the primary budget balance to GDP ratio also in the second quarter of 2007; and *iii*) the average rate of growth of real GDP from then first quarter of 2000:I to the second quarter of 2007.

Liquidity is a variable very often present in models that intend to predict debt crises. For example, Frank and Cline (1971) found that the debt service ratio and the

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that the fall of the GDP growth rate leaded the increase in the debt to GDP ratio. See also (European Commission, 2009) for the root causes of the crisis.

average maturity of debt have a high predictive power with respect to debt crises. Using indicators like the share of short-term debt, debt service, and the level of international reserves Detragiache and Spilimbergo (2001) found that less liquid countries are more prone to debt crises. Also MacFaden *et al.* (1985) found that liquidity measures such as non-gold reserves are significant predictors of debt crisis. Here, we take the share of short-run debt on total public debt as a proxy of liquidity.

Competitiveness can also be a source of debt crises when countries have no access to exchange rate changes. Krugman (2012) asserts that this is the most important one in explaining the current situation of the peripheral euro-zone countries. We use the following indicators: *i*) the current account balance as a proportion of GDP; *ii*) the real effective exchange rate; and *iii*) employment in the construction sector.

Finally, structural weaknesses, especially labour market adjustment rigidity, has been widely pointed out has a crucial problem in PIIGS. Indeed, after a short and limited response of fiscal policy following the recent financial crisis, questions regarding labour market institutions replaced macroeconomic policy at the centre of the policy debate regarding structural reforms in the PIIGS. Actually, the EU/ECB/IMF Financial Assistance Programme demands that countries under assistance deregulate labour markets to increase labor flexibility to make wages and labour costs more responsive to market pressures. As a proxy of labour market rigidity we use the 2007 edition Employment Rigidity Index from the World Bank – Doing Business indicators. We also consider private indebtedness captured by the mortgage debt to GDP ratio.

Visual inspection of the data relative to some of the fundamentals that have been blamed for the crisis in the PIIGS, such as excessive public indebtedness, high primary budget deficits, low GDP growth rates, or the rigidity of the labour market (see Figures 10, 11, 12 and 16), reveals that they are not consistently different between the euro-zone peripheral countries and the more developed central european countries. However, a more systematic distinguishing pattern is found in the current account balance to GDP ratio, employment in the construction sector, and in private debt measured by the mortgage debt as a proportion to GDP (see Figures 13, 14 and 15). Figure 17 shows the bi-variate relationship between the macroeconomic fundamentals immediately prior to the crisis (second quarter of 2007), and the increase in the public debt to GDP ratio from 2007:02 to 2011:02. Only with employment in construction and with the mortgage debt to GDP ratio do we find a significant and positive association. We repeat the bi-variate

analysis for the variation of the real average interest rate paid on government bonds (see Figure 18). In this case, only the current account balance to GDP ratio and the employment in the construction sector are significant. There is a negative association between the current account balance and the long-term interest rate, and a positive association between employment in construction and the interest rate.

In light of this preliminary evidence, we estimate the following cross section regression, covering all the 27 EU countries, in order to explain the changes on the average real interest rate paid on government bonds:

$$\Delta RIR_i = \alpha + \beta_1 \times \Delta CA_i + \beta_2 \times DEBT_i + \beta_3 \times PSURPLUS_i + \beta_4 \times ERI_i + \mu_i$$
(4)

where ΔRIR_i is the variation of the real interest rate on government bonds in the period from the third quarter of 2007 to the second quarter of 2011, ΔCA_i[12] in the current account balance to GDP ratio in 2007, $DEBT_i$ is the public debt to GDP ratio in the second quarter of 2007, $PDEFICIT_i$ is the primary budget to GDP ratio in the second quarter of 2007, ERI_i is the Employment Rigidity Index built by The World Bank in 2007, and μ_i is a random disturbance term.

The data suggest that the deterioration in the current account balance is positively correlated with: *i*) increases in private indebtedness (measured by mortgage debt); *ii*) growth in the non-tradable sector (measured by employment in the construction sector); *iii*) the real effective exchange rate dynamics (see Table 8). Even knowing that employment in the construction sector, and the mortgage debt to GDP ratio are significant in the bi-variate analysis, we didn't include them in equation 4 to avoid multicolinearity.[13] Instead, we estimate another equation where we replace the current account with these two variables.

The estimation results are reported in Table 9 (Model I). The data do not support the idea that increases in the interest rate on government bonds are explained by rising public indebtedness or by labour market rigidity. Both indicators of public solvency, $DEBT_i$ and $PSURPLUS_i$, are non-significant, as well as the indicator of labour market rigidity, ERI_i. The regression has indeed a low explanatory power (the R^2 is only

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[12] Data are from European Commission (2009, Table IV.1.1. – p. 170).
[13] We also didn't include variables such as the GDP growth rate, the short term share of public debt, and the real effective exchange rate to avoid the same problem.

0.371), and the only significant variable is the current account balance to GDP ratio. When we replace the current account balance by employment in the construction sector, $ECONST_i$, and by the mortgage debt to GDP ratio, $PRIVDEBT_i$,[14] (see Table 9, Model II) only the former variable is significant.

From the analysis of the macroeconomic fundamentals as carried out in this paper, only those related to countries' external competitiveness have an effect on long term real interest rates, thus supporting Krugman's position (2012).[15] There is some evidence that within a monetary union where the real effective exchange rate continuously appreciated, a dynamic internal demand excessively biased towards non-tradable goods, and fuelled by credit expansion, led the peripheral countries to experience growing current account deficits (matched by huge surpluses in Germany) and contributed to investors fears about the ability of these countries to finance the expansionary fiscal policies needed to compensate for the effects of the financial crisis, without endangering public finances.

3.3. The Relationship between the Initial Fiscal Response and the Debt Crisis

In this section, we first address the issue of the adequacy of discretionary fiscal stimulus following the financial crisis; secondly, we investigate the relationship between these measures and the current sovereign debt crisis in the EU peripheral countries.

There is substantial evidence showing that expansionary fiscal policies are effective for short-run economic stabilization, especially in face of a liquidity trap, *i.e.*, when short-term interest rates reach or are close to the zero bound. In so being, almost every developed country (EU included) adopted discretionary fiscal stimulus in the wake of the financial crisis to avert further contractions in demand. The European Commission (2009, p. 21) stated that one of the lessons from the Great Depression of the 30s is that aggregate demand should be sustained by means of expansionary monetary and fiscal policies.

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[14] Data are from European Comission (2009, Table IV.1.1. – p. 170).
[15] See also OECD (2009, p. 168).

In normal times monetary policy offsets the effects of government spending through changes in interest rates. However, when excess supply prevails in the economy, and short-term interest rate reach their lower bounds – implying that the monetary authorities suspend the application of the Taylor rule– fiscal multipliers can be greater than one (see *e.g.* Hall, 2009, Gordon and Krenn, 2010, Christiano *et al.*, 2011, Eggertsson, 2011, Krugman, 2012, Romer, 2012, and Solow, 2012). Besides, the OECD (2009) considers that when countries do not start out with weak fiscal positions, discretionary fiscal policy might have an important role to sustain a cyclical downturn when monetary policy is constrained. Indeed, in this situation, and for less open economies, the short-term multiplier for government expenditures is on average 0.9 in the first year, and 1.3 in the second year, while the multiplier for income tax cuts is 0.6 in the first year and around 1.0 in the second (OECD, 2009, p. 114).[16]

Thus, when the opportunity cost in terms of output lost of being in the zero bound state is large, it can be socially optimal to apply expansionary fiscal policy in response to shocks. In these circumstances fiscal stimulus, for example through government spending, leads to an increase in output marginal cost, and expected inflation, which drives down the real interest rate and increases private spending (Christiano *et al.*, 2011, p. 80).

On November 2008 the European Commission launched a coordinated European Economy Recovery Plan (EERP), to provide a temporary discretionary fiscal stimulus of about 1.8% of the combined EU GDP to address falling output and rising unemployment, of which two-thirds were to be implemented in 2009 and the remainder in 2010.[17] Besides, the Stability and Growth Pact was applied in a more flexible manner in order to let the automatic stabilisers operate unconstrained. The automatic stabilizers were projected to support the economies by another 3.2% of the GDP.[18] The objectives were to: *i*) sustain demand; *ii*) sustain employment; *iii*) addressing competitiveness problems; and *iv*) ease social hardship.

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[16] Short-run multipliers for government investment are larger than those from the revenue side measures because for government spending there is not a leakage to savings (OECD, 2009, p. 114). Note, also, that the government investment multipliers are greater than one even in small open economies such as Greece, Ireland, and Portugal (see OECD, 2009, p. 138).

[17] Practically all OECD countries have applied discretionary fiscal measures in response to the crisis (see OECD, 2009). Exceptions were countries that had very limited fiscal space and were facing market pressures.

[18] European Commission (2009b, p. 148).

This expansionary fiscal policy was implemented due to the limited effect of monetary policy to stabilise the economies through reduction in the key ECB interest rates, and through other non-conventional measures. These fiscal measures had also in mind that the sharp reduction in real GDP in the EU can have long-lasting effects on economic activity, and affect its growth potential (see European Commission, 2009, p. 1, and Krugman, 2012, p. 15-16) a phenomena technically known as hysteresis.[19]

Table 10 shows total fiscal impulse and its components, namely support: to households and vulnerable groups; to labour markets; to business and industry; and to investment for the EU countries. There was a considerable dispersion of the stimulus size by country reflecting: *i*) the available "fiscal space", *i.e.*, their ability to temporarily use fiscal deficits without putting at risk the sustainability of public finances; *ii*) the severity of the crisis that hit the real economy; and *iii*) the size of the automatic stabilizers. Table 10 and Figure 19 show that discretionary fiscal stimulus was larger than average in countries such as Spain, Finland, Germany, Austria, Sweden, Poland and the UK, while it was smaller than average in Ireland, Portugal, Italy, Greece, France, Netherlands Bulgaria, Romania, Hungary, and in the Baltic States.

In terms of content, the fiscal stimulus includes, on average, equal sized revenue and expenditures measures, but it varied substantially between countries. The last two columns of Table 10 show the breakdown of the fiscal measures between expenditures and revenues. In Austria, Luxembourg, Poland and in the UK, fiscal measures were especially concentrated on the revenue side, while the opposite happened in Cyprus, Denmark, Estonia, France, Italy, Malta, Portugal, Slovenia and Slovakia. In the remaining countries the fiscal measures were more or less balanced between revenues and expenditures.

Accordingly to the European Commission (2009c, p. 2): "The dispersion of fiscal stimulus across Member States has been substantial, but this is generally – and appropriately – in line with differences in terms of their needs and their fiscal room for manoeuvre." Moreover, there is robust evidence that the countries that applied larger fiscal stimulus had better GDP performance in the second quarter of 2009 than would have been expected (Executive Office of the President of Council of Economic Advisers, 2009). The report estimated fiscal multipliers larger than one for a sample of

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[19] For example, Mota *et all.* (2012) documented the existence of hysteresis in the dynamics of the aggregate employment in Portugal (one of the countries under assistance from EU and IMF).

OECD economies. The IMF (2010a) also states that the evidence supports the view that under current circumstances a well-executed fiscal stimulus could provided a substantial increase in aggregate demand throughout the world economy

Figure 20 shows that the size of the fiscal stimulus (the fiscal stimulus in percentage of the GDP) in 2008-2010 was positively correlated with the fiscal space of the Member States (measured by the fiscal balance to tax base ratio – see Aizenmn, and Yothin, 2011, data appendix B). This means that the fiscal stimulus were broadly in line with the room of manoeuvre to apply discretionary fiscal policy. Notably, with the exception of Spain, the European peripheral countries that are presently facing a debt crisis applied a fiscal stimulus that was lower than average. Figure 21 suggests that the fiscal stimulus was positively correlated with changes in the output gap. The higher the fall in the output relatively to its trend the stronger were the fiscal stimulus applied. Again, countries such as Greece, Ireland, Portugal and Italy applied comparatively small fiscal packages. Moreover, although OECD (2009) reported the existence of an inverse relationship between the size of the discretionary fiscal packages and the strength of the automatic stabilisers for OECD countries, Figure 22 shows the absence of such a relationship for the EU. We use as an indicator of the strength of the automatic stabilisers the semi-elasticity, which measure the change of the budget balance, expressed as a percentage of GDP, for one percent change in GDP (see Girouard and André, 2006, p. 51 – Table 9). Nonetheless, the fact that PIIGS, with the exception of Spain, implemented small fiscal packages is again revealed.

Finally, Figures 23 and 24 show the relationship between the size of the fiscal stimulus between 2009-10 as a percentage of the GDP and the variation of the debt to GDP ratio, and the variation of the long-term interest rates on government bonds in the period from the first quarter of 2000 to the second quarter of 2011. The evidence is that the relationship is at most negative, meaning that there is no support on the data that the fiscal stimulus applied by EU peripheral countries in the wake of the financial crisis was the cause of the current debt crises of the peripheral countries.

4. Conclusions

Our findings indicate that the European sovereign debt crisis is not entirely linked to the state of the fundamental on the eve of the crisis, or to the fiscal stimulus implemented on a coordinated basis by EU countries.

These findings imply that measures such as: *a*) the adjustment of macroeconomic imbalances through austerity measures towards aggressive budgetary consolidation; *b*) labour market reforms to decrease firing costs, to increase flexibility in working time, to make wages and labour costs more responsive to market pressures, and to weaken unemployment benefit systems, could be of no use to solve the EU debt problem, because they are based on wrong diagnosis.

The debt crisis can be solved by economic growth more oriented towards external demand in the peripheral countries and to domestic demand in central countries such as Germany, and mid inflation that lowers the value the real value of the debt, but this option is not available at present to the EU peripheral countries. On the contrary the austerity measures that turn the unemployment rate dependent on the state of confidence are not solving the problem. The consequences have been a deep recession and high unemployment rates that rise doubts about the capacity of these countries to pay their debt.

In fact the evidence gives no support to the view that when monetary policy effectiveness is constrained (when short-term interest rates reached or are close to the lower zero bound) due to the severity of the crisis, as it happens in the USA but also in the EU, contractionary fiscal policy is expansionary. On the contrary it is by now well established that fiscal consolidation is typically contractionary in the short-run (see IMF 2010b). According to IMF (2010b, p. 110), when countries cannot rely on the exchange rate channel to stimulate exports (as it is the case of euro zone countries), when monetary policy is ineffective, because the zero lower bond for interest rates in binding, and when many countries are implemented fiscal contractionary measures, the output costs of fiscal consolidations are larger.

Nonetheless, some lack of consensus still remains about the effects in the long run. For some, fiscal consolidation will increase confidence of investors and it will have positive effects in the growth rate of the output in the long-run. We think, on the contrary, that austerity measures that harm growth in the present will have negative effects in the future due to hysteresis mechanisms.

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Table 1. *Government Debt to GDP Summary Statistics*

Countries	Mean	Max	Min.	Std. Dev.
Austria	68.19	74.82	59.38	3.11
Belgium	99.05	114.13	85.84	7.88
Bulgaria	37.14	80.87	13.85	22.53
Cyprus	63.37	71.53	49.30	6.01
Czech Republic	29.34	40.32	16.67	5.69
Germany	66.51	83.24	58.04	6.26
Denmark	42.45	56.09	23.49	8.89
Estonia	5.15	7.14	3.24	1.01
Spain	49.33	65.68	35.22	8.50
Finland	41.06	47.80	30.71	4.21
France	66.30	85.36	56.39	8.36
Greece	108.06	152.97	95.07	16.10
Hungary	64.85	83.58	51.51	9.48
Ireland	42.28	101.72	24.46	21.17
Italy	110.19	121.15	104.38	4.56
Lithunia	22.76	38.19	14.60	6.48
Luxemburg	8.84	20.40	5.51	4.75
Latvia	18.33	45.68	8.89	11.32
Malta	65.28	73.16	55.99	4.76
Netherlands	53.87	63.34	45.27	5.39
Poland	46.03	55.86	35.91	5.18
Portugal	64.42	105.82	50.33	13.53
Romania	20.26	34.30	11.70	5.99
Sweden	46.98	61.61	35.26	6.82
Slovenia	29.08	45.04	22.92	5.18
Slovakia	38.93	51.29	25.40	7.80
United Kingdom	47.17	79.98	36.99	12.98
All	50.19	152.97	3.24	28.11

Table 2. *Government Primary Surplus to GDP Summary Statistics*

Countries	Mean	Max	Min.	Std. Dev.
Austria	-1.78	0.97	-10.28	1.80
Belgium	3.14	8.65	-7.41	3.28
Bulgaria	2.63	7.83	-13.00	3.56
Cyprus	0.70	13.94	-14.19	5.32
Czech Republic	-3.11	4.16	-10.49	2.65
Germany	0.44	11.50	-5.46	2.44
Denmark	4.00	7.41	-2.01	2.88
Estonia	0.94	10.53	-8.38	2.73
Spain	-0.01	4.43	-16.05	4.51
Finland	4.64	10.12	-2.19	3.31
France	-0.75	2.41	-4.94	1.93
Greece	-0.90	6.68	-10.08	3.64
Hungary	-0.58	39.64	-8.32	6.59
Ireland	-2.41	7.18	-34.60	9.47
Italy	1.88	6.27	-0.61	1.77
Lithunia	-1.71	2.12	-8.26	2.48
Luxemburg	2.38	7.20	-1.32	2.40
Latvia	-1.71	2.51	-9.18	2.85
Malta	-0.84	1.99	-6.51	1.56
Netherlands	1.25	5.85	-3.17	2.52
Poland	-1.53	0.35	-4.03	1.11
Portugal	-1.25	2.97	-6.82	2.58
Romania	-0.37	5.65	-9.30	2.99
Sweden	3.43	7.80	0.59	1.93
Slovenia	-0.61	2.02	-3.92	1.45
Slovakia	-3.69	1.42	-13.31	3.49
United Kingdom	-1.48	4.29	-9.91	3.48

All	0.10	39.64	-34.60	4.14

Table 3. *Unemployment Rate Summary Statistics*

Countries	Mean	Max	Min.	Std. Dev.
Austria	6.58	7.61	5.40	0.55
Belgium	7.70	8.83	6.27	0.69
Bulgaria	11.67	20.14	5.04	4.53
Cyprus	4.66	7.34	3.10	1.01
Czech Republic	8.44	10.29	5.24	1.34
Germany	8.79	11.81	5.89	1.81
Denmark	4.81	6.38	2.29	1.08
Estonia	10.20	18.84	4.00	3.88
Spain	12.52	21.06	8.01	4.14
Finland	8.80	13.54	6.19	1.86
France	8.50	9.57	7.18	0.64
Greece	10.19	16.84	7.44	1.85
Hungary	7.48	11.37	5.55	1.83
Ireland	6.40	14.81	3.68	3.63
Italy	7.99	10.76	5.96	1.11
Lithunia	9.48	19.21	2.96	4.76
Luxemburg	4.06	6.08	2.30	1.21
Latvia	10.66	20.74	5.58	4.19
Malta	6.85	8.38	5.87	0.54
Netherlands	4.78	6.57	2.51	1.17
Poland	15.26	20.16	9.33	3.57
Portugal	7.26	12.45	3.66	2.36
Romania	7.01	11.79	3.80	2.23
Sweden	6.08	8.90	3.51	1.60
Slovenia	10.02	12.18	6.54	1.57
Slovakia	13.24	18.99	7.43	3.64
United Kingdom	5.76	7.99	4.68	1.12
All	8.34	21.06	2.29	3.69

Table 4. *GDP Growth Rate Summary Statistics*

Countries	Mean	Max	Min.	Std. Dev.
Austria	1.93	9.82	-7.23	2.96
Belgium	1.65	5.00	-4.21	1.84
Bulgaria	3.22	8.27	-7.58	4.06
Cyprus	2.85	5.69	-3.05	2.04
Czech Republic	3.25	7.58	-5.06	2.93
Germany	1.27	4.94	-6.82	2.65
Denmark	0.92	4.40	-7.97	2.71
Estonia	4.84	11.57	-16.58	7.41
Spain	2.30	5.82	-4.51	2.45
Finland	2.36	6.59	-9.67	3.77
France	1.40	4.30	-3.94	1.73
Greece	1.67	7.42	-8.60	3.88
Hungary	2.19	6.41	-7.96	3.25
Ireland	3.04	12.40	-8.31	4.76
Italy	0.60	4.12	-6.66	2.33
Lithunia	4.62	11.57	-15.76	6.77
Luxemburg	3.27	11.88	-7.81	3.89
Latvia	4.28	13.96	-18.56	8.45
Malta	2.21	9.30	-4.02	3.00
Netherlands	1.64	4.73	-4.51	2.15
Poland	3.98	7.55	-0.25	2.08
Portugal	0.90	4.39	-4.00	1.85
Romania	3.80	11.64	-8.66	4.97
Sweden	2.44	7.59	-6.87	3.22
Slovenia	2.88	7.79	-9.53	3.94
Slovakia	6.53	18.64	-2.89	4.64
United Kingdom	1.65	4.55	-5.90	2.38

All	2.65	18.64	-18.56	4.13

Table 5. *Real Interest Rate Summary Statistics*

Countries	Mean	Max	Min.	Std. Dev.
Austria	4.18	5.53	2.86	0.68
Belgium	4.26	5.58	3.14	0.64
Bulgaria	5.73	7.62	3.47	1.18
Cyprus	5.28	7.78	3.97	1.17
Czech Republic	4.61	7.48	3.18	1.02
Germany	3.94	5.20	2.40	0.72
Denmark	4.16	5.63	2.49	0.77
Estonia	6.62	10.77	3.77	2.19
Spain	4.36	5.49	3.15	0.62
Finland	4.13	5.43	2.67	0.71
France	4.11	5.37	2.77	0.65
Greece	5.45	15.13	3.37	2.37
Hungary	7.55	10.30	5.90	0.92
Ireland	4.80	10.41	3.14	1.37
Italy	4.47	5.56	3.37	0.55
Lithunia	6.32	14.60	3.49	2.93
Luxemburg	4.20	5.51	2.75	0.68
Latvia	6.58	13.63	3.60	2.64
Malta	4.96	6.32	3.97	0.69
Netherlands	4.09	5.35	2.63	0.68
Poland	6.74	11.50	4.63	1.90
Portugal	4.69	9.66	3.26	1.11
Romania	7.32	11.12	6.72	0.86
Sweden	4.11	5.53	2.54	0.83
Slovenia	5.65	9.66	3.67	2.19
Slovakia	5.24	8.42	3.10	1.54
United Kingdom	4.50	5.28	3.20	0.61
All	5.11	15.13	2.40	1.73

Table 6. *Public Expenditures Rate Summary Statistics*

Countries	Mean	Max	Min.	Std. Dev.
Austria	51.1	60.0	47.6	2.4
Belgium	50.5	59.3	47.0	2.3
Bulgaria	38.8	49.2	29.5	3.6
Cyprus	62.7	80.3	40.0	12.7
Czech Republic	44.7	51.6	40.2	2.5
Germany	46.7	51.8	37.7	2.3
Denmark	54.5	58.8	50.3	2.4
Estonia	36.8	46.7	31.8	3.7
Spain	39.2	45.9	36.6	2.5
Finland	50.1	57.9	46.5	2.8
France	53.3	58.3	50.6	1.8
Greece	45.8	57.7	40.2	3.7
Hungary	49.6	57.4	43.6	3.1
Ireland	38.7	73.5	30.2	9.9
Italy	48.2	51.4	42.2	1.8
Lithunia	36.4	48.0	30.3	4.0
Luxemburg	40.2	48.6	35.3	3.0
Latvia	37.4	47.4	30.2	3.9
Malta	35.3	51.8	18.2	9.8
Netherlands	46.5	51.6	43.3	2.2
Poland	42.8	47.2	38.9	1.7
Portugal	45.4	53.4	34.9	3.8
Romania	33.6	37.8	30.0	1.8
Sweden	54.5	58.0	50.1	1.9
Slovenia	45.5	51.7	38.9	2.5
Slovakia	50.0	75.3	34.0	11.5
United Kingdom	44.2	51.9	38.1	3.7

All	45.3	80.3	18.2	8.5	

Table 7: Estimation Results - Dependent Variable: Public Debt Variation as a Percentage of GDP

Variables	Model I Baseline		Model II Cyclical State of the Economy		Model III Crisis		Model III PIIGS	
	Coef.	t-statistic[+]	Coef.	t-statistic[+]	Coef.	t-statistic[+]	Coef.	t-statistic[+]
β_0	0.410	0.468	-0.027	-0.315	-0.045	-0.050	0.967	1.331
$DEBT_{i,t-1}$	-0.013	-1.181	-0.005	-0.476	-0.014	-1.194	-0.028**	-2.488
$PDEFICIT_{i,t}$	-0.138***	-3.892	-	-	-		-	
$\Delta U_{i,t}$	-	-	0.138*	1.655	0.159*	1.758	0.100*	1.620
$\Delta EXP_{i,t}$	-	-	0.077**	2.564	0.052**	2.181	0.051**	2.385
$RIR_{i,t}$	0.141**	2.252	0.198***	3.266	0.218***	3.190	0.119*	2.063
$GDPGR_{i,t}$	-0.045*	-1.603	-0.044*	-1.732	-0.103***	-3.175	-0.04*	-1.673
$OPEN_{i,t}$	-0.110	-1.222	-0.145	-0.232	0.086	0.120	-0.253	-0.417
$FDI_{i,t}$	-0.003	-1.223	-0.002	-0.988	-0.001	-0.528	-0.002	-1.125
$ELECT_{i,t}$	-0.081	-0.684	-0.002	-0.014	0.007	0.078	-0.130	-1.265
$DEBT_{i,t-1} \times CRISIS_{i,t}$	-	-	-	-	0.016**	2.078	-	-
$PDEFICIT_{i,t} \times CRISIS_{i,t}$	-	-	-	-	-	-	-	-
$\Delta U_{i,t} \times CRISIS_{i,t}$	-	-	-	-	-0.103	-0.516	-	-
$\Delta EXP_{i,t} \times CRISIS_{i,t}$	-	-	-	-	0.054	0.767	-	-
$RIR_{i,t} \times CRISIS_{i,t}$	-	-	-	-	-0.045	-0.447	-	-
$GDPGR_{i,t} \times CRISIS_{i,t}$	-	-	-	-	0.057	1.020	-	-
$OPEN_{i,t} \times CRISIS_{i,t}$	-	-	-	-	-0.316	-0.860	-	-
$FDI_{i,t} \times CRISIS_{i,t}$	-	-	-	-	-0.007	-0.747	-	-
$ELECT_{i,t} \times CRISIS_{i,t}$	-	-	-	-	-0.014	-0.030	-	-
$DEBT_{i,t-1} \times PIIGS_{i,t}$	-	-	-	-	-	-	0.047**	2.037
$PDEFICIT_{i,t} \times PIIGS_{i,t}$	-	-	-	-	-	-	-	-
$\Delta U_{i,t} \times PIIGS_{i,t}$	-	-	-	-	-	-	-0.029	-0.104
$\Delta EXP_{i,t} \times PIIGS_{i,t}$	-	-	-	-	-	-	0.066	1.041
$RIR_{i,t} \times PIIGS_{i,t}$	-	-	-	-	-	-	-0.092	-0.547
$GDPGR_{i,t} \times PIIGS_{i,t}$	-	-	-	-	-	-	-0.322***	-3.877
$OPEN_{i,t} \times PIIGS_{i,t}$	-	-	-	-	-	-	0.040	0.020
$FDI_{i,t} \times PIIGS_{i,t}$	-	-	-	-	-	-	0.010	0.733
$ELECT_{i,t} \times PIIGS_{i,t}$	-	-	-	-	-	-	0.730*	1.620
No. Observations/ No. Countries	1215 / 27		1215 / 27		1215 / 27		1215 / 27	
Time Fixed Effects/ Country Fixed	Yes / Yes		Yes / Yes		Yes / Yes		Yes / Yes	
R^2	0.388		0.370		0.378		0.420	
DW	2.148		2.000		2.035		2.141	
F-statistic	9.400		8.375		7.868		9.510	

***, **, and * indicate significance at 1, 5 and 10 percent respectively; [+] t-statistics based on White cross-section consistent standard errors.

Table 8: *Correlation between Fundamentals*

	$DEBT_i$	$PDEFICIT$	$GDPGR_i$	$SDEBT_i$	CA_i	$ECONST_i$	$PDEBT_i$	ERI_i
$DEBT_i$	1							
$PDEFICIT_i$	-0.091 (0.66)	1						
$GDPGR_i$	-0.699*** (0.001)	-0.178 (0.393)	1					
$SDEBT_i$	0.692*** (0.000)	0.040 (0.847)	-0.522*** (0.007)	1				
CA_i	0.215 (0.301)	0.150 (0.472)	-0.537*** (0.005)	0.257 (0.214)	1			
$ECONST_i$	-0.429** (0.032)	-0.115 (0.582)	0.632*** (0.000)	-0.197 (0.346)	-0.415** (0.039)	1		
$PDEBT_i$	-0.278 (0.181)	0.186 (0.370)	-0.355* (0.081)	0.009 (0.962)	0.383* (0.058)	-0.120 (0.566)	1	
ERI_i	-0.275 (0.187)	0.265 (0.200)	0.175 (0.402)	-0.020 (0.924)	-0.144 (0.501)	0.457** (0.021)	-0.073 (0.7259)	1

P-values in brackets.
***, **, and * indicate significance at 1, 5 and 10 percent respectively
Source: Authors' calculations

Table 9: Estimation Results - Dependent Variable: Variation of the long-term real interest rate on government bonds (2007:02-2011:02)

Variables	Model I	Model II
β_0	-3.064 (-1.721)	-2.882 (-1.324)
$DEBT_i$	0.042 (1.439)	0.040 (1.310)
CA_i	-0.164** (-2.444)	-
$PRIMDEFICIT_i$	-0.088 (-0.699)	-0.109 (-0.721)
ERI_i	0.030 (0.9361)	-0.016 (-0.443)
$ECONST_i$	-	0.500** (2.335)
$PRIVDEBT_i$	-	0.008 (0.543)
R^2	0.371	0.184
DW	3.075	2.099
F-statistic	2.955	1.130

t-statistics, based on the Newey-West (1987) procedure to account for heteroscedasticity and autocorrelation, in brackets.
***, **, and * indicate significance at 1, 5 and 10 percent respectively.
Source: Authors' calculations

Table 10: *Aggregate Discretionary Stimulus in the EU over the Period 2009-10*

Country	2009-10					2009	
	Measures aimed at households (% GDP)	Increased spending on labour market (% GDP)	Measures aimed at business (% GDP)	Increased investment expenditure (% GDP)	Overall (% GDP)	Expenditure (% of total)	Revenue (% of total)
Austria	2.6	0.2	0.2	0.5	3.5	22	78
Belgium	0.9	0.5	0.1	0.3	1.8	50	50
Bulgaria	0.0	0.0	0.0	0.1	0.1	-	-
Cyprus	0.0	0.0	0.0	1.8	1.8	100	0
Czech Republic	0.1	1.1	0.5	0.5	2.2	50	50
Germany	1.5	0.5	0.8	0.9	3.6	43	57
Denmark	0.0	1.0	0.1	0.4	1.5	75	25
Estonia	0.0	0.5	0.0	0.1	0.6	100	0
Spain	1.6	0.1	1.4	0.9	4.0	43	57
Finland	2.6	0.0	0.7	0.4	3.8	35	65
France	0.2	0.1	0.4	0.3	1.0	70	30
Greece	0.3	0.0	0.0	0.0	0.3	-	-
Hungary	0.0	0.0	0.0	n.a.	0.0	-	-
Ireland	0.8	0.2	0.4	0.0	1.4	60	40
Italy	0.2	0.4	0.5	0.1	1.2	100	0
Lithuania	0.0	0.0	0.0	n.a.	0.0	-	-
Luxemburg	n.a.	n.a	n.a	1.7	n.a	8	92
Latvia	0.6	0.0	0.3	0.1	0.9	-	-
Malta	0.4	0.0	0.2	0.6	1.2	81	19
Netherlands	1.6	0.4	0.2	0.5	0.5	44	56
Poland	1.2	0.0	0.4	1.2	2.8	30	70
Portugal	0.4	0.2	0.4	0.3	1.3	100	0
Romania	0.1	0.0	0.2	n.a.	0.3	-	-
Sweden	0.4	1.8	0.4	0.6	3.2	43	57
Slovenia	0.0	0.8	0.2	1.2	2.2	83	17
Slovakia	0.6	0.2	0.2	0.2	1.2	100	0
UK	1.7	0.3	0.4	0.2	2.6	29	71

Source: European Commission – Directorate-general for Economic and Financial Affair – European Economy – *Occasional Papers*,51 (July 2009), and *European Economy*, 5.

Figure 1. *Public* Debt t*o GDP across EU-27*
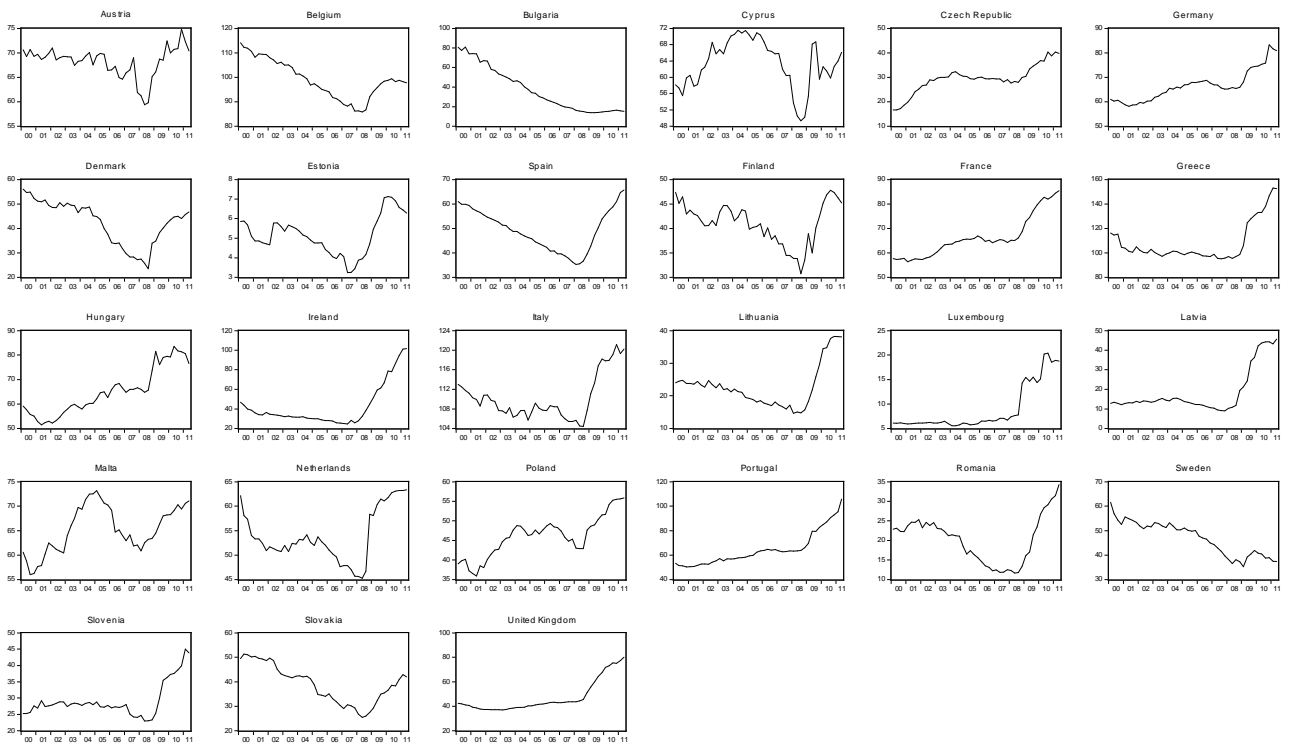
Figure 2. *Average Debt to GDP across EU-27*
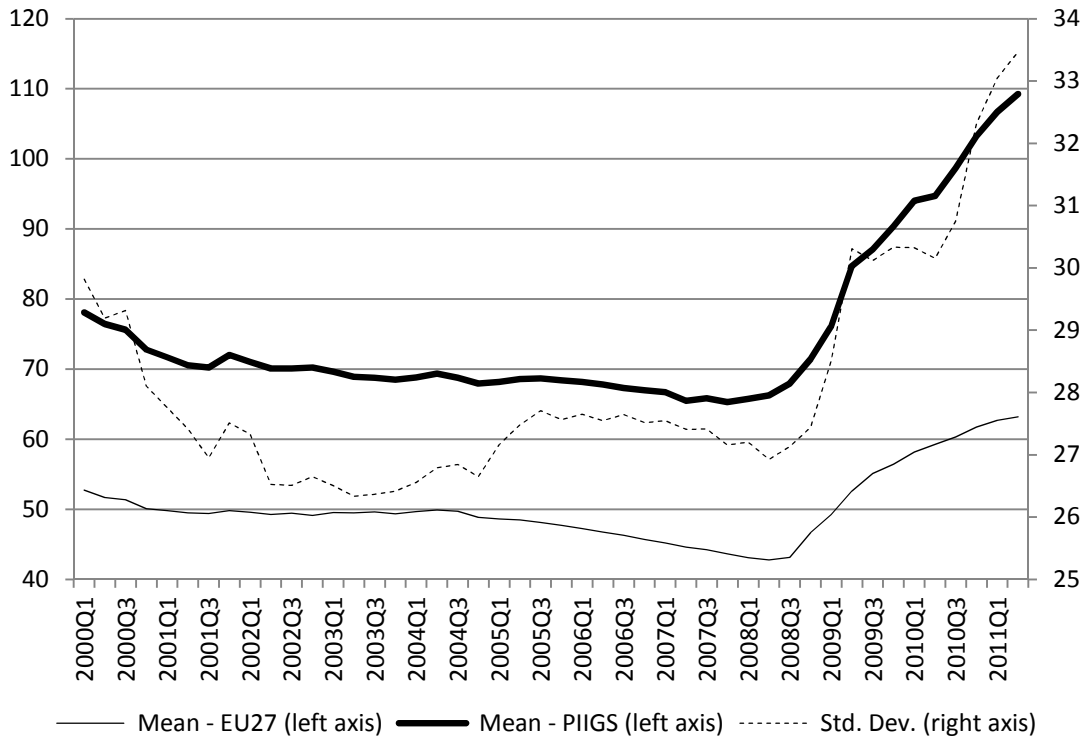
Source: Authors' calculations

Figure 3. *Average Primary Deficit to GDP across EU-27*
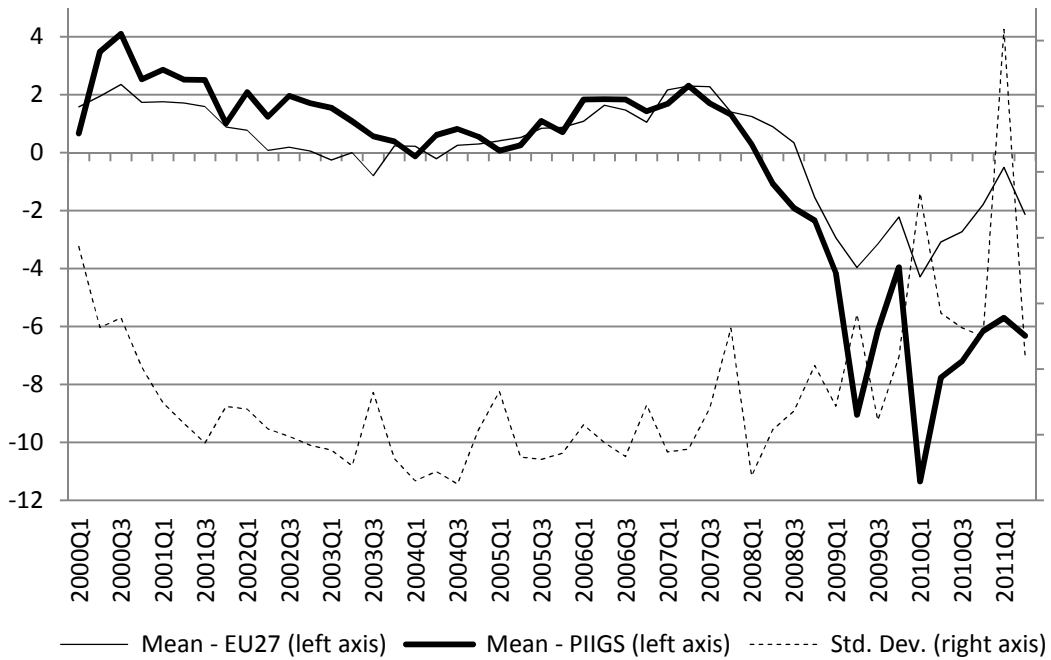
Source: Authors' calculations

Figure 4. *Average GDP Growth Rate across EU-27*
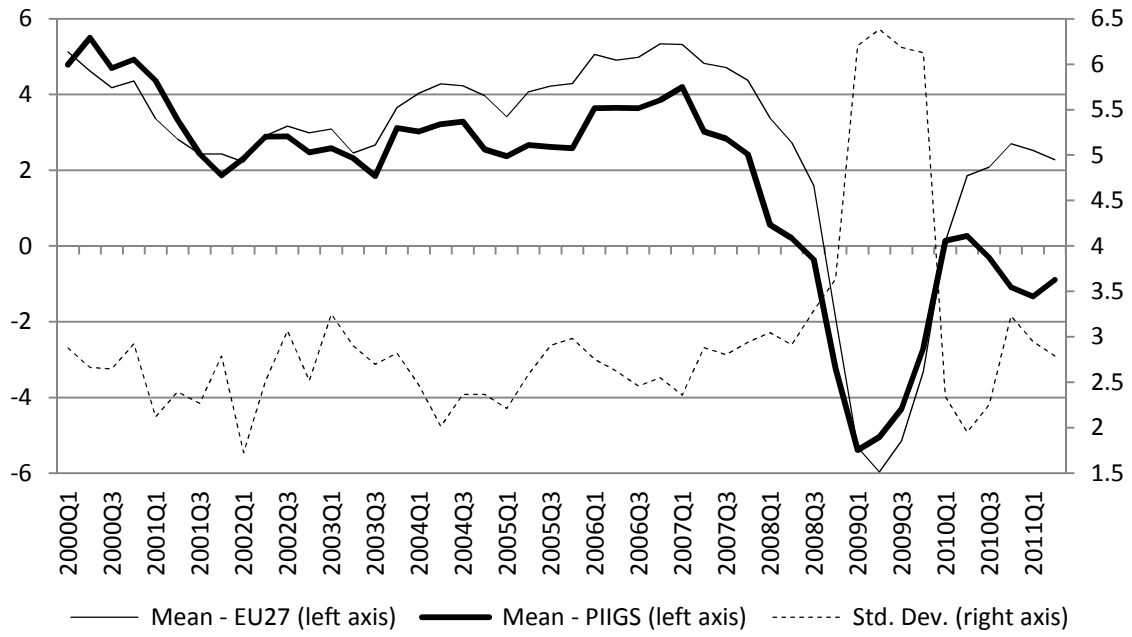
Source: Authors' calculations

Figure 5. *Average Unemployment across EU-27*
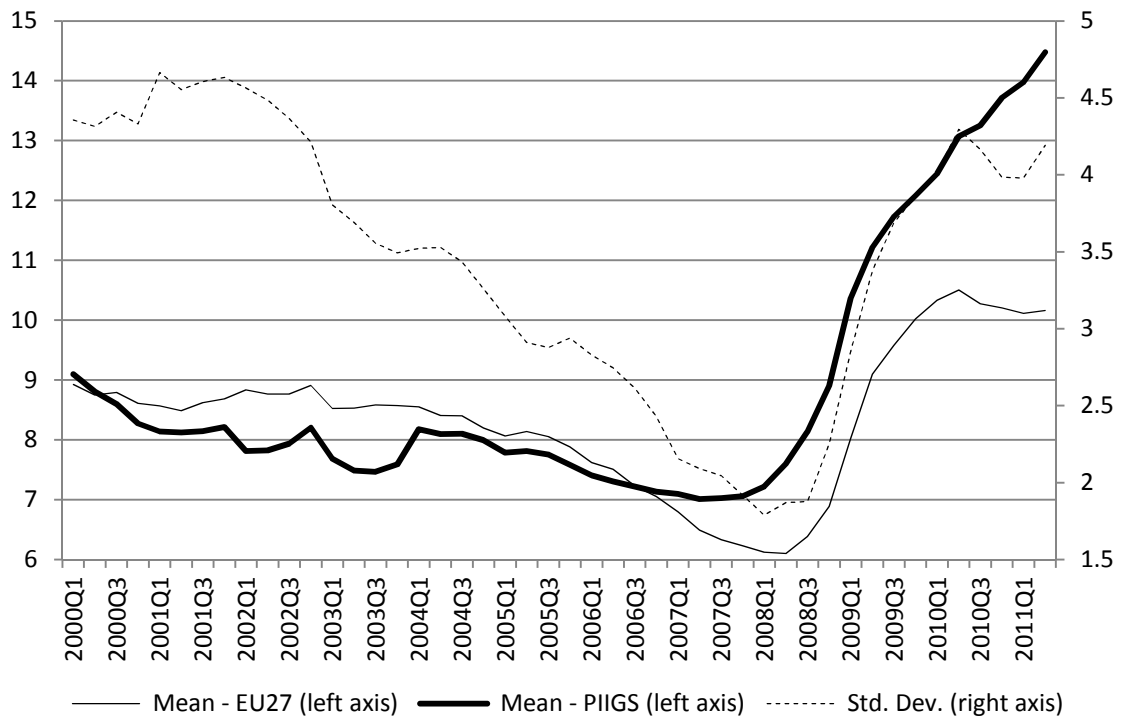
Source: Authors' calculations

Figure 6. *Average Real Interest Rate across EU-27*

| —— Mean - EU27 (left axis) | —— Mean - PIIGS (left axis) | ----- Std. Dev. (right axis) |
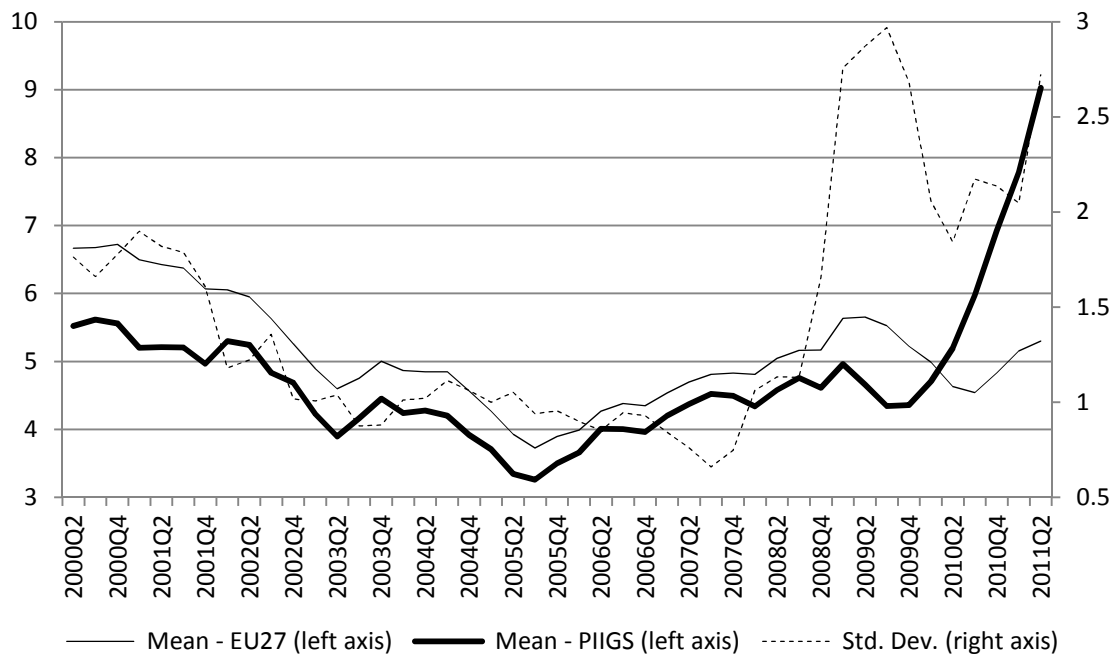
Source: Authors' calculations

Figure 7. *Average Public Expenditures to GDP across EU-27*

| —— Mean - EU27 (left axis) | —— Mean - PIIGS (left axis) | ----- Std. Dev. (right axis) |
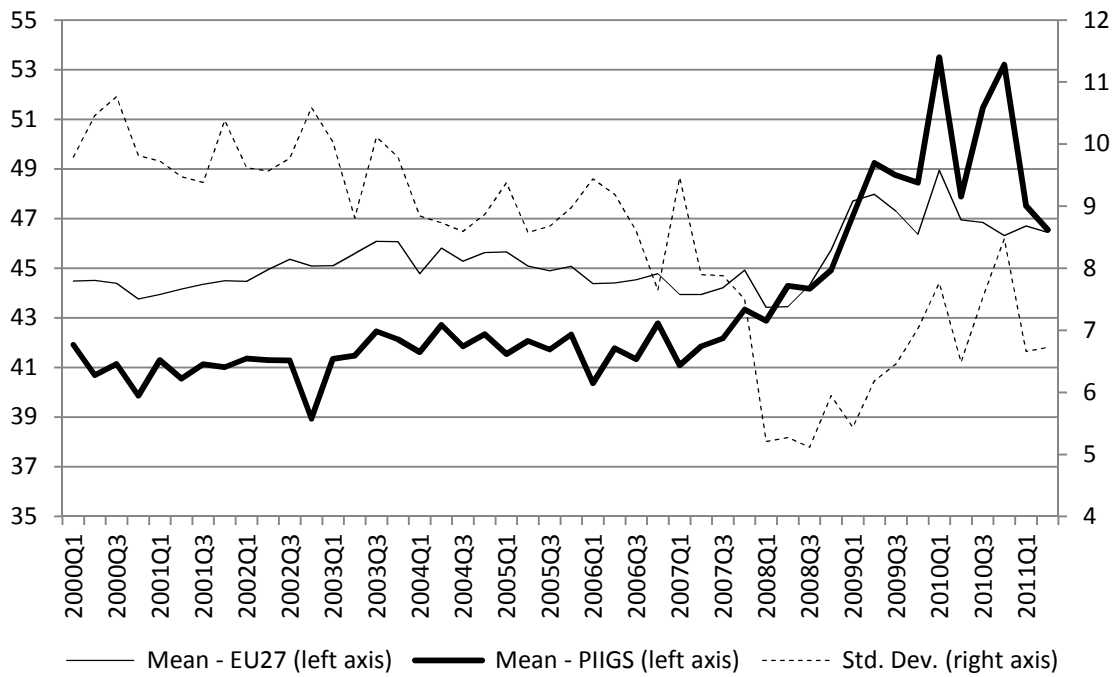
Source: Authors' calculations

Figure 8. *Public Debt to GDP Ratio in the EU-27 and its Components*
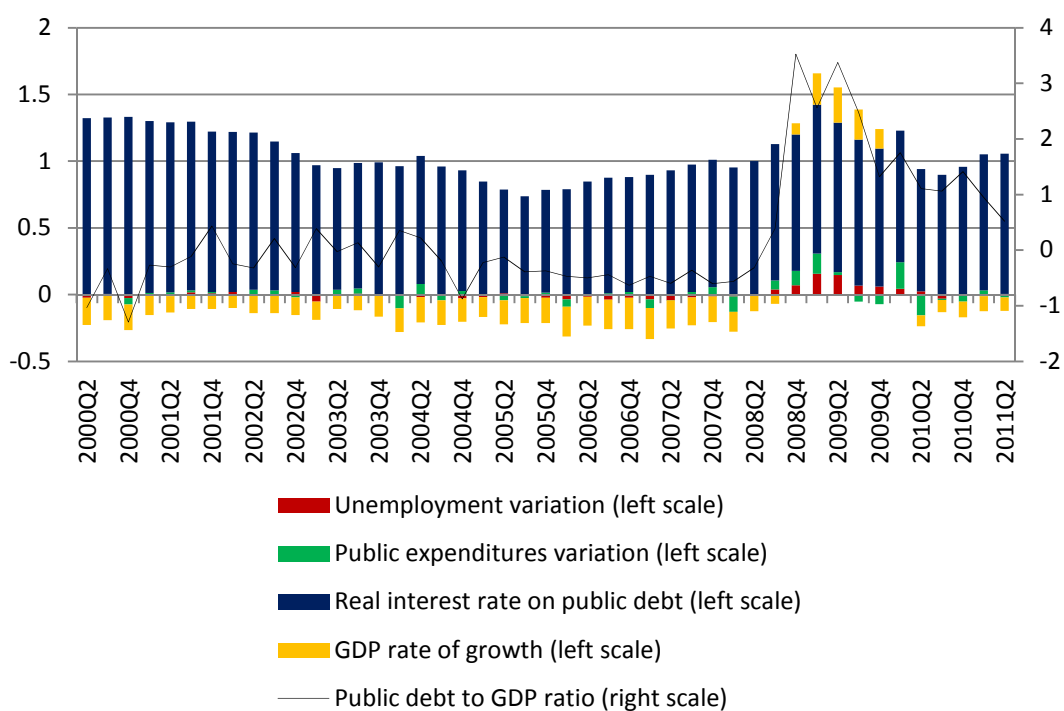
Source: Authors' calculations

(Note: Each column represents the contribution of each factor to quarterly change of the debt to GDP ratio. A positive value means that a given factor contributed to an increase of the debt to GDP ratio. A negative value means that a given factor contributed to a decrease of the debt to GDP ratio)

Figure 9. *Public Debt to GDP Ratio in the PIIGS and its Components*

Source: Authors' calculations

(Note: Each column represents the contribution of each factor to quarterly change of the debt to GDP ratio. A positive value means that a given factor contributed to an increase of the debt to GDP ratio. A negative value means that a given factor contributed to a decrease of the debt to GDP ratio)

Figure 10. *Public Debt to GDP Ratio in the EU (2007:02)*
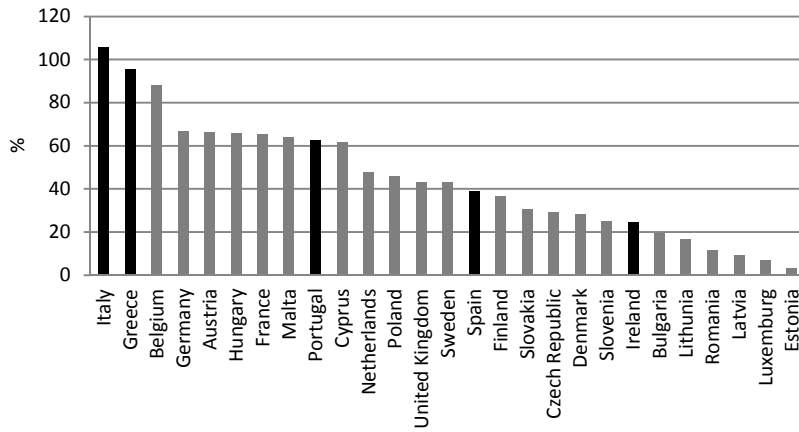
Figure 11. *Primary Surplus to GDP Ratio in the EU (2007:02)*
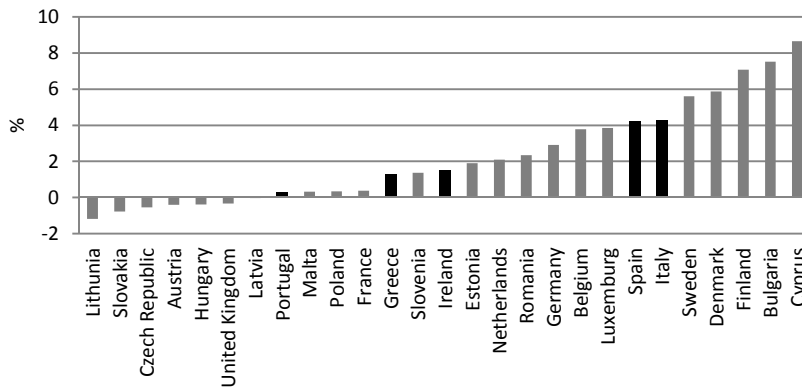
Figure 12. *Avg. Real Growth Rate of GDP (2007:02)*
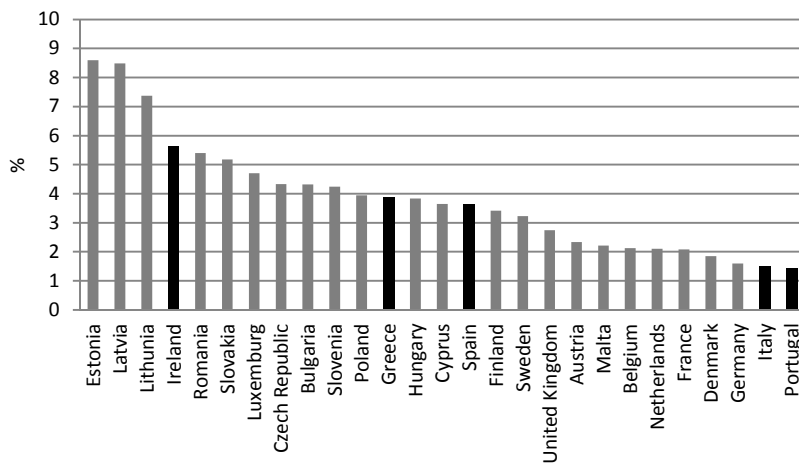
Figure 13. *Current Account in Percentage of the GDP (2007)*
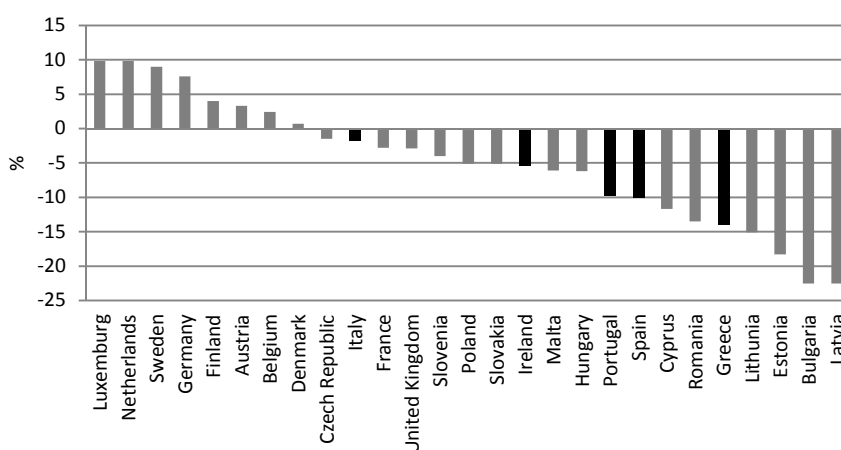
Figure 14. *Employment in Construction Sector (2007)*
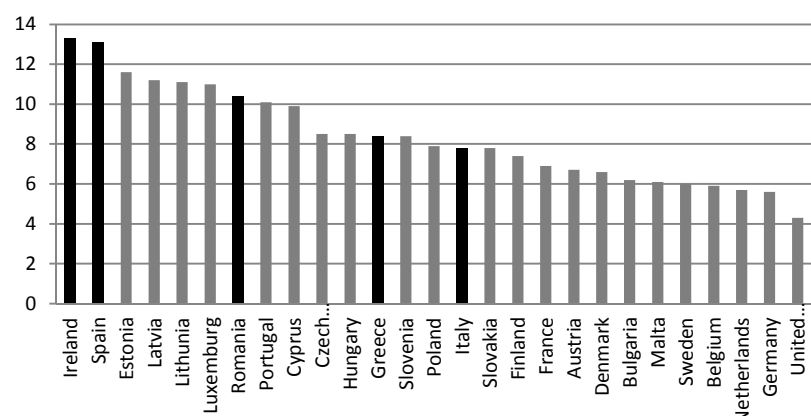
Figure 15. *Mortgage Debt in Percentage of the GDP (2007)*
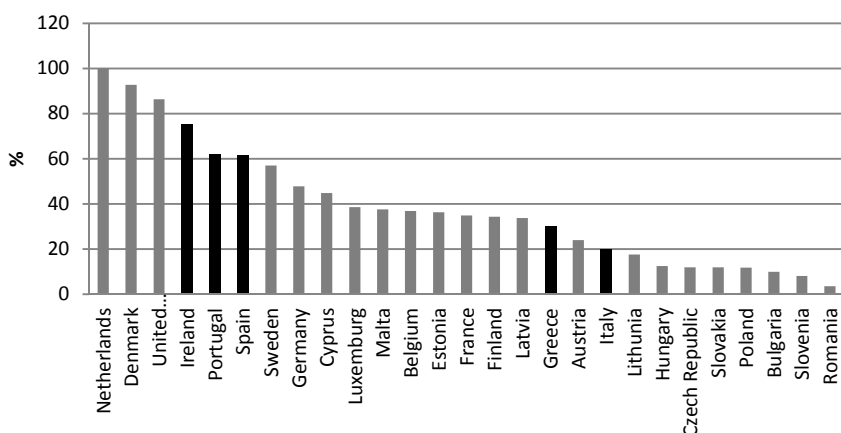
Figure 16. *Employment Rigidity Index – World Bank (2007)*
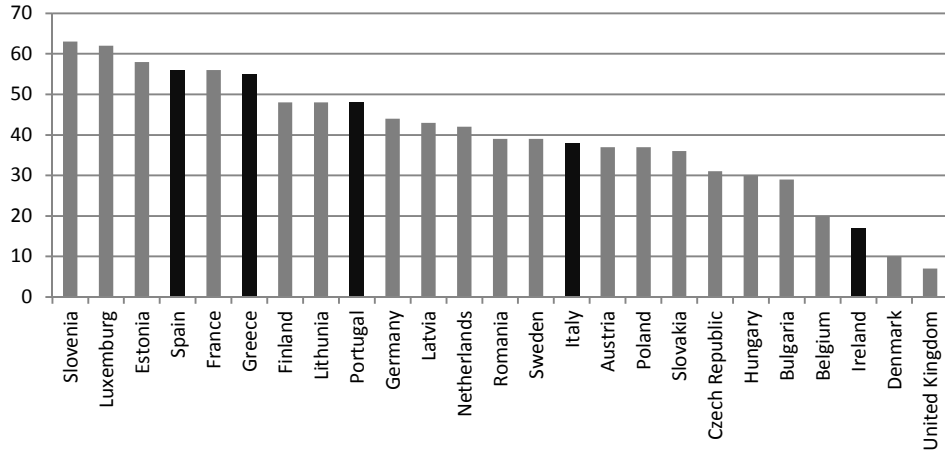
Source: World Bank – Doing Business 2007

Figure 17. *Bi-variate Relationship between Public Debt Variation and Fundamentals*

	Debt to GDP ratio (2007:02)	Primary budget to GDP ratio (2007:02)	Avg. GDP growth rate (2000:01-2011:02)	% of short-term public debt (2007:02)	Current account balance – percentage of GDP (2007)	Real effective exchange rate (2007)	Employment in the construction sector (2007)	Mortgage debt – % of GDOP (2007)	Employment rigidity index – World Bank (2007)
Variation of debt to GDP ratio (2007:02-2011:02)	0.11	-0.28	0.044	0.01	-0.20	0.02	0.43**	0.36*	0.002
	(0.52)	(-1.38)	(0.21)	(0.04)	(-0.98)	(0.09)	(2.29)	(1.86)	(0.01)

t-statistics in brackets
***, **, and * indicate significance at 1, 5 and 10 percent respectively.

Figure 18. *Bi-variate Relationship between Variation of the Real Average Interest Rate Paid on Government Bonds and Fundamentals*

	Debt to GDP ratio (2007:02)	Primary budget to GDP ratio (2007:02)	Avg. GDP growth rate (2000:01-2011:02)	% of short-term public debt (2007:02)	Current account balance – percentage of GDP (2007)	Real effective exchange rate (2007)	Employment in the construction sector (2007)	Mortgage debt – % of GDOP (2007)	Employment rigidity index – World Bank (2007)
Variation of the real interest rate on government bonds (2007:02-2011:02)	0.27	-0.16	0.04	0.01	-0.46**	-0.11	0.40**	0.02	0.08
	(1.34)	(-0.75)	(0.21)	(0.09)	(-2.47)	(-0.06)	(2.09)	(0.09)	(0.41)

t-statistics in brackets
***, **, and * indicate significance at 1, 5 and 10 percent respectively.

Figure 19. *Size of the Fiscal Stimulus*
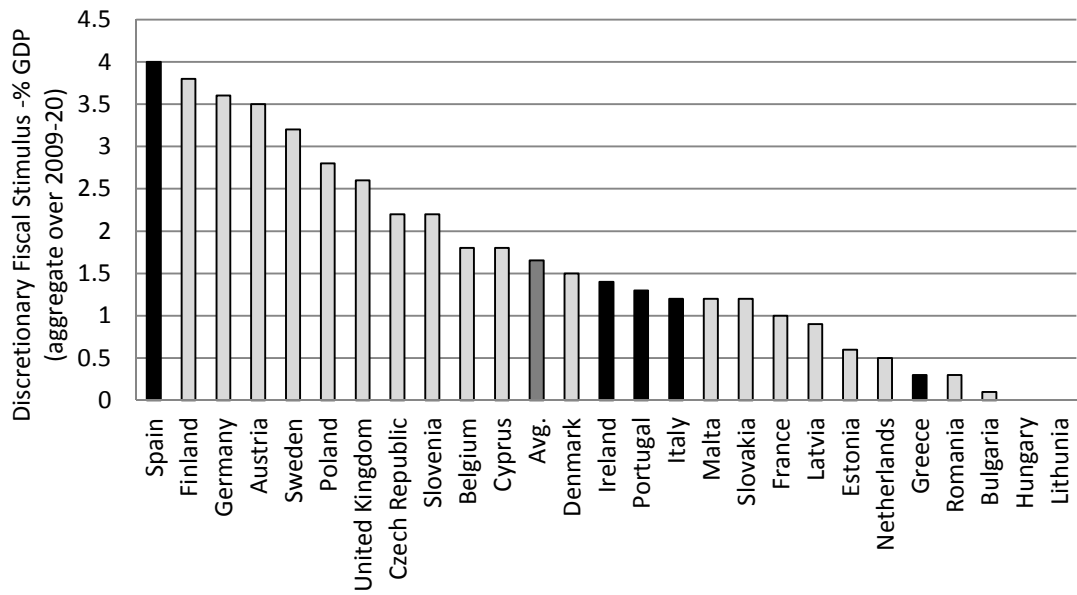
Figure 20. *Bi-variate Relationship between the Fiscal Stimulus and the Fiscal Space*
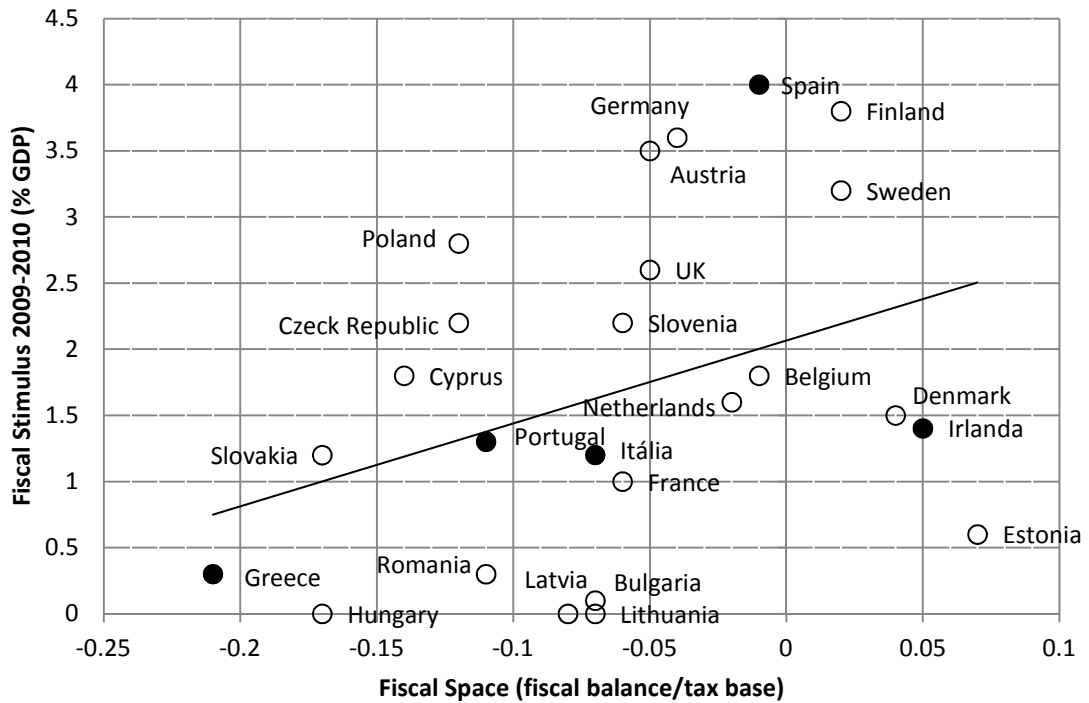
Figure 21. *Bi-variate Relationship between the Fiscal Stimulus and the variation in the Output GAP*
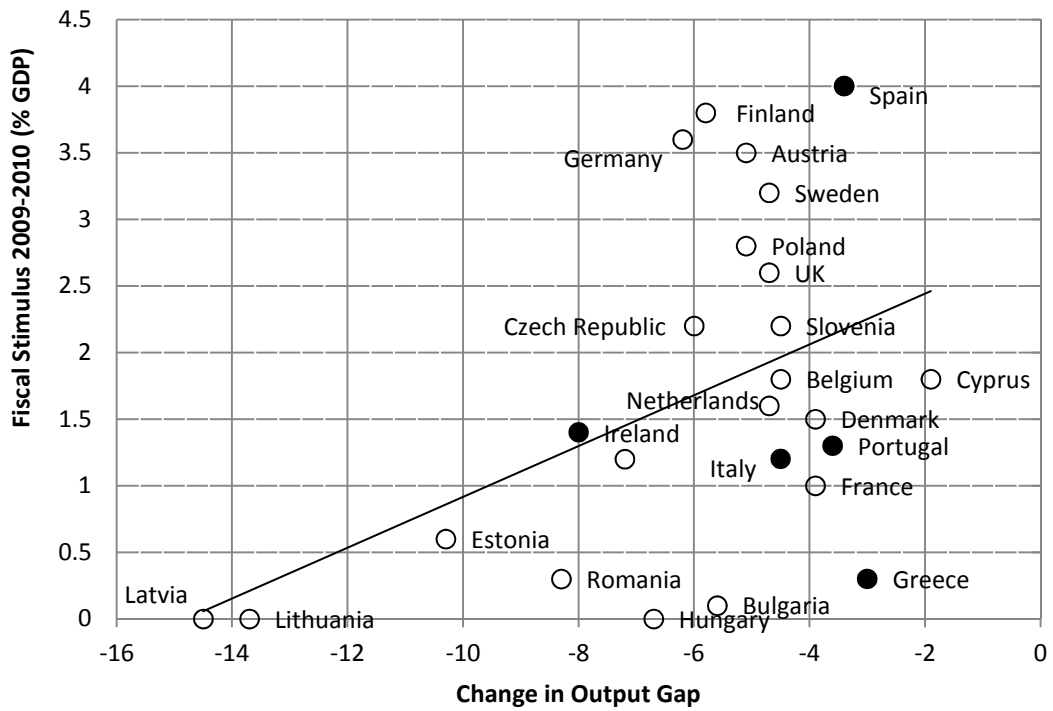

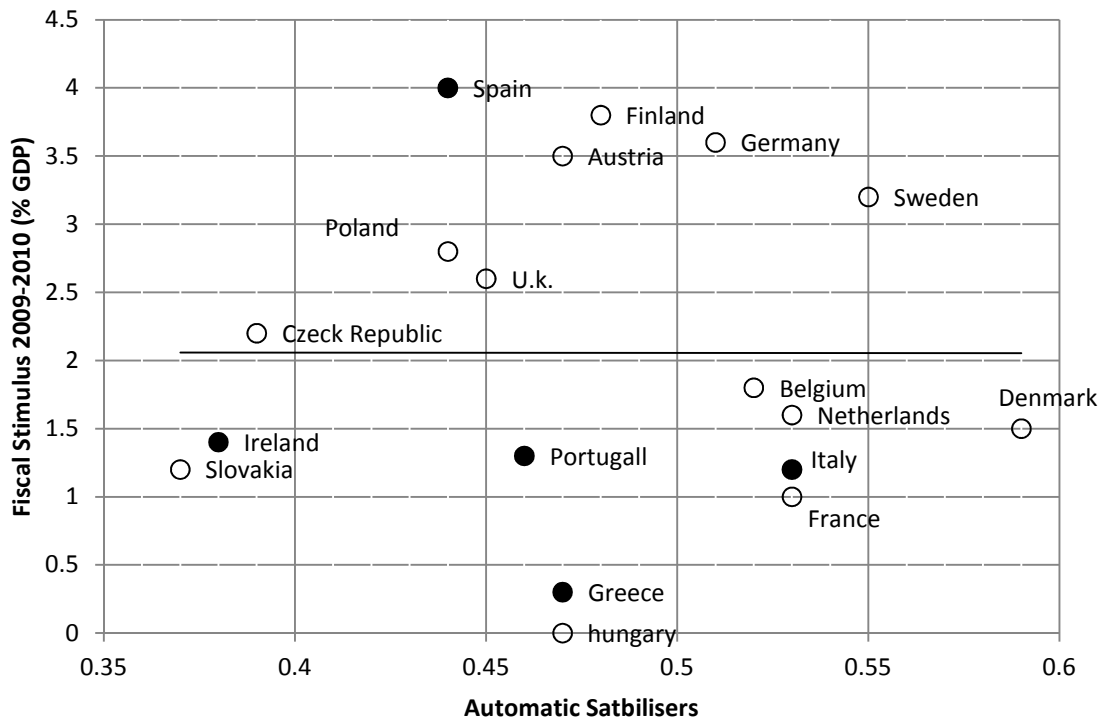**Figure 22.** *Bi-variate Relationship between the Fiscal Stimulus and the Size of the Automatic Stabilisers*

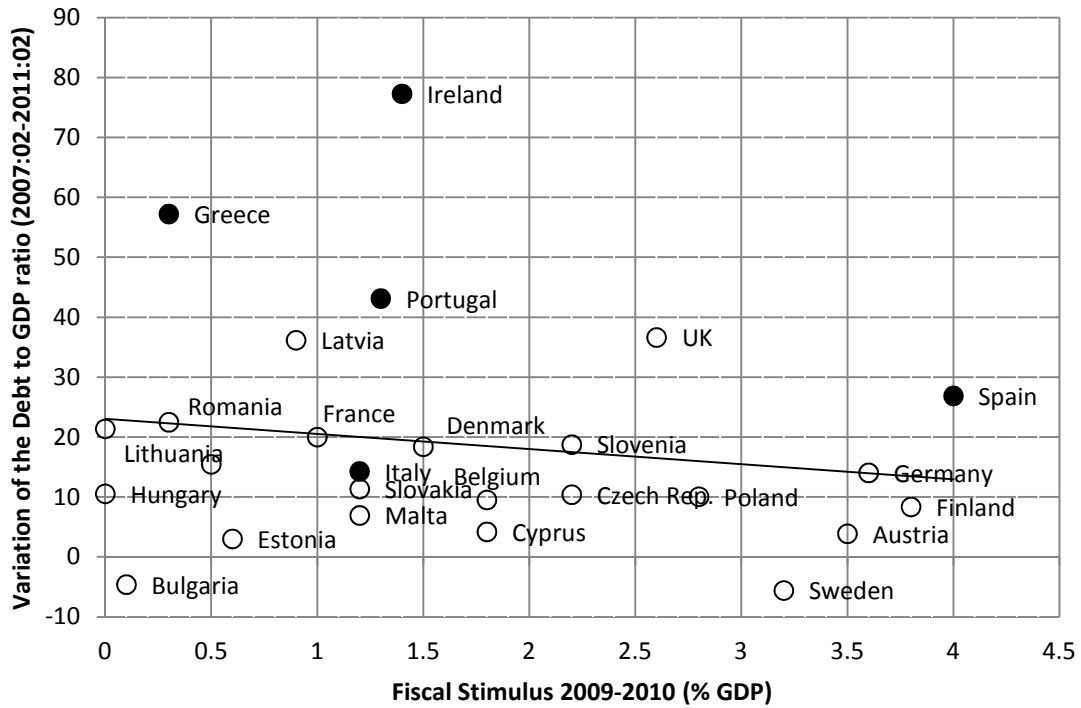**Figure 23.** *Bi-variate Relationship between the Fiscal Stimulus and the Variation of the Debt to GDP Ratio*
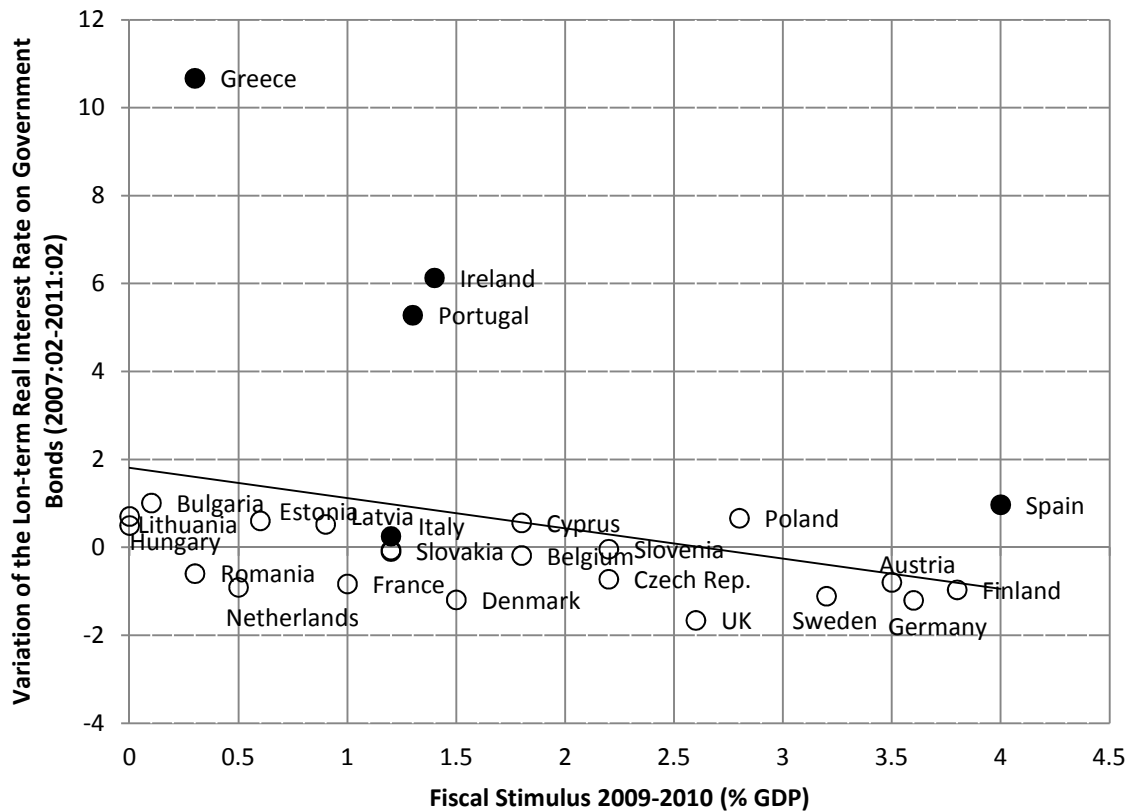

Figure 24. *Bi-variate Relationship between the Fiscal Stimulus and the Variation of the Lon-Term Real Interest Rate on Government Bonds*

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