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Abstract

In this paper we provide empirical evidence documenting the nature of the Eurozone's fragility. We find that during periods of turmoil, financial markets have tended to impose strong programs of austerity on member countries of the Eurozone. This confirms the evidence we found in a previous paper (De Grauwe and Ji(2013)). In addition we find that the panic-induced austerity, as it occurs mainly during periods of recession, has the effect of reducing the power of the automatic stabilizers in the government budgets, thereby making the economic downturns more intense. We find evidence that this feature has been present in the Eurozone. Our policy conclusion is that the institutional changes that have been introduced in the Eurozone since the start of the sovereign debt crisis are insufficient to safeguard the Eurozone from future crises.

JEL-Code: E400.

Keywords: Eurozone, austerity, automatic budget stabilizers.

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1. Introduction

The sovereign debt crisis that erupted in 2010 has exposed the structural weaknesses of the Eurozone. These structural weaknesses can be summarized as follows. The governments of Eurozone countries issue debt in a currency, the euro, over which these governments have no control. As a result, when a recession hits and public finances deteriorate, market panic can be set in motion leading to large surges in the government bond spreads and a sudden stop in liquidity provision, forcing governments of Eurozone countries into quick and intense austerity. In standalone countries these surges in spreads and sudden stops are avoided because of the existence of national central banks that will provide liquidity in times of crisis.

Thus the structural weakness of the Eurozone countries arises from the absence of a backstop (a lender of last resort) in the government bond markets making sovereigns in the Eurozone vulnerable to market sentiments of fear and panic. When these sentiments surge, they can lead to self-fulfilling liquidity crises characterized by sharp increases in the government bond rates, sudden stops in liquidity in the government bond markets and intense austerity measures. As these crises typically erupt when the economy experiences a downturn, these austerity measures have the effect of switching off the automatic stabilizers in the government budget. As a result, the economic recessions are made more intense and can lead to social and political instability in the countries concerned (see De Grauwe (2011) for an analysis of this structural fragility of the Eurozone; see also Eichengreen, et al. (2005) for an analysis of a similar problem in emerging economies)[1].

All this makes it necessary to empirically analyze the nature of the fragility of the Eurozone. This is what this paper attempts to do. It is a follow-up on the empirical work performed by the present authors (see De Grauwe and Ji(2013)) and by others (Fuertes, et al. (2014)). We will organize our testing procedure as follows. According to the fragility hypothesis members of a monetary union are sensitive to movements of fear and panic that can push these countries into a

[1] See also Obstfeld(1986) and Gros(2007)

liquidity crisis forcing them to implement quick and intense austerity measures. We will test this hypothesis in two ways. The first one is a direct one: we will estimate the effect of increasing spreads on austerity measures. We expect that this effect is stronger in the Eurozone than in the non-Eurozone countries. The second one is indirect. While a recession leads to an automatic increase in the budget deficits, members of a monetary union are more likely to be forced into austerity during a recession and thus to be forced to offset this automaticity in the government budget. We will design an empirical procedure to test this hypothesis.

The remainder of the paper is organized as follows. In section 2 we analyze empirically the link between the spreads and austerity measures. In section 3, we provide evidence that during the sovereign debt crisis Eurozone countries were forced to switch off the automatic stabilizers. Policy implications and conclusions are discussed in section 4 and 5.

2. The link between spreads and austerity

In De Grauwe and Ji(2013) empirical evidence was provided for the hypothesis that panic and fear in the government bond markets had forced Eurozone governments into intense austerity programs. However, we provided evidence for just one period (2009-12) and a limited number of countries (mainly the peripheral Eurozone countries). In this section we enlarge the empirical analysis by using a larger sample of countries (including non-Eurozone countries). They include 19 countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain, Czech, Denmark, Hungary, Norway, Poland, Sweden, Switzerland and UK. Using annual information, we will also include a longer time period from 2000 to 2014. We ask the question of how sensitive austerity policies are to increases in the spreads in the government bond rates (10-year).

The headline budget balance does not distinguish between structural and cyclical components. To obtain the structural component, we use the cyclically-

adjusted primary budget balances computed by the OECD[2] (Girouard and Andre(2005)). We measure austerity by the "fiscal impulse" variable used by the IMF. This is defined as the change in the structural primary budget balance. A positive sign of the fiscal impulse variable means that the government has raised taxes and/or reduced spending in a discretionary way, i.e. independently from the changes in taxes and spending that occur as a result of changes in GDP. A negative sign means the opposite, i.e. that the government has reduced taxes and/or increased spending in a discretionary way.

We specify the following econometric equation:

$$\Delta F_{i,t} = a + bF_{i,t-1} + \Upsilon S_{i,t-1} + c_i + v_{i,t} \qquad (1)$$

where $\Delta F_{i,t}$ is the change in the structural primary balance in country i in period t, (when $\Delta F_{i,t} > 0$ country i applies austerity in period t), $F_{i,t-1}$ is the structural primary balance in country i in period t-1, $S_{i,t-1}$ is the difference between the 10-year government bond rate of country i and Germany (the spread) in period t-1, c_i is a country fixed effect expressing the time invariant country specific effects on austerity. Finally, $v_{i,t}$, is the error term.

We use the lagged value of the spread, $S_{i,t-1}$ to take into account that there is usually a time delay between the market pressure (represented by the spread) and the austerity measures. In addition, the lag in the spread has as an advantage to remove a potential reverse causality problem in our econometric analysis. However, Equation (1) can still have a possible endogeneity problem between $\Delta F_{i,t}$ and $S_{i,t-1}$ due to "omitted variables". In order to deal with this, we

[2] The cyclically-adjusted balance is computed to show the underlying fiscal position when cyclical or automatic movements are removed. In terms of revenues, four different types of taxes are distinguished in the cyclical adjustment process: personal income tax; social security contributions; corporate income tax and indirect taxes. The sole item of public spending treated as cyclically sensitive is unemployment-related transfers. The cyclically-adjusted balance (ratio to potential output), b*, is thus defined as:

$$b^* = (\sum T_i^* - G^* + X)/Y^*$$

Where: G^*: cyclically-adjusted current primary government expenditures; T_i^*: cyclically-adjusted component of the i th category of tax; X: non-tax revenues minus capital and net interest spending; Y^*: level of potential output.

introduce three instrumental variables. These instrumental variables should be exogenous variables that are correlated with $S_{i,t-1}$, but are uncorrelated with the error term $v_{i,t}$.

First, we explore the advantage of the panel data and use the lagged value of $S_{i,t-1}$, i.e. $S_{i,t-2}$. This is often an ideal instrumental variable as $S_{i,t-2}$ at period t-2 is unlikely to play a direct role on the fiscal impulse at period t. Second, we use a global financial crisis dummy (2009-2014, indicated as 1). The financial crisis is an exogenous shock that affected spreads in the government bond markets as investors became increasingly risk averse. As this crisis dummy is a business cycle dummy, it is unlikely that it has a direct effect on the fiscal impulse variable which is removed of its cyclical component. Third, we use an "OMT program dummy". The OMT program was announced in 2012 and it had an important impact on the spreads as it eliminated the fear factor and allowed the spreads to decline significantly, especially in the periphery countries of the Eurozone (De Grauwe (2011), De Grauwe and Ji (2013) and Altavilla et al. (2014)). Similarly, it is unlikely that the OMT program of the European Central Bank would play a direct role on the fiscal impulse variable we are interested in.

Equation (2) describes the relationship between $S_{i,t-1}$ and these instrumental variables.

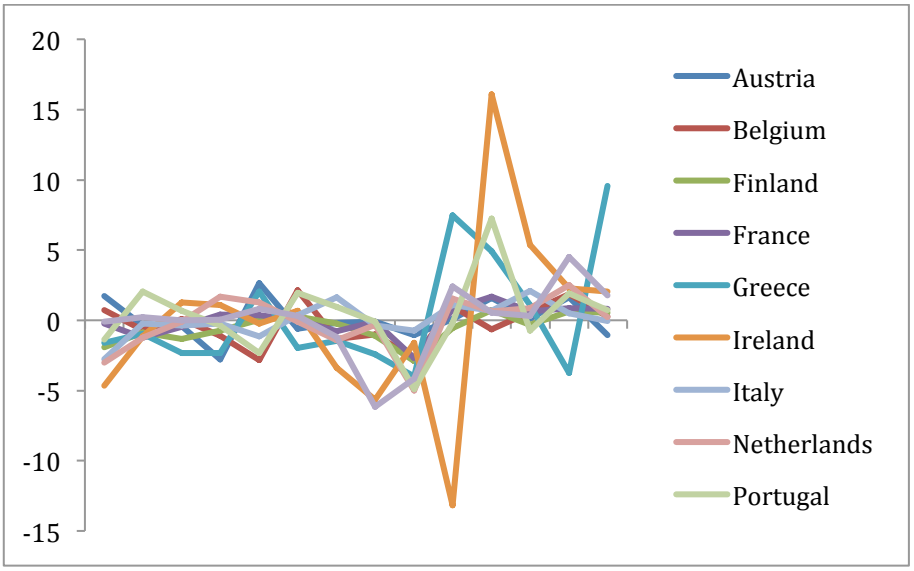
$$S_{i,t-1} = zS_{i,t-2} + \pi OMT_{i,t-1} + \mu crisis_{i,t-1} + \varepsilon_{i,t-1} \qquad (2)$$

We have already explained that these instrumental variables are expected to be exogenous and the following conditions hold:

$$\text{cov}(S_{i,t-2}, v_{i,t}) = 0, \qquad \text{cov}(OMT_{i,t-1}, v_{i,t}) = 0, \qquad \text{cov}(crisis_{i,t-1}, v_{i,t}) = 0$$

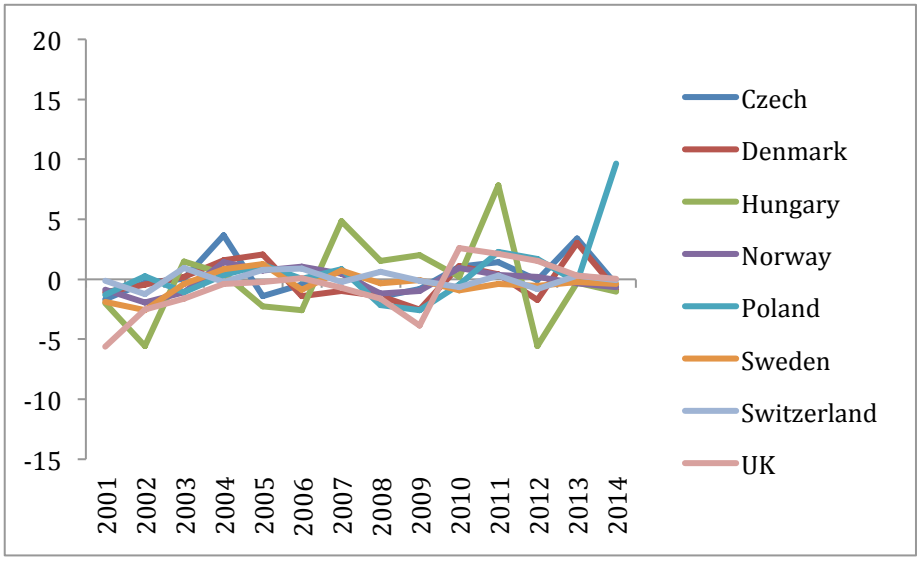
Before discussing the estimation results we present the fiscal impulse variable $\Delta F_{i,t}$ in Figure 1 (Eurozone countries) and Figure 2 (non-Eurozone countries).

Figure 1: Fiscal impulse as a percent of GDP, Eurozone



Source: OECD and authors' own calculations

Figure 2: Fiscal impulse as a percent of GDP, Non-Eurozone EU



Source: OECD and authors' own calculations

We observe a greater variability of the fiscal impulse variable in the Eurozone as compared with the rest of the European Union since the start of the sovereign debt crisis. The case of Ireland is extreme with large fluctuations in the fiscal impulse variable[3].

The next step in the analysis consisted in checking for structural differences in the effect of the spreads on the fiscal impulse variable in equation (1) between

[3] We note the extreme negative value in 2010. This is the year Ireland had to write into its budget the large losses due to the banking crisis.

Eurozone and non-Eurozone countries. We applied a Chow-test. We do not find significant differences in the coefficient of $S_{i,t-1}$ as between Eurozone and non-Eurozone countries. In other words in the whole sample of countries a given increase in the spread leads governments to apply similar austerity measures. The difference between Eurozone and non-Eurozone countries is to be found in the magnitude of the changes in the spreads (as made clear by Figures 1 and 2).

The results of the estimation of equation (1) with and without instruments are presented in Table 1. These results lend themselves to the following interpretation. First, there is a significant positive effect of the spreads on the fiscal impulse variable. We find that a one percent increase in the spread leads to an increase in austerity (an increase in the structural primary budget) of 0.249 to 0.697 percent of GDP.

Table 1. The effect of Spread on the Fiscal Impulse variable (Ft)

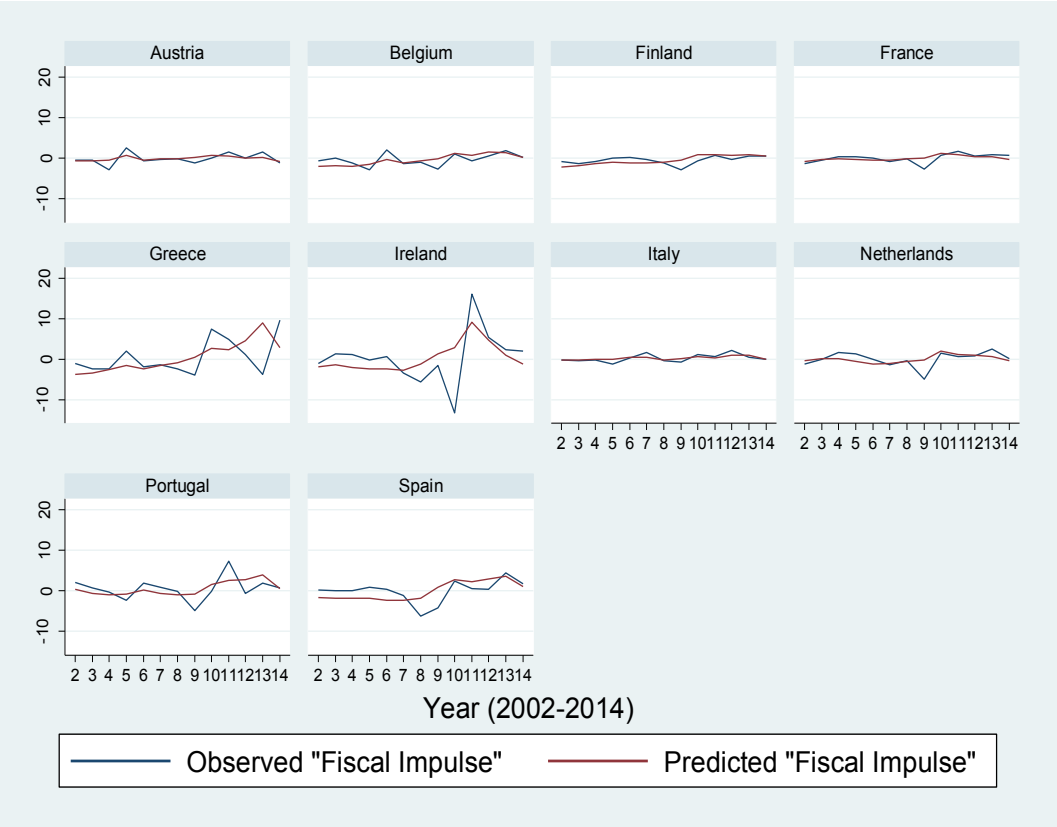
	(1) OLS	(2) IV	(3) IV	(4) IV
Fi,t-1	-0.399***	-0.408***	-0.412***	-0.409***
	(0.035)	(0.061)	(0.054)	(0.061)
Si,t-1	0.249***	0.610***	0.697***	0.619***
	(0.078)	(0.083)	(0.153)	(0.080)
Instrumental Variables:				
Si,t-2	No	Yes	No	Yes
OMTi,t-1*Periphery	No	No	Yes	Yes
Crisisi,t-1	No	No	Yes	Yes
Weak instrument test: F test (1st stage regression)	----	985.04	3.51	625.57
Overidentification test: Hansen J statistic (Chi-sq(2) P-val =)	----	-----	0.9185	0.5882
Observations	265	246	265	246
R-squared	0.228	0.133	0.126	0.130
Number of country	19	19	19	19

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Second, the OLS estimate (column (1)) is smaller than the Instrumental Variable estimates (columns (2) to (4)). This is due to the fact that because of the endogeneity problem the OLS method generates a downward bias of the causal effect of the spread on austerity. (Note that we use different instrumental variables in columns (2) to (4)). Both weak instrument tests and overidentification tests are performed to compare the use of instrumental variables. Column (4) shows that a combination of $S_{i,t-2}, OMT_{i,t-1}$ *and* $crisis_{i,t-1}$

produces a more reliable coefficient estimate of 0.619. Thus an increase in the spread by one percentage point leads to an increase in austerity by 0.6 % of GDP.

Figure 3: Predicted and observed fiscal impulse variable



The next step in the analysis consisted in simulating how well the model predicts the fiscal impulses during the sample period. We show the results of this exercise in Figure 3. We observe that the model tracks the changes in the fiscal impulses during the crisis period relatively well, i.e. the increase in austerity seems to be associated with increasing spreads. There is however a relatively large unexplained component that is related to idiosyncratic policy reactions in the different countries. Note also that the period of 2008-09 is not well explained by the model. This is the period immediately following the banking crisis that has led to the Great Recession. During that period governments seem to have reacted by expansionary fiscal policies (a negative fiscal impulse variable).

3. The automatic stabilizers in the budget during the crisis

One of the major achievements of the last century is the fact that government budgets tend to exhibit automatic stabilizers. Thus, during a recession government revenues tend to decline automatically while government spending (e.g. unemployment benefits) tends to increase automatically. As a result, during a recession the government debt to GDP ratio tends to increase automatically. The opposite occurs during a boom. The latter leads to an automatic increase in the government budget surplus, and thus to an automatic decline in the government debt to GDP ratio.

It is generally recognized that these automatic budget stabilizers are welfare improving. They tend to diminish the amplitude of the business cycle, i.e. they make the recession less deep and soften the blow for many people that are hit by the recession. During a boom these stabilizers tend to reduce the intensity of the boom.

In this section we wish to study the Eurozone fragility hypothesis from the perspective of how it has affected the automatic stabilizers. We will look at both the Eurozone countries (Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain) and the non-Eurozone EU-countries (Czech, Denmark, Hungary, Poland, Sweden and UK). The latter will be used as a control group. We will use quarterly data from 2000Q1 to 2014Q1.

Two issues arise when testing this hypothesis. The first issue is whether there is evidence that automatic stabilizers in the Eurozone countries were switched-off (partially or fully) during the sovereign debt crisis. The second issue is whether this is something specific to the Eurozone countries or not. The fragility hypothesis suggests that the automatic stabilizers are more likely to be switched off in the Eurozone than in the non-Eurozone countries.

From the preceding it follows first that we have to empirically investigate the extent to which the automatic stabilizers were switched off in the Eurozone. Second we have to test whether a similar switching-off occurred in the non-euro EU-countries.

To test the first part of the hypothesis we specify the following equation:

$$\Delta D_{i,t} = a + c_i + b\Delta Y_{i,t-1} + gZ_{it} + \varepsilon_{i,t} \qquad (3)$$

where $\Delta D_{i,t}$ is the change (in percent) of the debt to GDP ratio, c_i are the country fixed effects, $\Delta Y_{i,t-1}$ is the change (in percent) of real GDP in period t-1. We have added a number of control variables Z_{it} in the econometric equation. One measures the effect of government bond rate. As documented in the previous section an increase in the spread (the difference of the domestic interest rate and the German interest rate) forces the budgetary authorities to apply more austerity measures. These then may lead to a change in the debt to GDP ratio.

The other control variable is the current account. We expect that by increasing the external debt, a current account deficit spills over into an increase in the government debt to GDP ratio.

Note that we lag the growth rate of GDP. This is to take into account that changes GDP have a lagged effect on the budget. Note that as we use quarterly data the lag is relatively short. Using a lagged growth rate of GDP also helps to avoid reverse causality problems that have to do with the fact that changes in the debt to GDP ratio can affect the growth rate of the economy.

The coefficient b measures the degree to which an automatic budget stabilizer exists, i.e. it measures the extent to which an increase (decline) in the growth rate of GDP in period $t-1$ affects the budget outcome in period t (the change in the debt to GDP ratio). We expect it $b < 0$, i.e. a decline in the growth of GDP leads to an increase in the government budget deficit (an increase in the debt ratio) and vice versa.

The way we want to analyze the effect of the financial crisis on the automatic stabilizers is to estimate how this coefficient b has been affected by the crisis. In order to do so, we will add a crisis dummy variable that interacts with the growth rate of GDP, i.e.

$$\Delta D_{i,t} = a + c_i + b\Delta Y_{i,t-1} + b'\Delta Y_{i,t-1}Crisis + gZ_t + \varepsilon_{i,t} \qquad (4)$$

where *Crisis* is a dummy variable with zeros before and ones since the crisis. The parameter b' then measures the extent to which the automatic stabilizer has changed, i.e. a significant positive b' tells us that since the crisis the growth rate of GDP has a smaller impact on the budget (the change in the debt to GDP ratio).

We will also want to analyze whether such a structural change has been more prevalent in some countries than in others. For example, we want to analyze whether the structural shift, if any, has been more pronounced among the Eurozone countries of the periphery than among those of the core.

The second part of the fragility hypothesis is tested by estimating the same equation for the non-Euro EU-countries, and to compare the results with those of the Eurozone countries.

The results of this testing exercise are presented in Table 2. Columns (1) to (3) show the results of estimating (4) for the Eurozone countries, while column (4) does this for the non-euro EU-countries. The results lead to the following interpretations.

Table 2: Estimating equation (4): fixed effect model; sample period 2000Q1-2014Q1; quarterly data

	(1) Eurozone	(2) Core	(3) Periphery	(4) Others
Lagged GDP Growth	-0.521***	-0.434***	-0.587***	-0.212**
	(0.057)	(0.073)	(0.058)	(0.079)
Crisis*Lagged GDP Growth	0.318***	0.279**	0.312***	0.037
	(0.053)	(0.104)	(0.043)	(0.033)
Lagged interest rate	-0.023	0.050	-0.084	0.033
	(0.090)	(0.059)	(0.112)	(0.111)
Lagged current account	-0.011	-0.037	-0.007	-0.033
	(0.032)	(0.066)	(0.047)	(0.051)
Observations	558	335	223	388
R-squared	0.146	0.104	0.177	0.062
Number of countries	10	6	4	7

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

From Table 2 one observes first that prior to the financial crisis the degree of automatic stabilization of the budget is found to be quite sizable in the Eurozone countries. For every 1% decline in output in a particular quarter, the debt to GDP ratio in the next quarter increases by 0.52% in the Eurozone as a whole. This effect is even higher in the periphery and correspondingly smaller in the Core countries of the Eurozone.

A second observation is that since the crisis the size of the automatic stabilizers has declined significantly in the Eurozone countries. This can be seen from the fact that the coefficients of the Crisis*Lagged GDP Growth is positive and significantly so.

Turning to column (4) we find that the pre-crisis coefficient of Growth GDP (automatic stabilizer) in the non-Eurozone is significant but lower than in the case of the Eurozone countries. More importantly, we find that the coefficient of Growth GDP*Crisis is not significantly different from zero. Thus the financial crisis does not seem to have reduced the automatic stabilizers in the budget of the non-euro EU-countries.

4. Some Policy Implications

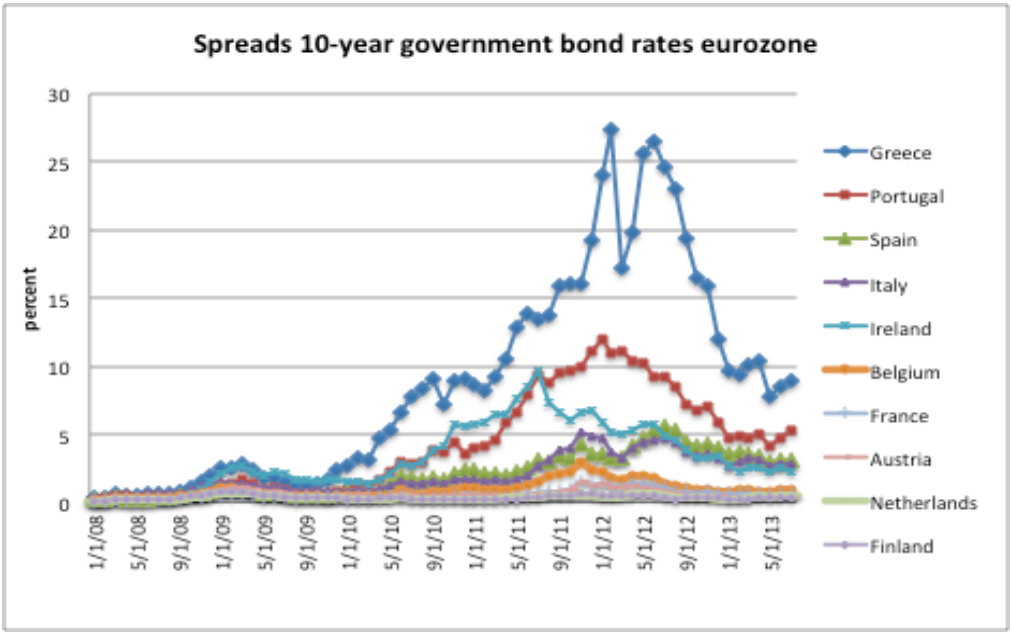
The previous evidence confirms previous empirical research about the fragility of the Eurozone. The fragility of the financial markets, mainly government bond markets, also leads to the weakening of the anti-cyclical fiscal policies of these Eurozone countries. The policy reactions to the fragility of the Eurozone have been twofold. The first one came in the form of setting up a system of short-term financial support (the EFSF later transformed into the ESM) for countries hit by liquidity stops, conditional on maintaining an (un)healthy dose of austerity in the countries receiving the support. As these financial support mechanisms appeared to be insufficient to stop panic in the government bond markets, the ECB stepped in in 2012 and announced its OMT-program, which was a promise to provide unlimited liquidity support in the sovereign bond markets in times of crisis (conditional again on a willingness of the recipient country to engage in austerity measures). This OMT-program has been highly successful in bringing stability into the government bond markets and led to a spectacular decline in the government bond spreads (as illustrated in Figure 4)[4].

The question that arises today is whether the OMT-program is sufficiently credible to be used next time when a crisis hits the sovereign bonds markets of the Eurozone. The lack of credibility finds its origin in the "guerilla-warfare" conducted in Germany against the OMT-program culminating in the German Constitutional Court's ruling in early 2014 that OMT is illegal. Although the last word on this legal issue will have to wait until the European Court of Justice issues its verdict, a lot of uncertainty and doubt have been created about the

[4] See (Wyplosz(2012)) for a discussion of other issues concerning the ECB

capacity of the ECB to deal with the next crisis in the Eurozone government bond markets (see De Grauwe (2014) and Winkler(2014)).

Figure 4:



Source: Datastream

The second policy reaction to the structural fragility of the Eurozone has been to reinforce the mechanism of budgetary discipline (through the reinforced Stability and Growth Pact (SGP) and Fiscal Compact). The theory underlying this disciplining mechanism is that it will prevent governments from being pushed into liquidity crises by financial markets in the first place (von Hagen(2007)). Financial markets will not punish fiscally virtuous governments. Put differently, the disciplining mechanism will promote virtue and prevent crises from occurring.

The problem with this approach is twofold. First, virtue is not always rewarded. There are shocks big enough that will push governments with low debt levels quickly into danger territory as was made clear by the cases of Ireland and Spain that had the lowest debt to GDP ratios in the Eurozone prior to the crisis. Second, the governance structure of the SGP is unsustainable. The European Commission has been given much authority in imposing budgetary discipline. As a result, that institution can de facto push national governments into raising taxes and

reducing spending while it does not bear the political costs of these decisions. Those who bear these political costs are the national governments. Such a governance structure cannot be sustained because it lacks democratic legitimacy. Sooner or later it will lead to conflicts and refusals by national governments to abide by the rules that the Commission tries to impose. This has already happened with major countries like France and Italy successfully resisting the pressures from Brussels.

From the preceding it follows that the policy reactions that aim at dealing with the structural fragility of the Eurozone have not created institutional changes strong enough to deal with such a crisis. The OMT-program lacks credibility and the disciplining mechanisms have an unsustainable governance. As a result, this fragility is still with us. At some moment it will lead to new crises in the Eurozone. The fact is that the Eurozone is not prepared to deal with such a new crisis.

5. Conclusion

The Eurozone is a fragile construction and it remains so, even after the institutional reforms that have been introduced since the eruption of the sovereign debt crisis. It is therefore important to understand the nature of this fragility.

In this paper we have provided empirical evidence documenting the nature of this fragility. We found empirical evidence that during periods of turmoil, financial markets have tended to impose strong programs of austerity on member countries of the Eurozone. This confirms the evidence we found in a previous paper (De Grauwe and Ji(2013)). In addition we found that the panic-induced austerity, as it occurs mainly during periods of recession, has the effect of reducing the power of the automatic stabilizers in the government budgets, thereby making the economic downturns more intense. We found evidence that this feature has been present in the Eurozone. We could not detect such a feature in a sample of non-Eurozone countries.

The fact that financial markets have the power to force member countries into austerity programs may not by itself be problematic. It is, however, when this dynamics is driven by fear and panic. The latter are no good guides of sound macroeconomic policies. If such a feature becomes endemic, i.e. with each recession financial markets push the Eurozone countries into applying intense austerity measure, the social and political sustainability of the Eurozone will increasingly be put into question. The inhabitants of these countries are unlikely to accept that being member of the Eurozone makes it necessary to suffer more than inhabitants of countries that have kept their own currencies.

A necessary, but by no means sufficient, condition to avoid such a dynamics is that the ECB's role as a lender of last resort in the government bond markets be backed politically by all member countries. Such a backup is necessary for the ECB to keep its credibility. Without such credibility the Eurozone is almost certainly walking towards its next crisis.

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