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Eurozone crisis and fiscal procyclicality:

An econometric approach

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SUMMARY

"The boom, not the slump, is the right time for austerity at the Treasury".

- John Maynard Keynes (1937)

INTRODUCTION

The recent economic and financial crisis in the Eurozone, together with the uprising sovereign risk, forced European Institutions to undertake a program of unprecedented reforms. This program had a double aim: to recover damaged economies and to smooth away situations of imbalances and unsustainability (e.g. the high levels of debt and the high current account deficits) that almost led some of the Eurozone countries to the edge of default. In this framework, particular attention has been paid to the reduction of imbalances, whose importance has been underlined by a part of the literature: accordingly, the reduction of debt was a precondition for a renewed and healthier economic growth (Reinhart and Rogoff, 2010). For these reasons, Institutions have implemented some austerity measures in the Eurozone. Among these, the most relevant one has been the Fiscal Compact, an intergovernmental treaty that imposed new and stricter budgetary requirements for the Member States of the Eurozone, whose primary aim, indeed, was to rule out high levels of debt by restricting fiscal deficits and promoting surpluses.

For its stringent policy implications, Fiscal Compact received huge criticism both in the economic and political debate: the major claim was that Member States were no longer able to implement the necessary fiscal stimulus to recover the economy. Among others, Frankel (2012), Whelan (2012) and Krugman (2013) pointed out that austerity in a time of crisis has the negative effect of depressing growth and reducing social welfare: Krugman himself attacked many times the austerity measures in the columns of the *New York Times*.

Among the negative effect of the austerity during the crisis, Frenkel (2012) and Vegh and Vuletin (2014) claim that these measures have contributed in a relevant way to develop fiscal procyclicality in Southern Eurozone. Fiscal policies are procyclical when they respond positively to short-run fluctuations of GDP, i.e. they are expansionary during booms and contractionary during downturns. The importance of having policies that respond ‘correctly’ to the cycle has been frequently highlighted by the literature over the past decade. Generally, both Keynesian and Neoclassical economics consider

procyclicality as pathologic: it increases output volatility; it makes the economy prone to economic crises and creates several social and economic imbalances. Vegh and Vuetin (2014), looking at country-by-country correlations between spending policies and GDP, found that there has been a certain degree of procyclicality after 2008 in Southern economies of the Eurozone. However, their results are subjected to some criticism and this evidence needs to be further confirmed, especially because they do not point out the difference with the pre-2008 period.

Empirical evidence showed that procyclicality is generally more evident in emerging markets than industrial countries (Gavin and Perotti, 1997), and generally it is taken as one of the major explanation of why these economies have poor welfare conditions and are more prone to default after a financial or economic crisis. If the presence of procyclical fiscal policies is proved in Southern Eurozone, it could imply important negative consequences on Eurozone policies and it may explain some evidence in current economic situation of this geographical area. First of all, the presence of procyclicality may explain the situation of debt intolerance currently suffered from the Southern countries: actually, According to Reinhart and Rogoff (2009) there is a strong link between procyclicality and debt unsustainability. Moreover, it could explain as well why Southern countries experience poor economic growth: as we will see later, almost all of them (with the sole exception of Spain) have experienced a permanent negative trend in output since the outbreak of the crisis, however, this is not only the case of Mediterranean countries. The relation between procyclicality and bad growth has been studied, among others, by Aghion and Marinescu (2008). Frankel, Vegh and Vuletin (2014) do not exclude the possibility that industrial countries may ‘go back to school’, i.e. turn from countercyclical into procyclical, documenting some cases in which thishas happened (e.g. Greece).

At this point, the question of fiscal policy cyclicality is of primary importance, because it can be a starting point for the design of better future policies. For this reason, the intention of this dissertation is to address the problem of procyclicality, by, firstly, determining if this problem is really persistent in the Eurozone and, secondly, in which way it is related to the measures imposed by the European Union. Indeed, we are going to investigate the presence of procyclicality in the Eurozone for the period 2002-2016,

looking for changes in cyclical behaviour that can have a direct relationship with the austerity or the crisis. More specifically, we start from the empirical results obtained by Fatas and Mihov (2010), for the pre-crisis period, and Vegh and Vuletin (2014) for the period after 2008, and we implement an empirical analysis, through the use of policy reaction functions, to capture any change in the management of fiscal policy after the crisis and to see if the results are consistent with what has been found by past literature. This research involves a country-by-country analysis over a sample of 11 countries, i.e. the original Euro area countries excluding Luxembourg. The methodology that we will follow is based on Gavin and Perotti (1997). It has been largely applied in the literature: with the important contribution of Gali and Perotti (2003), Strawczynski and Zeira (2007), Jaimovich and Panizza (2007), Fatas and Mihov (2010). This methodology involves the use of policy reaction functions and distances from the approach of Kaminsky, Reinhart and Vegh (2005), which is instead based on the analysis of country-by-country correlations (a method that has been largely criticized).

The results that we obtained seem to contradict existing literature: austerity has almost no role in changing cyclicality of Southern Eurozone economies, the reason lies in the fact that they were already procyclical at the time when the crisis broke out and the austerity measures have been issued. However, the results of Fatas and Mihov (2010) rejected the hypothesis of procyclicality between 1999 and 2007, but this is due to some methodological weaknesses in the process that they followed.

In the first chapter we will explain the problem of procyclicality, we will discuss its main causes and the likely consequences on the economy; in the second chapter we will briefly summarize the disequilibria characterizing the Eurozone and its road to the sovereign debt crisis and which are the main austerity measures adopted as a response; in the third chapter we will explain the methodology followed during our empirical analysis, and in the fourth one, we will present the results together with a policy discussion about the likely implications. Finally, the conclusions will follow.

CHAPTER I:

MACROECONOMIC IMPLICATIONS OF FISCAL PROCYCLICALITY

Policy discretion represents the autonomy of the government in designing fiscal policies, with the aim to achieve predetermined political and economic goals. We can, then, distinguish two kinds of fiscal adjustments: discretionary ones and non-discretionary ones, these latter known also as automatic stabilizers, because their role is to adjust fiscal aggregates to output fluctuations. Debrun, Hauner and Kumar (2007) argue that discretionary (autonomous) fiscal decisions should:

> "*be consistent with government solvency,* […] *be resilient against unexpected shocks* […] *and contribute to macroeconomic stabilization*"[1].

Then, the government cannot always set arbitrary levels for the deficit or the surplus but decisions must be adapted to the pattern of other macroeconomic variables and constrained by the need of preserving the financial and the economic stability of the country, a lesson that advanced economies have learned through history (Reinhart and Rogoff, 2009, as well as Frankel, 2013). One of the main factors to be taken into account, while designing budgetary decisions, is the position of the economy over the business cycle, which sometimes is very difficult to estimate (Frankel, 2013).

Macroeconomic literature evidences how GDP fluctuates in the short run, while in the long run it follows a smooth trend (which for advanced countries is generally increasing): GDP deviations from the full-employment output[2] are due to the fact that aggregate output responds to some temporary economic stimuli (both exogenous and endogenous). The difference between current level of GDP and the trend yields the measure of the cycle. Cyclical GDP has no sign restrictions and it depends on the

[1] Debrun, X., Hauner, D. and M. S. Kumar (2007) "*Discretion, institutions and fiscal discipline*".

[2] Full employment output can be measured by computing the long-term output trend or the potential output. Although there are some important differences in the two measures, a large part of the literature agrees in considering them as substitutes, we will return on this topic on a second time during this dissertation, but at this point we will consider full-employment output as measured through the output trend and we will use the two definitions as synonyms.

presence of short term shocks and on cyclical and seasonal adjustments, in particular it tells us by how much GDP is far from the long term objective.

At this stage, policymakers should take fiscal decisions so that short run fluctuations are not exacerbated or at least they should allow the good functioning of automatic stabilizers. Fiscal policy reaction to the cycle can assume three typologies: procyclical, acyclical or countercyclical. Accordingly, fiscal policies are procyclical if they replicate the business cycle: they are expansionary during booms and contractionary during downturns; conversely, they are countercyclical if they are expansionary during recessions and contractionary during booms. If they do not react to ups and downs of the output gap fiscal policies are acyclical.

1.1 The implications of procyclicality: why can it de-stabilize business cycles?

Economic literature generally agrees on the fact that fiscal policy should follow a countercyclical, or at least acyclical pattern in order to safeguard the stability of the economic system (Balassone and Kumar, 2007) and that procyclicality is a pathology of the aggregate system that should be corrected (Kumar and Ter-Minassian, 2007).

Barro (1979) points out that fiscal policy and, accordingly debt issuance, should act in a countercyclical way with respect to output fluctuations, especially towards unexpected and temporary output changes. In particular, an optimal tax policy should imply an average constant tax-to-output rate at every period: the rationale behind this is that governments should seek to minimize non-tax costs borne by taxpayers, but related to fiscal pressure (in the paper they are regarded as 'collecting costs', namely costs rising from the levying operations). This is the tax-smoothing principle. An implication of this result is that temporary negative output fluctuations (e.g. as in war periods), that should be corrected through an expansionary fiscal policy, are accompanied by an increase in public spending, which must be covered by raising further debt. Tax-smoothing implies accumulation of debt during bad times and debt repayment during good times. Procyclical tax policies, could not only be inefficient against short run fluctuations but also to increase the tax burden for citizens and make them too socially costly to be levied.

Fatas and Mihov (2003, 2008, 2010 and 2013) stress the causal relation between cyclicality of fiscal policies and volatility of output: if policies are procyclical they are likely to increase GDP fluctuations in the short term and undermine economic growth on a longer run; moreover, if fiscal policies are very volatile (Fatas and Mihov, 2013) then these negative effects are even more exacerbated. Similarly, Balassone and Kumar (2007) point out that procyclicality fosters inequality in income distribution; it can increase the risk of falling into poverty during downturns. In addition, output volatility reduces the possibility to implement social insurance mechanisms in recessive periods and to ensure the provision of public services (such as healthcare and schooling). This way we may have a negative outcome on the overall growth in the economy. Of course, the magnitude of these effects strictly depends on country-specific characteristics: emerging markets will be more affected than industrial countries. Aghion et al. (2009) yield a similar result: they investigate how countercyclical policies may affect growth by analysing how spending expansions and contractions may be helpful to stabilize output in case of productivity shocks.

Reinhart and Rogoff (2009), instead, stress the link between procyclical fiscal policies, debt intolerance and financial risk. As they point out, procyclical capital flows[3] are an important source of procyclicality. As a matter of fact, they may prompt public borrowing during booms, but, if inflows dry up during recessions, they may create stressful situations with high public debt and high sovereign risk. In order not to default, government is forced to implement tight fiscal policies during the recession. The mechanism in which fiscal policy and capital flows reinforce each other is described by Kaminsky, Reinhart and Vegh (2005) calling it the "*when it rains it pours phenomenon*".

1.2 Stylized facts about fiscal cyclicality

Fiscal procyclicality, therefore, is a source of economic distortions and instability, and it should be avoided when possible. Despite this, a certain number of empirical analyses report the evidence that some governments are used to design procyclical budgetary policies. Among these, Gavin and Perotti (1997), Kaminsky, Rehinart and Vegh (2005)

[3] Inflows during booms and outflows during recessions.

and Vegh and Vuletin (2014) documented some differences in the behaviour of fiscal policy industrial and emerging markets: the first ones tend to be more countercyclical or acyclical, while the second ones are significantly procyclical. Moreover, they also report that both industrial and developing countries, on average, are characterized by more countercyclical or less procyclical fiscal policies during *bad macroeconomic conditions*[4]. Instead, during *good times*, policies are more procyclical (or less countercyclical). This result is even more evident for industrial countries than for Latin America. A similar evidence is proved also by Balassone et al. (2010) who found that fiscal policies tend to be more procyclical in booms and more countercyclical in bad times, i.e. "*primary balance deteriorates in bad times without a corresponding offsetting improvement in good times*"[5]. This asymmetry has a fundamental role in contributing to debt accumulation.

1.3 Likely determinants of procyclicality

Balassone and Kumar (2007) individuated three principal macro-factors that can explain why we have evidence of procyclicality: the difficulties in assessing the economic cycle, an excessively deep use of political discretion and the presence of financial constraints that may prevent the government from borrowing on financial markets during downturns.

1.3.1 Difficulties in assessing the cycle.

The assessment of the business cycle generally involves the disposal of high quality information, meaning complete data and reliable forecasts (which in turn require good statistical and economic know-how). There are some cases in which government institutions do not fulfil these requirements or estimates can be mistaken or badly interpreted. What is more, official forecasts often tend to be over-optimistic: they may be strongly biased upwards, especially in cases in which government is seeking a higher consensus from the public by increasing discretionary fiscal stance. This is the

[4] In Gavin and Perotti (1997)'s framework *bad times* are defined as "*periods of times in which a country's rate of output growth is less than its average rate of growth minus one standard deviation"*, other periods are defined as *good times*.
[5] Balassone, F., Francese, M. and Zotteri, S. "*Cyclical asymmetry in fiscal variables in the EU*", 2010.

argument of Frankel (2013): accordingly, emerging markets are more prone to exogenous shocks and flawed by unstable political power. This increases enormously the uncertainty in the economy and variability of any estimation results. As a consequence, it is more complicated to run statistical analysis, especially if institutions do not have sufficient expertise. In this stance, Frankel studies the case of Chile: Chilean economy's main driver is the copper market and therefore extremely prone to fluctuations in copper prices: when they go up, Chile enters a boom (product and exports rise), when they go down - there is a recession. Therefore, in order to perform good stabilization policies of the business cycle, it is important to have good forecasts of copper prices. Between 2008 and 2009, Chilean government reformed budget institutions, including the implementation of new forecasting methods for copper prices. As a result, predictions were becoming more and more accurate and government has been successful in implementing countercyclical fiscal policies.

1.3.2 The role of policy discretion and institutional quality

The excessive use of discretionary spending may be also an important factor that generates procyclicality. In fact, lobbyists and policymakers may seek to maximize private benefits by appropriating of political rents (as in Alesina, Tabellini and Campante, 2008) through pressures or legislative modifications, taking advantage of a principal-agent problem: voters/taxpayers cannot directly observe the government. According to Gavin and Perotti (1997), this is the *voracity effect*, which increases wastes in public spending and fosters the implementation of distortionary policies, and it is more evident during bad times.

A solution to this problem is to put some political constraints on budgetary decisions made by the government, e.g. a veto power on expenditures is allowed to the Parliament (Balassone and Kumar, 2007). Generally, limitations to political distortions in fiscal decisions are possible only with the presence of good quality institutions and good incentives for the government to remain benevolent. That is to say, policymakers find almost no reason for deviating from an optimal budgetary policy. Frankel, Vegh and Vuletin (2013) study the relation between fiscal procyclicality and institutional quality

finding that countries with good institutions[6] are more likely to perform countercyclical fiscal policies and that a change in institutional quality may seriously affect how fiscal policy is conducted over the business cycle. Empirical evidence shows that there are some cases in which an institutional improvement led to more countercyclical (or at least less procyclical) fiscal policies: one of the documented ones is the aforementioned case of Chile. Of course we have also some cases of the converse: one of the documented example is represented by Greece. The link between institutional quality and procyclicality of policies is also evident and strong with regard to monetary policy (Duncan, 2014).

1.3.3 Financial constraints

The third important cause of procyclicality is represented by the presence of financial constraints. Governments may face stressful situations that prevent them from implementing the right budgetary policy, according to the contingent situation; these constraints may have economic or political nature. On the political side, the Parliament can pose the veto over the further borrowing and constrain the possibility to implement an expansionary spending policy during a recession. Examples can be found in the US debt-ceiling crises of 2011 and 2013 when US Government risked a partial default because the US Congress resisted in approving the further increase of the US debt ceiling.

From the economic point of view, borrowing limits may rise because of structural characteristics of the economy. We already mentioned the "*when-it-rains-it-pours*" phenomenon (*supra* Rehinart and Rogoff, 2009, and Kaminsky, Rehinart and Vegh, 2005) that affects especially emerging markets. Procyclical capital flows are not the only destabilizing factor, actually creditworthiness of these economies is extremely precarious and prone to the mood of the market: if investors lose confidence, required interest rates can rise enormously and make borrowing more and more costly. This can lead to a reduced possibility for the government to implement an optimal discretionary

[6] According to Frankel, Vegh and Vuletin (2013) *good institutions*: promote a regulatory framework that enhances investments, with the full respect of contract agreements, deadlines and minimized source of risk, are very unlikely to be affected by corruption, have a strong and impartial legal system and ensure the enforcement of the law in case of any type of violation and have a good bureaucratic system that can efficiently respond to changes in policies.

and countercyclical policy and it reduces the effect of the automatic stabilizers (Fatas and Mihov, 2010). The situation is even worse when the debt outstanding is already high. This is not only the case of emerging markets: during the last sovereign debt crisis in the Eurozone, the interest rate spreads of Italy, Greece and Spain rose sharply and left those countries in a state of financial troubles for several quarters: in particular, as we will see in the next chapter, Italy and Greece displayed an already high level of public debt.

We have also cases in which borrowing limits are imposed by supranational authorities or are the result of international agreements. This is the situation of the Eurozone: with the Maastricht Treaty, Member States of the Eurozone agreed on putting a cap on their debt-to-GDP and deficit-to-GDP ratios, and in order to avoid violations they are forced to set up careful fiscal policies, even restrictive when the Maastricht parameters are exceeded. Maastricht parameters rose some questions about the possible impairment of the government in pursuing countercyclical fiscal policies, however Gali and Perotti (2003) rule out this possibility: they find no relevant evidence that fiscal policy have turned from countercyclical (or acyclical) into procyclical after the promulgation of the Maastricht Treaty in 1992. What we are going to see in the next chapters is if the last sovereign crisis and the supranational imposition of even stricter budgetary rules (the so called *austerity*) have resulted in a change in the cyclical behaviour of fiscal policies.

CHAPTER II:

THE RISE OF THE AUSTERITY

The major critique regarding the Eurozone is its incapacity to face asymmetric shocks. In fact, the most recent economic crisis showed the limits of communitarian economic policy. Verde (2013) highlights the existing gap between the Eurozone and an OCA theorized by economic literature and, even if this difference seems quite evident, the lack of an efficient shock-absorption mechanism to replace the exchange-rate policies pre-unification. The management of the fiscal policy, that is still state-based, has had a particularly important role in delaying the recovery from the financial crisis of 2008 and created the soil that gave rise to the sovereign-debt crisis in 2009.

2.1 The Stability and Growth Pact and the coordination of fiscal policies.

The Treaty over the Functioning of the European Union (henceforth the TFEU), in accordance with the principles of the Maastricht Treaty, states that Member States of the European Economic and Monetary Union (henceforth the EEMU) have the full autonomy in conducting their own fiscal policies. However, these policies need to have a supranational coordination, in order to be designed in accordance with some communitarian objectives, namely to ensure the credibility of the monetary union and its institutions and to avoid deficit biases, bad spillover effects, and moral hazard.

With this puropose, Art. 126 of the TFEU[7], asserts a set of directives that each Member State should follow in order to design budgetary policies and a set of measures that the European Institutions (Commission and Council) should take in case of non-compliance. In particular, there is the imposition of precise deficit and debt limits that each Member State should mandatorily fulfil: the reference values for deficit and debt, the so-called 'Maastricht parameters', have been settled, respectively, at 3% and 60% of GDP[8]. In case a Member State is not compliant with these thresholds, Institutions can

[7] Formerly known as Art. 104 of the TEC (Treaty establishing the European Community).
[8] Deficit is meant as public net borrowing and debt is meant as the total consolidated gross debt outstanding at the end of the year (Source: Protocol No. 12 on the excessive deficit procedure).

issue some recovery and corrective measures that can lead to an Excessive Deficit Procedure (henceforth EDP), which involves budgetary and structural adjustments for the non-compliant Member State, and there can be the impositions of fines as well[9].

All these rules have been embodied in the Stability and Growth Pact[10] (henceforth SGP), launched in 1997 and entered into force in 1999, which has been the main instrument for 10 years, at the supranational level, with which the EU monitored and coordinated fiscal policies of each Member States of the EEMU.

Nevertheless, the validity of SGP received some criticism. Gali and Perotti (2003) point out that the SGP in its original formulation presented some points of ambiguity and this fact makes it "*prone to endless bargaining and controversy*"[11]. Buti et al. (2003) stress the fact that SGP is not easily enforceable: it is not plausible at all to impose sanctions to countries that exceeded the deficit, by making them even more non-compliant and by making it worse for them to recover the 'excessive' deficit. Moreover, SGP should also be integrated with structural reforms, however, the reforming process started late in some countries and it yet to be completed, because it is nor short neither easy to implement. Pasinetti (1998), instead, argues that the fixed thresholds (3% and 60%) do not take into account the real deficit and debt sustainability of each Member State. As a matter of fact, sustainability does not fit a supranational arbitrary value but responds to many variables and the ideal sustainable limit effectively varies among countries. Finally, Annett et al. (2005) argue that SGP leaves too much room to over-optimistic forecasts about growth (also criticised by Frankel, 2013), incentivises moral hazard behaviour (like the rule circumvention through misreporting and creative accounting) and fosters deficit bias. Moreover, excessive deficit procedure lacks flexibility and proved to be ineffective on some occasions. Actually, with the outbreak of the last crisis, SGP proved to be fallacious.

[9] Fines can be of an amount equal to 0.2% of the GDP if early warning and corrective directives are not respected and they can rise up to 0.5% of GDP if the non-compliance is protracted in time.

[10] Formally the Stability and Growth Pact is not a treaty but it consists of a Resolution of the European Council (held in Amsterdam in 1997) and of two Regulations of the European Council (No. 1466/97 and No. 1467/97).

[11] Gali, J. and Perotti, R. (2003) "*Fiscal policy and monetary integration in Europe*".

2.2 The sovereign debt crisis

The global financial crisis hit the Eurozone violently, not only because of the exposition of the European banking sector to the US asset-backed security market, but also because of the macroeconomic imbalances that were characterizing the whole area from the beginning of 2000s. Both private and public sectors were dangerously exposed and peripheral countries were the most harmed ones: the reason lies in the fact that they were already displaying some structural problems and the financial crisis helped to exacerbate them; as a result, they ended up in a serious economic and sovereign-debt related crisis.

2.2.1 The question of the high public debt

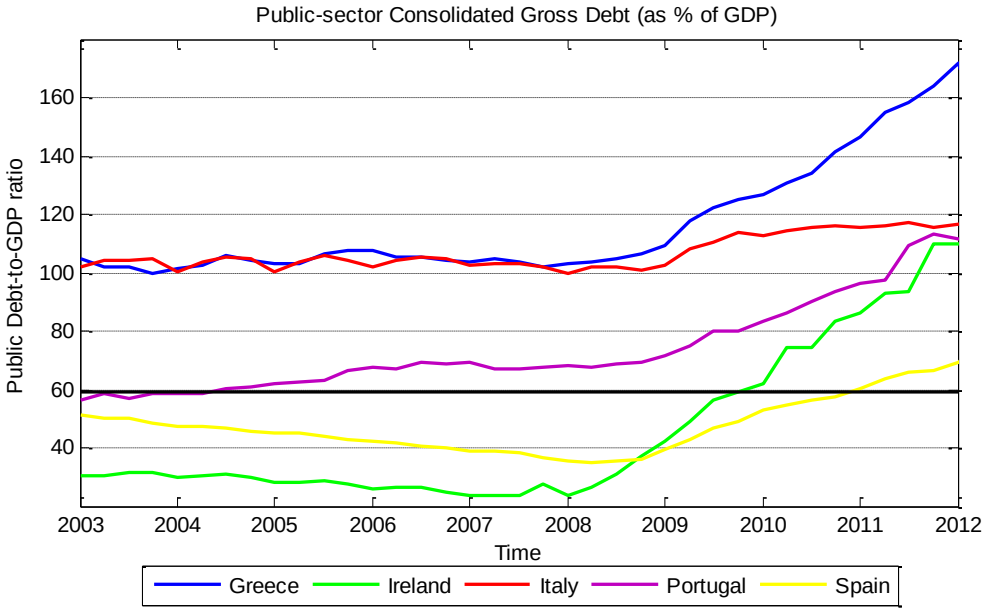


Figure 2.1: *General government consolidated gross debt expressed as percentage of GDP over time. Quarterly data. The black horizontal line displays the threshold imposed by the TFEU. Source of data: Eurostat database.*

The first and the most evident source of instability inside the EEMU was the question of high public debt. In countries like Italy, according to Bartoletto et al. (2013), in Italy "*present and future associated burden* [of high levels of debt] *was systematically underestimated by the decision-making process*"[12]. This is why public debt outstanding

[12] Bartoletto, et al. (2013) "*Is the Italian public debt really unsustainable? Is the Italian public debt really unsustainable? An historical comparison (1861-2010*"

rose enormously between the '80s and the '90s and, as a result, it was non-compliant to debt parameter from the early foundation of the Eurozone. A similar situation has been experienced by Greece. To be admitted in the EEMU, these countries have been required to implement a recovery program to put a stop to debt accumulation and even reduce its outstanding. Figure 2.1 tells us that this has not been the case: debt-to-GDP ratio remained stable above 100% from 2002 to the eve of the financial crisis. In addition, Chiorazzo et al. (1999) considered the adjustment process as not sufficient to make Italy comply with SGP in a short time.

Conversely, Ireland, Portugal, and Spain did not experience high levels of debt before the crisis: at the moment of the institution of the EEMU they were perfectly compliant to Art. 126. According to Lane (2012), careful debt-reducing policies have been implemented in these countries from the '90s, although Portuguese debt-to-GDP started rising over the Maastricht threshold several years before the financial turmoil in 2007. Nonetheless, the level of the ratio remained stable around the value of 70% until the last quarter of 2008.

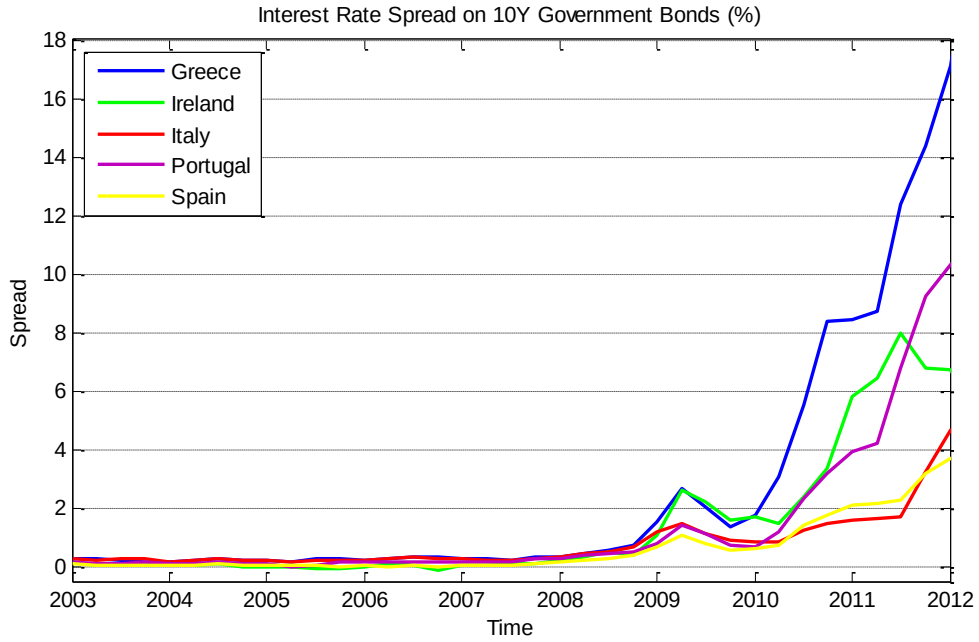


Figure 2.2: *Interest rate spread between 10-year national government bond and 10-year German government bonds, expressed as percentages. Quarterly averages. Source of data: author's calculations based on OECD database.*

Figure 2.2 shows also that interest rate spreads between national government bonds of the PIIGS and the German government bonds were relatively stable: according to Lane

(2012), international financial markets were not perceiving any default risk, at least on a short-medium term. However, it is not clear if this perceived security was due to an effective sustainability of debt or because the market itself could not perceive the underlying vulnerabilities that would have led to the sovereign-debt crisis in a short time (Lane, 2012). Nevertheless, with regard to the Italian case, Bartoletto et al. (2013) argue that Italian debt was relatively sustainable in the decade 2000-2009: this may be an explanation for why both European Institutions and the international markets considered Italian debt securities as risk-free.

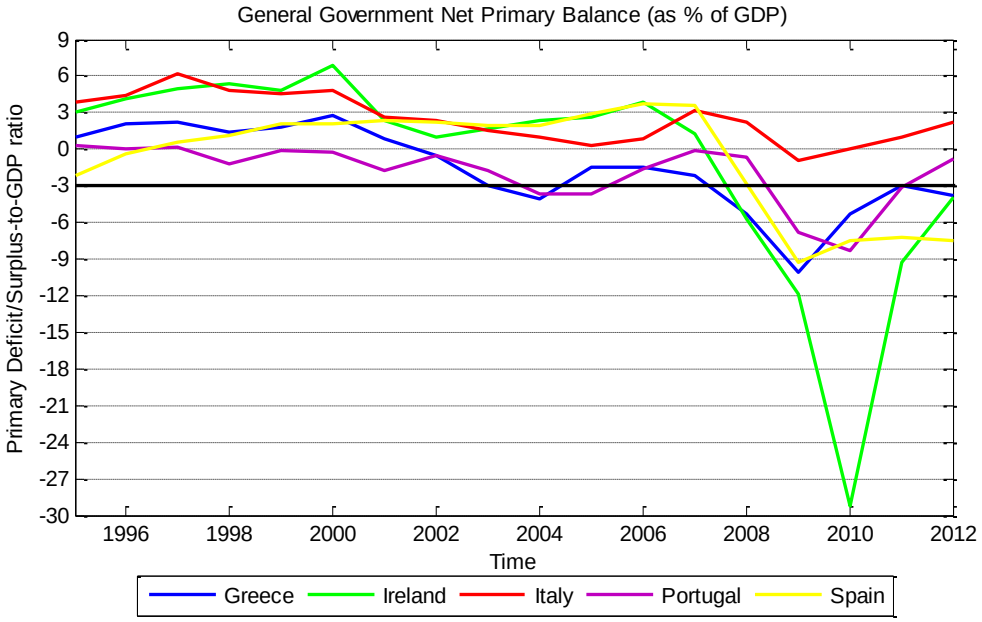


Figure 2.3: *General government net primary balance expressed as percentage of GDP over time. Annual data. The black horizontal line displays the threshold imposed by the TFEU. Source of data: AMECO database, European Commission.*

2.2.2 Fiscal balance dynamics.

With regard to fiscal balance, we can see in Figure 2.3 that all the PIIGS, between 1997 and 2007 were on average compliant to Art. 126. Primary balance for all the PIIGS is above the Maastricht threshold on average (with very few cases of trespassing) usually solved via early warnings. Moreover, there are several cases of primary surpluses. If we consider net balance in Figure 4 we can see that PIIGS experienced deficits more or less in line with the Maastricht rules. As a matter of fact, before 2009 European Commission and European Council activated very few Excessive Deficit Procedures: there had been one for Italy in 2005, suspended when Italian Government modified the trespassing

provisional budget becoming eventually a compliant ex post budget in 2006, one for Greece in 2004, prolonged to 2007 (and then closed) for inadequate measures taken by Greek Government and one for Portugal, successfully ended in 2006[13].

However, observing Figure 2.3 (primary balance) and Figure 2.4 (actual balance) we can see that, before 2009 some countries, in particular Greece and Italy, displayed a big difference between actual and primary balance. This means that in these countries the interest-related expenditure was particularly high and undoubtedly has played an important role in designing fiscal policies. Table 2.1 gives some insights about this. Since we mentioned that interest rate spreads were almost at the same level, a first explanation to this fact can be found in the levels of debt: Greece and Italy had a debt-to-GDP ratio that was far higher than the ones of Ireland and Spain (they have the lowest interest related expenditure).

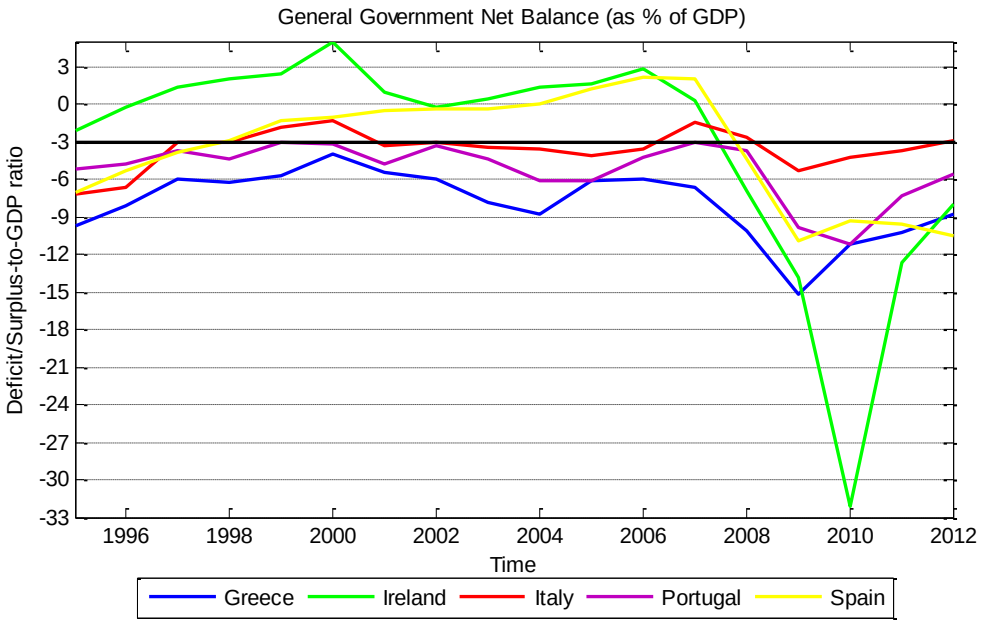


Figure 2.4: *General government net balance expressed as percentage of GDP over time. Annual data. The black horizontal line displays the threshold imposed by the TFEU. Source of data: AMECO database, European Commission.*

High levels of spending for the debt service not only reduce the discretionary power of the government, but also reduce the functioning of the automatic stabilizers, making de facto more difficult to smooth output fluctuations over time. Thus, a debt reduction was even more necessary for Greece and Italy (sustainability is not the unique issue) but nor

[13] Source: European Commission, DG ECFIN database.

the market, neither the European Institutions seemed concerned with pushing these countries towards tighter fiscal policies, so they kept borrowing at the same pace.

	Greece		Italy	
Time	**Actual Surplus/Deficit**	**Primary Surplus/Deficit**	**Actual Surplus/Deficit**	**Primary Surplus/Deficit**
1998	-6.268%	1.431%	-3.021%	4.849%
2000	-4.063%	2.789%	-1.324%	4.806%
2002	-6.024%	-0.455%	-3.073%	2.382%
2004	-8.828%	-4.043%	-3.567%	1.04%
2006	-5.946%	-1.529%	-3.587%	0.86%
2008	-10.176%	-5.361%	-2.692%	2.238%

	Ireland		Portugal	
Time	**Actual Surplus/Deficit**	**Primary Surplus/Deficit**	**Actual Surplus/Deficit**	**Primary Surplus/Deficit**
1998	2.026%	5.369%	-4.386%	-1.247%
2000	4.867%	6.811%	-3.215%	-0.207%
2002	-0.32%	0.995%	-3.34%	-0.504%
2004	1.333%	2.427%	-6.195%	-3.639%
2006	2.809%	3.807%	-4.328%	-1.561%
2008	-6.979%	-5.707%	-3.766%	-0.659%

	Spain	
Time	**Actual Surplus/Deficit**	**Primary Surplus/Deficit**
1998	-2.949%	1.113%
2000	-1.023%	2.138%
2002	-0.415%	2.214%
2004	-0.0423%	1.943%
2006	2.197%	3.794%
2008	-4.424%	-2.878%

Table 2.1: *Comparison between Actual Deficit/Surplus and Primary Deficit/Surplus per each country of the PIIGS at selected years. Deficits/Surpluses are measured as percentage of GDP. Source of data: AMECO database, European Commission.*

2.2.3 The dynamics of capital flows

With the launch of the Euro in 1999, financial markets of the PIIGS experienced a credit boom. The adoption of the single currency removed exchange rate related risk and transactional costs, since it was easier for core countries (like Germany, Belgium or France) to invest in peripheral ones. Furthermore, the interest rate spreads were relatively low. All these factors created comfortable investment conditions that generated an increase in private borrowing and developed (in some countries more than

in others) the insurgence of a credit boom (Lane, 2012). Table 2.2 shows the dynamic of private debt (compared to GDP): between 1999 and 2007 (the eve of the financial crisis) private debt reached very high level in the PIIGS[14] but remained relatively stable in the core countries, or generally, eventual increases in the ratio have not been so dramatic.

Private-Debt-to-GDP ratio dynamics

Time	**Greece**	**Ireland**	**Italy**	**Portugal**
1999	43.8%	-	71.8%	124.5%
2001	60.0%	139.3%	79.7%	149.8%
2003	67.9%	141.3%	86.3%	162%
2005	85.7%	170.1%	96%	171.4%
2007	101.5%	198%	109.7%	185%
Time	**Spain**	**Germany**	**Belgium**	**France**
1999	93.6%	119.9%	111.7%	94.7%
2001	109.4%	123.3%	113.3%	103.4%
2003	126%	123.1%	117.4%	103.4%
2005	154.3%	117%	120.6%	109.2%
2007	191.2%	110.9%	135.4%	115.6%

Table 2.2: *The dynamics of consolidated gross private debt in selected countries at selected time measured as percentage of GDP. It is measured as the stock of liabilities (debt securities and loans) held by the Non-Financial corporations, Households and Non-Profit institutions serving households. Source of data: Eurostat database.*

According to Fernandez-Villaverde et al. (2013), the credit boom facilitated the insurgence of financial and real estate bubbles in peripheral countries, which, accompanied by a lack of commitment in implementing the necessary structural reforms and in reducing public debt, constituted a source of capital inflows. The authors report that net investment positions, between 2000 and 2010, were positive for core countries and negative for the PIIGS, raising some concerns about financial procyclicality.

2.2.4 The External Imbalances

Another structural problem inside the Eurozone was the presence of external imbalances, i.e. the presence of increasing and persistent current account imbalances between the PIIGS and the core countries. In fact, Figure 2.5 shows that countries like Germany and Austria were running current account surpluses, while Greece and Portugal, especially, were running deficits.

[14] Eurostat ideal threshold to private debt = 133% of GDP, to ensure sustainability.

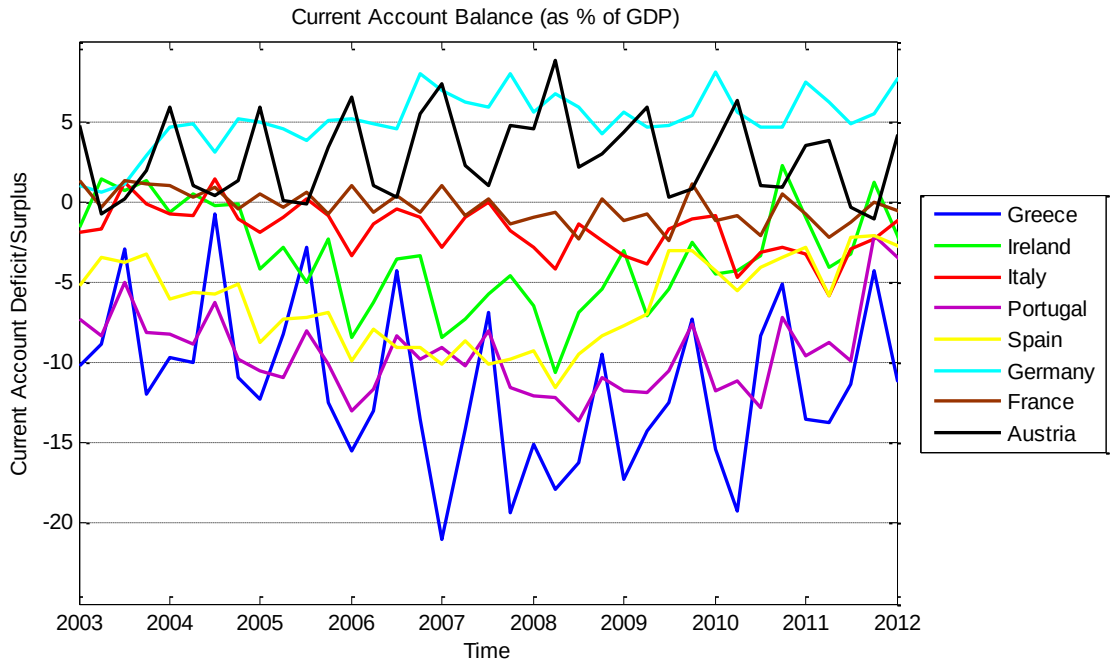


Figure 2.5: *Current Account Balance as percentage of GDP. The dashed line represents the average of the original 12 EEMU Member States. Quarterly data. Source: Eurostat database.*

The determinants of the imbalances are multiple and some of them can be brought back to the structure of the Eurozone. According to Chen et al. (2012), a certain degree of over-optimism in the convergence process, together with the absence of exchange-rate associated risks, fostered trade inflows to peripheral countries (as above for financial markets). Moreover, the ascent of big trade competitors, like China, and the integration process of Eastern and Central European Countries contributed to undermine the exports of Southern Europe. Valiante (2011), instead, argues that the introduction of the Euro exacerbated the difference in competitiveness between core and peripheral countries on the global markets: this can be supported with the fact that in most of the cases PIIGS's deficits were financed by core countries' surpluses.

Lane (2012) argues that external imbalances have had a major role in the sovereign debt crisis because they could have contributed to the generation of procyclical capital inflows towards the PIIGS (constituting a possible source of fiscal procyclicality).

2.2.5 The collapse of the Eurozone economies

At this stage, it is no longer surprising that when the financial crisis broke out the economies of the PIIGS literally collapsed. Between 2007 and 2012, financial and real economies of Eurozone shrinked: many sectors (e.g. banking and real estate ones) experienced huge losses, private investments dropped and the situation of public finances worsened. Figures 3 and 4 show that after the crisis, peripheral countries increased spending to recover the economy, however, this made debt levels rise: former compliant countries such as Spain and Ireland found themselves exceeding Maastricht threshold in short time (Figure 1). Contemporaneously sovereign risk perceived by the markets increased as well and this made interest rate spread increase exponentially: in 2012 Greek bonds distanced German ones by 1600 basis points (Figure 2)

We are not wrong if we conclude that imbalances and disequilibria have been the real cause of the sovereign debt crisis. Financial turmoil just played the role in triggering the self-destruction mechanism of real economy, built with several years of non-careful fiscal and financial policies. At this stance, we can see that it is nor the presence of a supranational currency, as Eurosceptic movements argue, neither the presence of too rigid budgetary schemes, but a lack of interest from national and supranational authorities in correcting imbalances that have created the circumstances for PIIGS to enter in this huge recession (for a further analysis of these aspects see Baldwin and Wyplosz, 2012, and Verde, 2013). Undoubtedly, the lack of a supranational shock absorbing mechanism in the Eurozone made things worse: the loss of the flexible exchange rate should have been supplied with fiscal or financial integration to implement a proper coordinated response at a supranational level (Verde, 2013). Nevertheless, the European Union implemented with time a series of measures to stabilize imbalances and ensure the stability of the whole Eurozone economy, whose existence has been deeply questioned after the crisis.

2.3 A new set of rules to strengthen fiscal discipline.

European Union undertook a recovery action for Eurozone economies, although giving more importance to correcting the structural imbalances (especially those related to debt and deficits) rather than solving the recession (which however remained a major goal).

This was due to the fact that the prevailing economic framework, at that time, was austerity oriented. The strong opinions of Alesina and Ardagna (2010) and of Reinhardt and Rogoff (2010)[15], which stressed the causal effect between high levels of debt and poor GDP growth, and some pressures coming from careful core European countries induced European Institutions to promote policies directed to the tightening of fiscal policies and the resolution, in the short time, of the debt-related imbalances.

2.3.1 New fiscal surveillance: the Six-Pack and the European Semester.

The first step in policy adjustments has been represented by the introduction of the European Semester, a six-month lasting process of coordination and monitoring that takes place during the budget drafting phases of each Member State. Supervision is prerogative of the European Commission, which has to control if budgetary policies are compliant in order to achieve the objectives of convergence stated by the Treaties and to avoid (or at least limit) situations of macroeconomic imbalances among the Member States. The Semester has entered into force in 2011 with the precise purpose of coordinating *ex ante* budgetary policies among Member States of the whole European Union, not only of the Eurozone. In addition to this, on 13th December 2011, after a year of debates and negotiations, a set of five regulations plus one directive, the so-called *Six-pack*, entered into force, in order to correct macroeconomic imbalances, furnish a better budgetary framework for Member States and implement the EDP.

The presence of contemporaneous expansionary monetary polices implemented by the ECB (such as the OMT program or the VLTRO), together with the institution of the European Stability Mechanism (formerly European Financial Stability Facility), represented the only instruments for avoiding sovereign defaults. Member States, mostly aligned on an austerity-oriented view, judged as necessary to tighten fiscal policies even more, adding more budgetary requirements to those foreseen by Art. 126 of the TFEU.

[15] This paper raised a huge debate both in the literature and in the media because Krugman (2013) and Herndon et al. (2013) strongly criticized the validity of the statistical calculus contained in Reinhardt and Rogoff (2010) and the validity of the results obtained.

2.3.2 A tighter framework for fiscal policy: Fiscal Compact, the instrument of the Austerity.

On 30th January 2012 the Treaty on Stability, Coordination and Governance in the Economic and Monetary Union (henceforth TSCG), commonly known as Fiscal Compact, was promulgated. It is not a common treaty, but it consists of an intergovernmental agreement between the signing countries, the idea was to abbreviate the implementation procedure. Fiscal Compact came effectively into force by the 1st January 2013, after the ratification of the National Parliament of each Member State of the European Union.

2.3.3 The 'golden rule' of the Fiscal Compact

With TSCG Member states committed to applying stricter fiscal rules for budgetary decisions, in particular:

> *the budgetary position of the general government of a Contracting Party shall be balanced or in surplus* (Art. 3(1) of TSCG, point a).

Namely:

> *the annual structural balance of the general government is at its country-specific medium-term objective* […] *with a lower limit of a structural deficit of 0,5 % of the gross domestic product at market prices* (Art. 3(1), point b).

The medium term objective stated in the article is a budgetary policy goal set up by each Member State in the drafting of the budget, under the SGP.

Fabbrini (2013) defines the statements above as the 'golden rule' of the Fiscal Compact: every Member State must have (or at least be very close to having) a public budgetary balance and the respect of this rule is an enforceable duty of each Member State. Moreover, the TSCG states that this principle should be mandatorily enshrined in the national core legislation (Constitutional law or equivalent) of each Member State.

However, Member States are allowed to "*temporarily deviate from their respective medium-term objective"* only with the occurrence of "*exceptional circumstances"* (Art.

3(1), point c, of TSCG), for example "*in the case of an unusual event outside the control of the Contracting Party concerned which has a major impact on the financial position of the general government"* (Art. 3(3), point b, of TSCG).

Of course, a lack of compliance with the imposed rules is regulated with a specific enforcement mechanism that is under the direct supervision of the European Court of Justice. According to Art. 8 of the TSCG, either the European Commission or one or more Contracting Parties can bring before the Court of Justice a Member State that has failed to comply to the golden rule. The Court in this case is authorized to impose fines on the non-compliant Member State. However, the applications of early warning procedures and excessive deficit procedures are always disciplined by Art. 126 of TFEU in case of violations.

According to Fabbrini (2013), the novelty of the Compact lies not only in the mathematical precision with which it sets the new budgetary requirements, but for its intrusiveness in legal matters: the mandatory inclusion of the golden rule in the constitutional law and the fact that contracting Parties are enforcers of the Pact at the same level of the European institutions. Furthermore, the possibility of imposing fines has come under criticism: again, as in the SGP, amends for non-compliant countries are very likely to reduce compliance also for the subsequent periods.

2.4 Criticism of the austerity.

The implementation of the austerity measures gave rise to a huge debate in the economic literature, mainly because applying austerity in a moment of economic crisis is deeply in contrast to the typical Keynesian view of fiscal policies. Nobel Prize winner Paul R. Krugman, in a very famous article that appeared on *The New York review of books*, strongly criticized the works of Alesina and Ardagna (2010) and of Reinhart and Rogoff (2010). Actually, he stated that the application of austerity in Europe has been even more harmful than the financial crisis for Eurozone economies (for the PIIGS in particular) because it depressed growth. What is more, the recovery of the crisis should have had the priority with respect to the amendment of debt imbalances: once the economies are back on a healthy track then austerity can be applied to tear down the high levels of debt. However, this reasoning does not take into account the question of

high spreads. On this side, De Grauwe and Ji (2013), in an article on *Voxeu.org*, claim that the rise of interest rate spreads was substantially panic-driven, more so than based on a real sovereign risk and that:

> *"financial markets* […] *spread panic into the world of the European authorities that translated the market panic into enforcing excessive austerity"*[16].

This led to further panicking and to even higher spreads. They conclude that without austerity adjustment polices could have been more automatic and the rise of interest rates could have been less dramatic.

It is superficial to state, at this time, that there could be an existing link between austerity measures and fiscal procyclicality as well. Frankel (2012) argues that applying austerity during a heavy recession (as the sovereign debt crisis) yields procyclicality of fiscal policies: it not only reduces government discretion in downturns, but it also reduces the effectiveness of the automatic stabilizers. Therefore, it is unquestionably more difficult to stabilize output in short run fluctuations. Vegh and Vuletin (2014) state that Southern Eurozone is reverting to a situation more similar to Latin America than to industrial countries (in the sense of Gavin and Perotti, 1997), or better Latin America, as opposed to the PIIGS, has shown recent signs of "graduation" with the implementation of some good countercyclical policies (see the case of Chile mentioned in Chapter 1). Moreover, Vegh and Vuletin argue that austerity reduces the likelihood of exiting the recession.

In the next chapter, we are going to analyze the cyclical behavior of fiscal policies in the EEMU, looking for changes in cyclicality due to both sovereign debt crisis and the austerity.

[16] De Grauwe, P. and Ji, Y. (2013) "*Panic-driven austerity in the Eurozone and its implications*"

CHAPTER III

THE METHODOLOGY FOR THE EMPIRICAL ANALYSIS

In this chapter we are going to run the empirical analysis in order to test the evidence of fiscal procyclicality in the Eurozone and, in particular, we are going to see if it has become more or less acute (or if it turned into counter- or a-cyclicality) after the sovereign debt/economic crisis and after the introduction of austerity measures. Strictly speaking, we are going to test the following hypotheses:

1. Fiscal policy was mostly countercyclical or acyclical in the Eurozone before the crisis, in accordance to what has been stated by Fatas and Mihov (2010) and, partially, by Gali and Perotti (2003).
2. Fiscal policy turned into procyclicality with the economic crisis, especially as a consequence of the new budgetary constraints imposed by the Fiscal Compact.

Along this chapter we will explain the methodology used.

3.1 Estimating the causal relationship

In order to measure the cyclical behavior of fiscal policies we have to estimate the causal relation that occurs between cyclical fluctuations and policy decisions taken by governments; according to this, we need a model that takes into account the following:

- The causal impact itself, not the simple correlation between the two variables;
- The discretionary power of policymakers.

With regard to the first point it is noticeable that an important part of the literature measures policy cyclicality just by taking into account simple correlations between fiscal variables and cyclical GDP (Kaminsky, Reinhart and Vegh, 2005, Vegh and Vuletin, 2014). However according to the critiques of Rigobon (2005) and Ilzetzki and Vegh (2008), this is not the correct way to implement such an analysis. Firstly, correlations do not say if the co-movement between the variables is due to a causal relationship or to the presence of other factors that are not taken into account and, secondly, correlations do not provide us with information on whether the cycle affects spending decisions or the opposite occurs, i.e. that policy decisions affect output.

Another important part of the literature, dating back to Gavin and Perotti (1997) uses policy reaction functions to capture the causal impact, i.e. by regressing fiscal variables on cyclical GDP (or on some variables that play as proxy), they have the following form:

$$F_{i,t} = \beta_{i,0} + \beta_{i,1} Y_{i,t}^{C} + u_{i,t} \tag{3.1}$$

Where $F_{i,t}$ is the fiscal variable under examination and $Y_{i,t}^{C}$ represents the measure of cyclical component of GDP (usually obtained through filtering methods) for every country $i=1 \dots N$ at each time $t=1 \dots T$. We rely on this part because policy reaction functions allow us to deal with issues raised in the previous paragraph. For the sake of completeness, we must notice that other, and more recent works, such as Blanchard and Perotti (1999) and Ilzetzki and Vegh (2008), rely on vector autoregressive models (VAR) to measure cyclicality of fiscal policy.

With regard to the second point, we need discretionary fiscal variables, because, as it has been pointed out in Chapter I, those are the variables directly influenced by the policymakers, also referred to as policy instruments. According to this, we cannot use the measure of the actual budget balance directly as fiscal variable.

3.2 Taxes versus spending

In our analysis, we need to measure the cyclicality of fiscal policy instruments; and since they are scarcely observable in the available data, we need a way to infer them. At this stage, we have to make a distinction between spending policy and tax policy: spending instruments can be estimated in a more straightforward way. More specifically, they can be obtained by cyclically adjusting actual spending (we will see it in the next paragraph); in the estimation of tax instruments, instead, some particular precautions are needed.

Tax revenues are computed as the product between a tax base and a tax rate. For example let us consider an income tax on individuals, which takes the following form:

$$TR_t^i = \sum_{j=1}^{J} \tau_{j,t}^i TI_{j,t}^i \tag{3.2}$$

Each $\tau_{j,t}^{i}$ is linked to one of the J brackets in which individual's taxable income ($TI_{j,t}^{i}$) is divided (at every $t=1 \ldots T$). Taxable income is a positive function of individual's contemporaneous income and, if we assume that J=1 and that in the economy there is a finite number of individuals, aggregate taxable income will be a positive function of the aggregate income of the whole economy, i.e. a function of total output. Then:

$$TR_t = \tau_t ATI_t = \tau_t f(Y_t) \tag{3.3}$$

At this point it is clear that simply regressing tax revenues on cyclical output as in (3.1) would create a problem of bias in the estimation: to solve this, we have to take into account policy instruments such as tax rates (Vegh and Vuletin, 2012). Moreover, regressing in (3.1) any variable which includes tax revenues (such as budgetary surplus/deficit) would yield biased estimations. For this reason, the following analysis will process spending and tax policy separately.

3.3 Expenditure policies

In this paragraph the methodology for the estimation of cyclical properties of spending policies will be explained.

3.3.1 Cyclically-adjusted expenditure

Discretionary expenditure is not directly measurable aggregate, but it must be estimated through some statistical method. For this, we rely on Gali and Perotti (2003) and on the IMF (2009), according to which, a proxy for discretionary policy can be the cyclically-adjusted expenditure (henceforth CAE). Formally, CAE is the level of the expenditure we would have, if actual GDP had been equal to potential output. According to Gali and Perotti (2003), CAE can be obtained through the following equation:

$$\frac{G_t^d}{G_t} = \left(\frac{Y_t^*}{Y_t}\right)^{\varepsilon} \tag{3.4}$$

Where:

- G_t^d is the CAE,
- G_t is our expenditure aggregate,
- Y_t^* is the potential output,
- Y_t is real GDP,

- ε is the elasticity of expenditure to output constructed by the OECD (2015).

According to Gali and Perotti (2003), we can substitute potential output with trend output in (3.4), which is easier to compute through some filtering methods. Actually, since sufficient data about potential output are not available (we need quarterly data), we adjust expenditure using GDP trend. Accordingly, a great part of the literature uses the Hodrick-Prescott filter to obtain output trend and compute cyclically adjusted spending.

3.3.2 Control Variables

As already stated, budgetary decisions do not respond solely to short-run GDP fluctuations, but also to other macroeconomic variables. Subsequently we need to add some control variables to model (3.1) in order to avoid an omitted variable bias.

An important control variable is represented by the public debt. According to Bohn (1998) and to Bartoletto et al. (2013), policymakers have to face important budget constraints and problems of debt sustainability. Consequently, an important variable to control is the gross nominal outstanding of debt at the end of the previous period, before any budgetary decisions are taken. We use debt in nominal terms and not in real ones because it is more likely that fiscal decisions react to nominal changes (following Bartoletto et al., 2009), which are directly observable on the market[17].

According to Bartoletto et al. (2013) and to Gali and Perotti (2003), we consider also one-period lagged CAE as another control variable: it is correct to assume that fiscal decisions are based on previous periods in order to achieve some goals in a longer run but also to try to reduce policy volatility over time.

The last variable that we use is the interest rate spread, as a measure of the soverign-related risk perceived by the market (Akitoby and Stratmann, 2008): the likelihood that markets influence budgetary decisions is very high, especially if we think about what happened during the sovereign-debt crisis. The presence of both interest rate spread and public debt as control variables should not be considered as a duplication. In fact, with the use of both variables together, we aim to establish the impact of effective debt

[17] During empirical computations it has been possible to observe that fiscal variables have been more reactive to nominal debt than to real debt, so we take this observation as correct.

sustainability on policy decisions (Bartoletto et al. 2013) and the effect of perceived debt sustainability on policy decisions (Akitoby and Stratmann, 2008).

3.3.3 The regression model and the interpretation of the coefficients

Finally, our policy reaction function is the following:

$$G_{i,t}^{d} = \beta_{i,0} + \beta_{i,1}E_{t-1}[Y_{i,t}^{C}] + \beta_{i,2}G_{i,t-1}^{d} + \beta_{i,3}B_{i,t-1} + \beta_{i,4}E_{t-1}[s_{i,t}] + \varepsilon_{i,t} \qquad (3.5a)$$

where:

- $G_{i,t}^{d}$, as before, represents real discretionary expenditure (expressed in millions of 2010 euros);
- $E_{t-1}[Y_{i,t}^{C}]$ is the expected value at time *t-1* of cyclical measure of real GDP at time *t* (expressed in millions of 2010 euros and seasonally-unadjusted);
- $B_{i,t-1}$ is the gross nominal outstanding of debt at the previous period (expressed in millions of current euros);
- $E_{t-1}[s_{i,t}]$ is the expected interest rate spread at time *t* between country *i*'s 10-year treasury bonds and German 10-year treasury bonds (expressed in basis points).
- $\varepsilon_{i,t}$ represents the stochastic innovation, in particular $\varepsilon_{i,t} \sim iid.(0, \sigma_{i,t}^{\varepsilon})$, this way we exclude homoscedasticity and normality, that would be too strong assumptions.

However, in the model to estimate we substitute expectations with realizations, as follows:

$$G_{i,t}^{d} = \beta_{i,0} + \beta_{i,1}Y_{i,t}^{C} + \beta_{i,2}G_{i,t-1}^{d} + \beta_{i,3}B_{i,t-1} + \beta_{i,4}s_{i,t} + \varepsilon_{i,t} \qquad (3.5b)$$

The data that we use to estimate parameters are quarterly, as in Vegh and Vuletin (2014): the use of quarterly data is useful to increase the significance of results obtained on one hand, but it relies on the assumptions that governments are usually able to revise and adjust budgets every three months and that the latest data to do so are immediately available. These assumptions are more relevant for industrial countries than for developing countries. For the lack of quarterly data on output gap, estimated through a potential output approach, we use Hodrick-Prescott filtering again to compute cyclical GDP in (3.5b).

In this specification, $\beta_{i,1}$ measures the cyclical behavior of spending policies; in particular:

$$\beta_{i,1} = \frac{\partial G_{i,t}^{d}}{\partial Y_{i,t}^{C}} \tag{3.6}$$

It represents the variation of CAE for a unitary variation of cyclical GDP. Positive beta would imply procyclicality, negative beta countercyclicality and null beta would mean acyclicality.

Gali and Perotti (2003) and Fatas and Mihov (2010) use a regression model similar to (3.5b): they do not consider spreads, but what is more they use variables divided by actual GDP. In particular in their specification beta 1 is such that:

$$\beta_{i,1} = \frac{\partial(\frac{G_{i,t}^{d}}{Y_{i,t}})}{\partial(\frac{Y_{i,t}^{C}}{Y_{i,t}})} \tag{3.7}$$

(3.7) has little sense in our analysis since it is less likely to capture the cyclical behavior of expenditure: it is easy to prove that a positive beta in (3.7) could imply countercyclicality under conditions that are also likely to take place (see the appendix).

3.3.4 The definition of the crisis.

Our goal is to see if there is a change in cyclical behavior of expenditure after the crisis and after the introduction of the austerity. For this reason, we add two dummy variables in the model, which are multiplied by cyclical GDP. The dummies that we add are: $d_{i,1}$ which takes value 1 after the outbreak of the crisis in country *i* and $d_{i,2}$ that takes value 1 after the issuance of the Fiscal Compact in the European legislation.

Fiscal Compact has been released in the first quarter of 2012 for all the countries belonging to the Eurozone at that time. Consequently, $d_{i,2}$ is the same for every country in our sample, since they belong to the Eurozone from 1999, excluding Greece (2002). We must take into account the fact that the application of the Fiscal Compact has begun only in the first quarter of 2013, but we will consider the launch date in order to seize any eventual 'announcement effects' on the cyclical behavior of spending policies.

The real issue lies in $d_{i,1}$ because there is no unique quarter in which crisis started for every member state of the Eurozone, consequently we have to find an accurate definition. Vegh and Vuletin (2014) define the crisis "*as beginning in the quarter in which real GDP falls below the preceding 4-quarter* [simple] *moving average and ending in the quarter in which real GDP reaches the pre-crisis level*". This is not the definition we are looking for, mainly because it could consider as crisis times also periods in which the fall of GDP under the moving average is due more to seasonal fluctuations (our data are not seasonally-adjusted) than to crisis period. By closely observing GDP graphs (see appendix), we can notice that it is not unlikely that GDP falls below the moving average even before 2007/2008 (the beginning of the financial turmoil).

An alternative definition could be formed by considering crisis as periods in which GDP trend reverts, i.e. it displays a negative path: the beginning of the crisis would be the first quarter in which the rate of growth of trend is negative and it ends in the first quarter in which rate of growth is positive again. However, also this definition raises some issues. Firstly, not all the countries in the sample experience a trend reversion (PIIGS do, but the greatest part of core countries do not). Secondly in some countries, like Ireland, reversion would be a matter of few quarters, at the end of which GDP has not yet returned to pre-crisis levels.

Excluding the presence of the economic crisis in core countries would be foolish, especially because GDP graphs show that after 2008 there are some abnormal GDP drops for every country in the sample. With the purpose to amend the lack of a univocal definition of crisis, we rely on GDP graphs. It is noticeable that before 2008 and for every country, GDP graph follows a harmonious path, which is repeated in time (even though it follows a clear increasing trend). After 2008 (also before if we consider Ireland) we notice an abnormal (if compared to previous fluctuations) negative variation of GDP, which is corroborated by a contemporaneous and deep fall of the 4-quarter simple moving average. We consider the crisis's beginning to be in the first quarter in which we have an 'abnormal' negative rate of growth, while the ending is in the quarter in which GDP reaches back (or even overcomes) the pre-crisis level of GDP (as in Vegh and Vuletin, 2014). GDP graphs and the crisis period considered for every country are

given in the Appendix. Having added the dummies, the model is transformed in the following way:

$$G_{i,t}^{d} = \beta_{i,0} + \beta_{i,1} Y_{i,t}^{C} + \gamma_{i,1} d_{i,1} Y_{i,t}^{C} + \gamma_{i,2} d_{i,2} Y_{i,t}^{C} + \beta_{i,2} G_{i,t-1}^{d} + \beta_{i,3} B_{i,t-1} + \beta_{i,4} s_{i,t} + \varepsilon_{i,t}$$

3.3.5 Problems of endogeneity

Another important issue is represented by endogeneity. As it has been mentioned in the previous paragraph, Rigobon (2005) firstly advanced the hypothesis of a 'reverse causality problem' in the estimation of cyclicality. More specifically, there is a strong likelihood that also the cycle itself depends on CAE, more than the other way round and this would create another problem of bias for our estimates. To solve this problem of endogeneity, we need to instrument cyclical GDP and in order to do so, we rely on Jaimovich and Panizza (2007), who constructed an *ad hoc* variable for this purpose, they referred to it as *external shock*:

$$Shock_{i,t} = \frac{\overline{Exp_i}}{\overline{GDP_i}} \sum_{j=1}^{N} \phi_{j,t-1} GDPGR_{j,t} \qquad (3.8)$$

Where:

- $\frac{\overline{Exp_i}}{\overline{GDP_i}}$ is the temporal average export-to-GDP ratio of country *i* throughout the sample;
- *j=1,...,N* represent each trade partner of country *i*;
- $\phi_{j,t-1}$ represents the lagged fraction of exports going from country *i* to each country *j*;
- $GDPGR_{j,t}$ is the rate of growth of real GDP of country *j* at time *t*.

The specific methodology for the construction of the external shock variable will be explained in the appendix. For the moment it should be specified that in the estimation of (3.5b) we did not divide (3.8) by average output $\overline{GDP_i}$ because it would be a too small instrument for the instrumented variable $Y_{i,t}^{C}$.

Endogeneity is not only an evident problem related to cycle, but also to interest rate spreads. Akitoby and Stratmann (2008) highlighted that spread strictly depends not only on the size of the public deficit/surplus but also on the amount of spending. In order to avoid reverse causality also in this case, we instrument also $s_{i,t}$ in the following way:

$$s_{i,t} = \varphi_{i,0} + \varphi_{i,1} s_{i,t-1} + u_{i,t} \quad (3.9)$$

Spreads strictly depend on the one-period lagged value and we can solve endogeneity with a two-stage least square (TSLS) estimation.

3.3.6 Expenditure aggregates

In the estimation we are going to consider two expenditure aggregates:

a. General government final consumption expenditure, which represents the spending that the government sustains in order to supply (individual and collective) goods and services for the citizens;
b. General government gross fixed capital formation, i.e. expenditure sustained by the government for multi-period investments.

In particular, we are going to analyze cyclical properties of consumption expenditure in the first place, and then the cyclical properties of both public consumption and investment, in order to check the validity and the robustness of our analysis.

In Table 3.1 you can see that on average, the countries in our sample consumption and investment dimensions of public spending represent together half of the total expenditure, so these aggregates can be a valid proxy to analyze cyclical properties of spending policies.

Consumption plus Investment Expenditure over Total Expenditure						
	Greece	**Ireland**	**Italy**	**Portugal**	**Spain**	
Mean	49.7%	52.7%	45.4%	49.1%	53.4%	
Median	50.0%	54.1%	46.0%	50.0%	53.7%	
Stand. Dev.	6.26%	7.66%	2.08%	5.52%	4.32%	
	Austria	**Belgium**	**Finland**	**France**	**Germany**	**Netherlands**
Mean	43.8%	48.5%	50.7%	49.7%	46.0%	62.9%
Median	44.1%	48.5%	50.9%	49.7%	46.3%	63.2%
S.D.	1.98%	1.28%	1.24%	0.99%	2.17%	1.85%

Table 3.1: *Descriptive statistics for final consumption expenditure plus gross fixed capital formation divided by total expenditure. Percentages. Source: author's calculations based on Eurostat database. Time: from 2002 Q1 to 2016 Q2 (Greece: 2003 Q1 to 2016 Q2; Ireland and Germany: 2002 Q2 to 2016 Q2).*

Total expenditure cannot be used directly, because it includes also expenditure for interests and transfers, which would bias our results. Tables 3.2 and 3.3 show descriptive statistics for cyclically adjusted expenditure aggregates in real terms.

Final Consumption Expenditure (CAE)					
	Greece	**Ireland**	**Italy**	**Portugal**	**Spain**
Mean	10,520.0	7.361.6	73,607.6	8,345.4	46,691.3
Median	10,552.8	7.317.3	75,119.7	8,242.2	48,542.1
Stand. Dev.	1,840.28	838.04	11,651.32	1,19.9	8,404.37
Final Consumption Expenditure + Gross Fixed Capital Formation (CAE)					
	Greece	**Ireland**	**Italy**	**Portugal**	**Spain**
Mean	12,925.2	8,795.3	84,441.9	9,870.6	57,098.3
Median	12,583.0	8,598.9	85,071.1	9,612.2	57,007.2
Stand. Dev.	1,970.71	1,215.13	12,053.1	1,472.82	8,420.769

Table 3.2: *PIIGS: descriptive statistics for final consumption expenditure (above) and for final consumption expenditure plus gross fixed capital formation (below). Millions of 2010 euros. Source: author's calculations based on Eurostat. Time: from 2002 Q1 to 2016 Q2 (Greece: 2003 Q1 to 2016 Q2; Ireland: 2002 Q2 to 2016 Q2).*

Final Consumption Expenditure (CAE)						
	Austria	**Belgium**	**Finland**	**France**	**Germany**	**Netherlands**
Mean	14,116.7	20,109.4	10,357.8	110,949.5	120,141.1	36,440.3
Median	14,340.9	19,678.1	9,719.7	110,036.9	120,402.1	36,755.6
S.D.	1,529.41	2,659.7	1,676.53	10,962.62	10,717	5,627.66
Final Consumption Expenditure + Gross Fixed Capital Formation (CAE)						
	Austria	**Belgium**	**Finland**	**France**	**Germany**	**Netherlands**
Mean	16,255.4	22,083.6	12,092.2	130,032.4	151,379.1	42,768.4
Median	16,795.8	21,614.8	11,550.6	130,353.6	135,224.2	43,244.5
S.D.	1,860.87	2,901.1	1,912.86	11,780.62	50,714.44	5,620.22

Table 3.3: *Core countries: descriptive statistics for final consumption expenditure (above) and for final consumption expenditure plus gross fixed capital formation (below). Millions of 2010 euros. Source: author's calculations based on Eurostat. Time: from 2002 Q1 to 2016 Q2 (Germany: 2002 Q2 to 2016 Q2).*

3.4 Expenditure and GDP growth

One of the greater drawbacks of model (3.5b) concerns the interpretation of coefficients that are negative or positive but statistically non-significant. One solution is that lack of

significance could be interpreted as acyclicality. However, Fatas and Mihov (2010) argue that non-significant but positive (negative) coefficients, may imply as well procyclicality (countercyclicality) but "*it may be a behavior we do not observe often*" but just during some periods. Moreover, they also argue that fiscal policies may be more reactive to output growth than to cyclical GDP, while Jaimovich and Panizza (2007), which regress expenditure growth on GDP growth in their policy reaction function, argue that such a model can yield similar results as (3.5b) [18].

Taking these observations into account, we repeat the analysis by estimating the following policy reaction function:

$$g_{i,t}^{d} = \alpha_{i,0} + \alpha_{i,1} g_{i,t}^{Y} + \alpha_{i,2} g_{i,t-1}^{B} + \alpha_{i,3} s_{i,t}^{\%} + \omega_{i,t} \tag{3.10}$$

Where:

- $g_{i,t}^{d}$ is the rate of growth of the CAE, used as proxy for the rate of growth of discretionary spending;
- $g_{i,t}^{Y}$ is the rate of growth of real GDP;
- $g_{i,t-1}^{B}$ is the (lagged) rate of growth of nominal gross debt;
- $s_{i,t}^{\%}$ is the interest rate spread (measured as percentage);
- $\omega_{i,t}$ is the stochastic innovation: $\omega_{i,t} \sim iid.(0, \sigma_t^{\omega})$.

We do not consider $g_{i,t-1}^{d}$ because it will yield problems of bias in the estimation. In the specification (3.10), $\alpha_{i,1}$ has a new interpretation:

$$\alpha_{i,1} = \frac{\partial g_{i,t}^{d}}{\partial g_{i,t}^{Y}} = \frac{\partial\left(\frac{G_{i,t}^{d} - G_{i,t-1}^{d}}{G_{i,t-1}^{d}}\right)}{\partial\left(\frac{Y_{i,t} - Y_{i,t-1}}{Y_{i,t-1}}\right)} \tag{3.11}$$

Alpha measures by how much expenditure growth reacts to unitary changes in output growth: if alpha is positive, output and expenditure growth move in the same direction. To be clear, we will not consider $\alpha_{i,1}$ as a direct measure of cyclicality: it could be, under some assumptions on output and expenditure, but for our purposes we will always consider $\beta_{i,1}$ to be the measure of cyclical behavior and $\alpha_{i,1}$ is just a complementary

[18] Even though, Jaimovich and Panizza (2007) considered deviations of output growth from the country-specific mean as a proxy for the cycle. We will not do this but we will take into account the difference between actual output and cyclical output in a different fashion.

instrument to exclude acyclicality for non significant beta. For example, if country i has a positive but non-significant $\beta_{i,1}$, but a positive and significant $\alpha_{i,1}$ we can exclude acyclicality, because on average spending policy goes up and down with the cycle. Certainly, this analysis will make our findings more robust. Of course, even in this case we used dummies to distinguish the effect of the crisis and of the new budgetary requirements stated by the Compact (whose coefficients are defined as $\theta_{i,1}$ and $\theta_{i,2}$).

However, we can further refine the latter analysis since output growth is a combined result of short run variations in the cycle and the growth of the long run trend. Furthermore, to see what part of output growth is due to cyclical variations we have to separate them from trend growth. We start from Hodrick and Prescott (1997), according to which the division of output in trend and cycle is additive (see appendix):

$$Y_t = Y_t^C + Y_t^T \tag{3.12}$$

Which is true for every time t, then we can write as well:

$$Y_{t-1} = Y_{t-1}^C + Y_{t-1}^T \tag{3.13}$$

Subtracting (3.13) from (3.12) and dividing both sides by Y_{t-1} yields as follows:

$$g_t^Y = g_t^C \frac{Y_{t-1}^C}{Y_{t-1}} + g_t^T \frac{Y_{t-1}^T}{Y_{t-1}} \tag{3.14}$$

Where g_t^Y is the rate of growth of GDP while g_t^C and g_t^T are respectively the variation rate and the growth rate of cyclical GDP and output trend. At first, one may be tempted to put g_t^C in model (3.10), however since the cycle can assume both negative and positive values, g_t^C may have not sense if we do not consider whether $Y_{t-1}^C$is negative or positive. Then, we shall use $g_t^C \frac{Y_{t-1}^C}{Y_{t-1}}$ in our regression to have an idea of the extent to which the rate of growth of GDP is explained by short run variations more than the growth of the long run trend. Then, defining $\hat{g}_t^C = g_t^C \frac{Y_{t-1}^C}{Y_{t-1}}$, we can write our model as:

$$g_{i,t}^d = \alpha_{i,0} + \alpha_{i,1}\hat{g}_{i,t}^C + \alpha_{i,2} g_{i,t-1}^B + \alpha_{i,3} s_{i,t}^{\%} + \omega_{i,t} \tag{3.15}$$

For the estimation we applied TSLS method, always using Jaimovich and Panizza's (original) shock variable and lagged spread as instruments. Also in this case we apply two dummy variables in order to establish the effect of the crisis and of the austerity on cyclical behavior of tax policies. We run the analysis for both expenditure aggregates

that we defined in previous sections. Empirical computations have confirmed that there is a significantly small difference between (3.10) and (3.15).

3.5 Tax Policy

Now, we focus our attention on the cyclical behavior of fiscal policies. As we stated before, it is not possible to extend the analysis we performed for expenditure also to tax revenues because of their own nature: taxes (especially income-based ones) strictly depend on the level of the aggregate output, then any regression analysis like (3.1) with tax revenues as dependent fiscal variable will yield biased results. We need an alternative way to overcome this problem.

According to Kaminsky, Reinhart and Vegh (2005) a proxy for tax revenues could be represented by inflation: actually it is not unlikely that governments cover deficits with money emission (see Reinhart and Rogoff, 2009), however this is not the case of the Eurozone. Deficit monetization had been largely used by Member States before the EEMU (see Bartoletto et al., 2009, for the Italian case), but now the TFEU and the presence of a unique European Central Bank explicitly ruled out this possibility.

A large part of the literature used to divide tax revenues by GDP (among others Gali and Perotti, 2003) in order to seek an "average tax rate", but this practice has received the criticism of Ilzetzki and Vegh (2008) and of Vegh and Vuletin (2012), because it does not rule out all the possible sources of bias. To be more exact, Vegh and Vuletin (2012) argue that the only reliable policy instrument is represented by statutory tax rates, because they are directly observable and modifiable by the government. For this reason, they build a tax index that is a weighted average of top PIT, CIT and VAT rates, whose weights are represented by the shares of these taxes in the total tax revenue. They applied this index in the study of cyclical properties of developing countries, and in particular Latin America, and they obtained reliable results. However, this was possible because policymakers in developing countries frequently adjust tax rates, even more often than once a year. In the Eurozone case this is not applicable because statutory tax rate adjustments are rarer (Vegh and Vuletin, 2014) and we do not possess relevant quarterly data.

To solve this problem, let us first reconsider equation (3.3), which displayed the ideal form of an income tax:

$$TR_t = \tau_t ATI_t = \tau_t f(Y_t)$$

Let us assume that $f(Y_t)$, the disposable income, is a linear function in Y_t, for example that it is given by the difference between the total income and some deductions allowed to taxpayers (i.e. we have the exclusion of a part of income from the taxable one):

$$ATI_t = \tau_t f(Y_t) = Y_t - D_t \tag{3.16}$$

And let us further assume that deductions D_t are also proportional to income, then disposable income would be as follows:

$$ATI_t = \tau_t f(Y_t) = Y_t(1 - d_t) \tag{3.17}$$

These assumptions are partially realistic since some tax exemptions depend on actual level of income, but not all of them (this may depend on e.g. particular expenses incurred during the fiscal period, which nonetheless still depend on Y_t); the very important restriction is that we are not taking into account the presence of many income brackets and many tax rates that would undermine the hypothesis of perfect linearity.

Under (3.15) and (3.16) dividing tax rates by GDP seems more rational, therefore our fiscal dependent variable for the regression analysis would be:

$$\frac{TR_t}{Y_t} = \tau_t(1 - d_t) \tag{3.18}$$

This way we can, ideally, take into account the effect that changes in the cycle have on both tax rates and in the computation of the disposable income. Actually, one of the major criticisms with regard to Vegh and Vuletin (2012) is that tax rates do not constitute the only policy instrument in the hands of the government, but it is free to modify the level of deductions, by moving d_t: accordingly, if d_t rises we have an expansionary policy, if it lowers we have a restrictive policy. Moreover, it is visible that in industrial countries governments prefer to modify the level of deductions allowed to the taxpayers rather than modify the tax rates.

Our policy reaction function is now:

$$\frac{TR_{i,t}}{Y_{i,t}} = \delta_{i,0} + \delta_{i,1}\hat{g}^C_{i,t} + \delta_{i,2}\frac{TR_{i,t-1}}{Y_{i,t-1}} + \delta_{i,3}B^{bil}_{i,t-1} + \delta_{i,4}s^{\%}_{i,t} + u_{i,t} \tag{3.19}$$

Where:

- $\frac{TR_{i,t}}{Y_{i,t}}$ is the fiscal variable as computed in (3.17);
- $\hat{g}_{i,t}^{C}$ is the cyclical contribution to output growth: we could have used Y_t^C as in (3.5b), but we would have got very small values of $\delta_{i,1}$; moreover, during the empirical calculations we notice that the use of $\hat{g}_{i,t}^{C}$ and Y_t^C do not modify the sign of the results or the statistical significance of the estimates;
- $B_{i,t-1}^{bil}$ is the one period lagged nominal debt, considered in billions (not in millions so that estimates of $\delta_{i,3}$ are not too small;
- $s_{i,t}^{\%}$ is the interest rate spread (measured as percentage);
- $u_{i,t}$ is the stochastic innovation: $\omega_{i,t} \sim iid.(0, \sigma_t^{\omega})$.

In this case the coefficient $\delta_{i,1}$ measures the cyclical behavior of fiscal policy: a positive value implies countercyclicality, because as cyclical GDP rises, tax instrument rises as well. Conversely a negative value implies procyclicality.

TSLS estimation is used also in this case with the usual instruments and we measure as well the effect of crisis and austerity trough two dummies (whose coefficients are defined as $\vartheta_{i,1}$ and $\vartheta_{i,2}$). The tax aggregate we used is constituted by taxes on income (both corporate and personal), in order to reduce any potential source of bias due to the restrictive assumptions (3.15) and (3.16).

3.6 Estimation period

The time interval in which we gather the observations is the following:

2002 Q1 – 2016 Q2

With the exception of Germany, Greece and Ireland that have an estimation window more restricted because of the lack of relevant data (Germany and Ireland from 2002 Q2/Q3 to 2016 Q2 and Greece from 2003 Q2/Q3 to 2016 Q1).

In the following chapter we present and discuss the results obtained through the regression of (3.5b), (3.15) and (3.19), together with some policy observations.

CHAPTER IV

RESULTS AND POLICY DISCUSSION

In this chapter, we present and discuss the results obtained following the methodology explained before and we will try to give an explanation to the cyclical behaviour observed. Results for spending are obtained just by considering final consumption expenditure, in the appendix there will be the results also for investment spending.

4.1 Cyclicality of spending policies

First of all, let us consider the estimation of model (3.5b) without including the dummy variables. In this case $\beta_{i,1}$ represents the cyclical behaviour of spending policies in the whole time interval that we are considering. Country-by-country estimates of $\beta_{i,1}$ are reported in Table 4.1.

Country	Coefficient	Estimation	t-stat
Greece	$\beta_{i,1}$	-0.0415	-0.3551
Ireland	$\beta_{i,1}$	-0.0986	-0.4623
Italy	$\beta_{i,1}$	2.0157	1.5628
Portugal	$\beta_{i,1}$	1.8936**	2.4821
Spain	$\beta_{i,1}$	0.6809***	7.7860
Austria	$\beta_{i,1}$	-0.1937	-1.1306
Belgium	$\beta_{i,1}$	-0.0581	-1.5856
Finland	$\beta_{i,1}$	0.2081***	5.0653
France	$\beta_{i,1}$	0.6328*	1.8661
Germany	$\beta_{i,1}$	-0.8026	-1.5980
Netherlands	$\beta_{i,1}$	0.8736***	3.7280

* Significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.1: *Results of the estimation of model (3.5b) with no dummy included. Regression coefficients are for cyclical GDP.*

In this framework we can interpret the standard t-test for single hypothesis on $\beta_{i,1}$ as a test for the presence of acyclicality: if the estimated coefficient is non-significantly different from zero, we cannot reject the hypothesis that policy has been acyclical. We can see that our estimates are consistent with the findings of Gavin and Perotti (1997), Gali and Perotti (2003) and Fatas and Mihov (2010), who report that spending policy tends to be procyclical, or at least acyclical, not only in developing markets, but also in

industrial countries[19]. In fact, as we can see in Table 4.1, the greatest part of the estimates is represented by positive betas, although most of them (especially all the negative coefficients) are not statistically different from zero. For these countries, we cannot reject the hypothesis that spending policy has been acyclical throughout the sample. What is more, some core countries show consistent procyclicality as well, similarly to the results of Fatas and Mihov (2010).

Let us now consider the model with the dummy variables for crisis and austerity included. We can now measure the cyclicality of spending policies in the following way:

- $\beta_{i,1}$ is the cyclicality of country *i* before the crisis;
- $\beta_{i,1} + \gamma_{i,1}$ is the cyclicality of country *i* after the crisis;
- $\beta_{i,1} + \gamma_{i,1} + \gamma_{i,2}$ is the cyclicality of country *i* after the crisis and the austerity.
- For some countries we can have also $\beta_{i,1} + \gamma_{i,2}$ because by the time that austerity measures came into force they had already undergone the crisis (this is what happens for the greatest part of the core countries).

Similarly to what we have said, if $\gamma_{i,1}$ and $\gamma_{i,2}$ are non-significant, we can reject the hypothesis that there has been a change in cyclical behavior due to the crisis and to the austerity.

Let us consider just $\beta_{i,1}$ for a while and let us compare again our estimates with the results got by Fatas and Mihov (2010) for the same bundle of countries in the same time period[20]. In our case, almost every country shows a positive beta (Table 4.2), apart from Belgium, Germany and Ireland. However, for most of the countries these estimates are not significantly different from zero. Fatas and Mihov (2010) got positive but non-significant results, with the only exception of Finland, which is negative and significant. The example of Finland represents a confusing case since in table 4.2 Finnish coefficient is positive and significant. To explain this puzzle, we re-ran our model for Finland with the methodology of Fatas and Mihov (2010), i.e. by dividing expenditure

[19] In particular, they say that any procyclical behavior in fiscal policy is mainly driven by spending rather than taxation: in the next section we are going to see that it is the case.
[20] Even if their sample includes annual data from 1999 to 2007.

and cycle by actual GDP: this way, we also got a negative and significant coefficient[21]. This is clear evidence that dividing the variables by actual output is likely to give a biased estimation, as we point out in Chapter III (see the appendix for a deeper insight).

Country	Coeff.	Estimation	t-stat	Country	Coeff.	Estimation	t-stat
Greece	$\beta_{i,1}$	0.0524	0.4371	**Austria**	$\beta_{i,1}$	-0.1788	-0.8141
	$\gamma_{i,1}$	-0.1447	-0.6671		$\gamma_{i,1}$	0.0096	0.0572
	$\gamma_{i,2}$	-0.0004	-0.0014		$\gamma_{i,2}$	-0.0516	-0.2835
Ireland	$\beta_{i,1}$	-1.5918	-0.0098	**Belgium**	$\beta_{i,1}$	-0.0779*	-1.7712
	$\gamma_{i,1}$	0.8866	0.0315		$\gamma_{i,1}$	0.0031	0.0244
	$\gamma_{i,2}$	0.9713	0.0053		$\gamma_{i,2}$	0.0833	0.9971
Italy	$\beta_{i,1}$	2.3896	1.0509	**Finland**	$\beta_{i,1}$	0.1598***	3.4108
	$\gamma_{i,1}$	-0.7605	-0.5335		$\gamma_{i,1}$	0.0356	0.4706
	$\gamma_{i,2}$	1.1845	0.7789		$\gamma_{i,2}$	0.1317*	1.8168
Portugal	$\beta_{i,1}$	2.9308*	1.8506	**France**	$\beta_{i,1}$	0.3627	1.3183
	$\gamma_{i,1}$	-0.6014	-0.3402		$\gamma_{i,1}$	0.0665	0.1770
	$\gamma_{i,2}$	-1.1673	-0.7971		$\gamma_{i,2}$	1.1835	1.3012
Spain	$\beta_{i,1}$	0,6422***	7.3135	**Germany**	$\beta_{i,1}$	-0.3751	-0.4119
	$\gamma_{i,1}$	0.1534	0.6580		$\gamma_{i,1}$	0.6778	0.3892
	$\gamma_{i,2}$	-0.0951	-0.3447		$\gamma_{i,2}$	-6.7497	-0.2538
				Netherlands	$\beta_{i,1}$	1.0664**	2.4495
					$\gamma_{i,1}$	0.2126	0.4094
					$\gamma_{i,2}$	-0.7468	-1.6622

* Significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.2: *Results of the estimation of model (3.5b) with dummies included. Regression coefficients are for cyclical GDP.*

Other contradictory cases are represented by Germany and Greece, but both in our analysis as well as in Fatas and Mihov (2010) the estimates are non-significant, so the puzzling results can be explained either assuming that both our and their model confirm acyclicality in German and Greek spending policies or with the source of bias that is outstanding in Fatas and Mihov (2010)[22].

If we consider the estimates of $\gamma_{i,1}$ and $\gamma_{i,2}$, we can see that in no case they result in being significantly different from zero from a statistical point of view: on the basis of

[21] Estimate of the beta = -0.1266 (t-stat = -1.9254).

[22] One may also argue that the difference in results are due to the instrument we used in our analysis that is different from the one used by Fatas and Mihov (2010), which instrumented output gap following Gali and Perotti (2003): Jaimovich and Panizza (2007) criticize this method and argue that the use of the external shock variable corrects endogeneity problem better (see appendix).

our estimates we cannot reject the fact that both the crisis and the new supranational budgetary rules yield no change in spending cyclicality.

Another observation is that endogeneity problem is relevant in (3.5b): we ran OLS estimation of (3.5b) for the PIIGS (results are included in the appendix) and we observed that the estimates are biased upwards: by instrumenting the cycle, estimates are either less significant or smaller in the TSLS approach rather than in the OLS. This is consistent with the findings of Jaimovich and Panizza (2007).

To distinguish the case of "time inconsistent" procyclicality (countercyclicality) from the case of acyclicality in non-significant estimates (Fatas and Mihov, 2010), we used model (3.15) with the aim to investigate if and how discretionary expenditure growth reacts to output growth. Results are presented in Table 4.3 (no dummies included) and Table 4.4 (dummies for crisis and austerity are included).

Country	Coefficient	Estimation	t-stat
Greece	$\alpha_{i,1}$	0.5254	1.6151
Ireland	$\alpha_{i,1}$	-0.0986	-0.4623
Italy	$\alpha_{i,1}$	5.2778***	6.1552
Portugal	$\alpha_{i,1}$	9.5647***	5.3226
Spain	$\alpha_{i,1}$	2.2088***	18.7410
Austria	$\alpha_{i,1}$	0.0789	0.4945
Belgium	$\alpha_{i,1}$	0.1580	1.6242
Finland	$\alpha_{i,1}$	0.4530***	3.9320
France	$\alpha_{i,1}$	0.6743***	5.1190
Germany	$\alpha_{i,1}$	-35.1813	-0.2658
Netherlands	$\alpha_{i,1}$	0.8736***	3.7280

* Significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.3: *Results of the estimation of model (3.15) with no dummy included. Regression coefficients are for cyclical contribution to GDP growth.*

In their panel analysis, Jaimovich and Panizza (2007) found that a negative relation between output growth and expenditure growth characterized industrial countries, while in our specification, results are negative for most of the countries. However, there are some differences between our analysis and Jaimovich and Panizza's analysis. First of all, they considered total expenditure and they did not adjust it for the cycle[23]. Secondly,

[23] According to Jaimovich and Panizza (2007) this is possible because the presence of automatic stabilizers makes estimates more countercyclical with respect to our case, in which we have cyclically-adjusted expenditure.

they did run a panel analysis which includes large extra-EMU industrial economies (Japan, Canada, US, UK) which may have influenced the results obtained, more than EMU countries. Moreover, their time interval is also different from the one used in this research, so we cannot make a direct comparison.

In table 4.4 the interpretation of $\alpha_{i,1}$, $\theta_{i,1}$ and $\theta_{i,2}$ is similar to the previous model: the thetas represent changes in the original cyclical behavior induced by crisis ($\theta_{i,1}$) and the austerity ($\theta_{i,2}$).

Country	Coeff.	Estimation	t-stat	Country	Coeff.	Estimation	t-stat
	$\alpha_{i,1}$	1.2675**	2.4960		$\alpha_{i,1}$	0.6212	1.5976
Greece	$\theta_{i,1}$	-0.7079	-0.9355	**Austria**	$\theta_{i,1}$	-0.8081*	-1.7478
	$\theta_{i,2}$	-0.5013	-0.5926		$\theta_{i,2}$	-0.7396*	-1.9102
	$\alpha_{i,1}$	-0.7427	-0.2718		$\alpha_{i,1}$	0.1529	1.6600
Ireland	$\theta_{i,1}$	2.1604	0.8285	**Belgium**	$\theta_{i,1}$	-0.1764	-0.7393
	$\theta_{i,2}$	0.0026	0.0010		$\theta_{i,2}$	0.1612	1.6335
	$\alpha_{i,1}$	5.7253***	5.4545		$\alpha_{i,1}$	0.4313***	2.5578
Italy	$\theta_{i,1}$	-1.0766	-0.5560	**Finland**	$\theta_{i,1}$	-0.0650	-0.2550
	$\theta_{i,2}$	0.6569	0.3452		$\theta_{i,2}$	0.1956	0.7932
	$\alpha_{i,1}$	10.1980***	4.5253		$\alpha_{i,1}$	0.4650***	2.4033
Portugal	$\theta_{i,1}$	4.2265	0.4726	**France**	$\theta_{i,1}$	0.0313	0.1278
	$\theta_{i,2}$	-9.1200	-1.0591		$\theta_{i,2}$	0.8008***	2.8450
	$\alpha_{i,1}$	2.2294***	16.5508		$\alpha_{i,1}$	-10.5198	-0.4483
Spain	$\theta_{i,1}$	-0.0617	-0.1803	**Germany**	$\theta_{i,1}$	17.1068	0.6033
	$\theta_{i,2}$	0.0324	0.0712		$\theta_{i,2}$	1.0946	0.0457
					$\alpha_{i,1}$	1.5574***	5.2883
				Netherlands	$\theta_{i,1}$	0.4874	1.2610
					$\theta_{i,2}$	-0.7721**	-2.4053

* Significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.4: *Results of the estimation of model (3.15) with dummies included. Regression coefficients are for cyclical contribution to GDP growth.*

For countries like Greece and Italy, we could exclude acyclicality before the crisis: they show a positive, but non-significant $\beta_{i,1}$, and a positive and significant $\alpha_{i,1}$, meaning that expenditure policy reacted to output variations, even though not in a consistent way over time (and this would explain the non-significance). However, since gammas and thetas are both non-significant, we cannot remark anything about a change in cyclicality due to crisis or austerity. This is also the case of France, but the significance of $\theta_{i,2}$, together with a positive $\gamma_{i,2}$ may let us infer that some changes towards

procyclicality are likely to have taken place. In Spain and Portugal, the positivity of alphas reinforces results in Table 4.2, but again, no significant changes are observed. Germany and Ireland still do not show significant estimates, so we cannot reject at all the null hypothesis of acyclicality. Austria shows an almost zero $\gamma_{i,1}$ and a negative $\gamma_{i,2}$ (non-significant) together with significantly negative $\theta_{i,1}$ and $\theta_{i,2}$: this can be interpreted as a shift from acyclicality (bot $\beta_{i,1}$ and $\alpha_{i,1}$ non-significant) to countercyclicality in more recent times. A similar response is shown by the Netherlands: $\theta_{i,2}$ is negative, so we could accept a reduction of procyclicality after the crisis. For Belgium we cannot tell if there has been a change in cyclicality: pre-crisis $\beta_{i,1}$ is negative but small (and significant), but Table 4.1 rules out that countercyclicality have been protracted in time.

Repeating the analysis with both public consumption and investment expenditure yields similar results (see the appendix): we have the validation that spending policies have been mostly procyclical before the crisis and only in some cases we register a change in cyclicality with crisis and austerity (especially in core countries). This conclusion rejects our initial hypotheses (namely, acyclicality/countercyclicality before the crisis and procyclicality afterwards, especially with the austerity) and seems to be puzzling, especially if compared to the effects that austerity measures have on growth. However, we have to keep in mind that Eurozone, especially the PIIGS, was showing non-careful policies and important macroeconomic imbalances that, as we stated in Chapter II, could have caused harmful procyclicality.

4.2 Cyclicality of taxation

Estimates of model (3.19) for our sample of countries (Germany and Italy excluded) are included in Table 4.5: these results show an opposite picture of what we obtained when analysing the spending policy data.

Greece						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
$\delta_{i,1}$	0.0500	1.3094	0.1415***	3.2211	0.1415***	3.2237
$\vartheta_{i,1}$			-0.1254*	-1.8798	-0.1551**	-2.6181
$\vartheta_{i,2}$					0.0490	0.5666
Ireland						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
$\delta_{i,1}$	0.2086	0.6136	0.0895	0.2490	2.0730	0.5313
$\vartheta_{i,1}$			0.7224	0.5196	0.6285	0.2509
$\vartheta_{i,2}$					-2.3186	-0.5898
Portugal						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
$\delta_{i,1}$	0.2818	1.2772	0.4771**	2.0299	0.4830**	2.0146
$\vartheta_{i,1}$			-0.4468*	-1.9317	-0.5654	-1.5368
$\vartheta_{i,2}$					0.1966	0.4857
Spain						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
$\delta_{i,1}$	0.1177**	2.1147	0.1775**	2.0714	0.1777**	2.0609
$\vartheta_{i,1}$			-0.1297	-1.2160	-0.1600	-1.1892
$\vartheta_{i,2}$					0.0645	0.4491
Austria						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
$\delta_{i,1}$	-0.3762	-1.2911	-0.3539	-1.2027	-0.3781	-1.2414
$\vartheta_{i,1}$			-0.0492	-0.3832	0.0183	0.1294
$\vartheta_{i,2}$					0.2113	1.4751
Belgium						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
$\delta_{i,1}$	0.2776***	4.1792	0.2917***	4.4226	0.2788***	3.5349
$\vartheta_{i,1}$			-0.0648	-0.4049	-0.0487	-0.2872
$\vartheta_{i,2}$					0.0456	0.5757
Finland						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
$\delta_{i,1}$	-0.4494***	-5.8934	-0.4073***	-4.4106	-0.4089***	-4.3655
$\vartheta_{i,1}$			-0.0767	-0.6363	-0.0408	-0.2832
$\vartheta_{i,2}$					-0.0718	-0.4394

* Significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.5: *Results of the estimation of model (3.19) with gradual inclusion of dummies. Regression coefficients are for cyclical contribution to GDP growth.*

France						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
$\delta_{i,1}$	0.0118	0.0673	0.0131	0.0654	-0.0378	-0.1589
$\vartheta_{i,1}$			-0.0039	-0.0163	0.0502	0.1860
$\vartheta_{i,2}$					0.1584	0.8496
Netherlands						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
$\delta_{i,1}$	0.1058	1.4954	0.1807***	2.1032	0.3184***	3.5384
$\vartheta_{i,1}$			-0.2280	-1.4104	-0.2251	-1.3422
$\vartheta_{i,2}$					-0.4358**	-2.0584

* Significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.5 (cont.): *Results of the estimation of model (3.19) with gradual inclusion of dummies. Regression coefficients are for cyclical contribution to GDP growth.*

Pre-crisis tax policies seem to be more countercyclical when compared to contemporaneous spending policies (positive $\delta_{i,1}$), with very few exceptions (e.g. Finland): this is, again consistent with Gavin and Perotti (1997), Gali and Perotti (2003) and Fatas and Mihov (2010). The situation changes for some countries with the outbreak of the crisis: this is the case of Greece and Portugal. Also the Netherlands experiences a shift to procyclicality with the introduction of austerity measures. While Finland has remained procyclical throughout the sample, Spain and Belgium have been consistently procyclical instead. For Austria, Ireland and France it is not possible to establish a well-defined pattern of tax policy in the whole sample.

According to this new analysis, it seems that we have a consistent shift to procyclicality for some southern countries. However, at this stage, we cannot consider these results as robust, because of the strong assumptions underlying the policy reaction function (3.19) and because of the lack of feasible alternative ways or tax dimensions that could further confirm what it has been stated in these pages. In order to establish an unbiased result and strong conclusions about tax policies, we need to investigate more.

4.3 Effective determinants of fiscal procyclicality in Southern Eurozone

We have seen that for the greatest part of the countries in our sample, spending policy has been consistently procyclical, even in the periods before the economic crisis, now we are going to see what are the likely factors that induced such a deficient performance. In chapter I we saw that there are three likely causes for fiscal

procyclicality: the lack of mechanisms able to assess the economic cycle, the abuse of political discretion and the presence of financial constraints.

4.3.1 Difficulties in assessing the cycle

With regard to the first factor, we can exclude that Southern Eurozone has been procyclical because countries have not been able to predict the cycle. In fact, we are dealing with industrial countries, whose national economic institutions possess both the know-how and the relevant information to do so. What is more, both Southern and core countries of the EEMU can rely on the same supranational institutions for economic analyses and forecasting, namely the European Commission and the European Central Bank. Consequently, this would not explain why some Member States have been more 'careful' in designing budget decisions than others.

4.4.2 The presence of financial constraints

In order to check for the presence of financial constraints we can look at estimates of model (3.5b) and model (3.15) to check if coefficients ($\beta_{i,4}$) are negative: if this is the case, spending decisions have been constrained by financial markets. However, Table 4.6 tells us that this is not the case. The result could be explained by the fact that uncertainty on the financial market has been largely fought with monetary policy exceptional instruments during the sovereign debt crisis (for example the OMT program), or, more simply, because the instrument that we used is not strong enough to rule out the problem of endogeneity for interest rate spreads.

Table 4.6: *Results of the estimation of model (3.5b) and (3.15) with dummies included. Regression coefficients are for interest rate spreads, expressed in basis points (first row) and as percentage (second row).*

Dependent Variable	Greece	Ireland	Italy	Portugal	Spain
$G_{i,t}^{d}$	-0.2597 (-0.4755)	-1.4735 (-0,0274)	57.9907 (1.3230)	0.9921 (0.6295)	16.5656*** (2.7444)
$g_{i,t}^{d}$	-0.1506 (-0.3369)	-0.0037 (-0.9842)	0.0121 (0.9173)	0.0029 (0.2055)	-0.0033 (-0.5506)

* Significant at 10%, ** significant at 5%, *** significant at 1%. Robust t-statistics are contained in the brackets.

Another source of financial constraint is represented by the 'when it rains it pours' phenomenon described by Kaminsky, Reinhart and Vegh (2005): procyclicality of

capital flows could have induced procyclicality also in spending policy. As we stated in chapter II, macroeconomic imbalances characterizing PIIGS before the crisis were a likely source of procyclical flows. To check this, we have to look at the net international investment position (NIIP) of each country. We run a regression model similar to the one we used for expenditure to check cyclicality of capital flows:

$$\Delta NIIP_{i,t} = \beta_{i,0} + \beta_{i,1} Y^{C}_{i,t} + u_{i,t} \qquad (4.1)$$

Where, capital flows are computed as the difference between the NIIP at time t and at time t-1. In our specification we will consider the NIIP as the difference between liabilities and assets, so a positive (negative) variation of the NIIP implies an inflow (outflow). We break in the time series at the 3rd quarter of 2008, in order to determine the difference before and after the financial crisis. TSLS estimates are in table 4.7.

Table 4.7: *Results of the estimation of model (4.1). Regression coefficients are for cyclical GDP.*

Period	Greece	Ireland	Italy	Portugal	Spain
Before Fin. Crisis	4.038 (1.5031)	-	-67.6156*** (-2.6168)	13.0163** (2.5088)	2.8495* (1.9383)
After Fin. Crisis	6.9658*** (3.3890)	51.094*** (3.1878)	0.4359 (0.6491)	1.7334 (0.9093)	4.8369*** (3.4312)

* Significant at 10%, ** significant at 5%, *** significant at 1%. Robust t-statistics are contained in the brackets.

Evidently, Portugal and Spain experienced procyclical capital flows before the crisis. Figures 4.1 and 4.2 show us cyclicality of capital flows for these countries, before and after the crisis, plus the relation between capital inflows and the expenditure. There are some differences between the two periods, in particular, Spain shows a positive relation between expenditure and inflows for both periods (positive-sloped LS line) and Portugal a negative one (negative-sloped LS line). However, if we exclude outlier observation in the graph before the crisis (Figure 4.3), we observe that the relation between expenditure and inflows was also positive. Procyclicality of capital flows could have consistently contributed to the problem of fiscal procyclicality in Spain and Portugal before the crisis, and for Greece and Spain, also after the crisis.

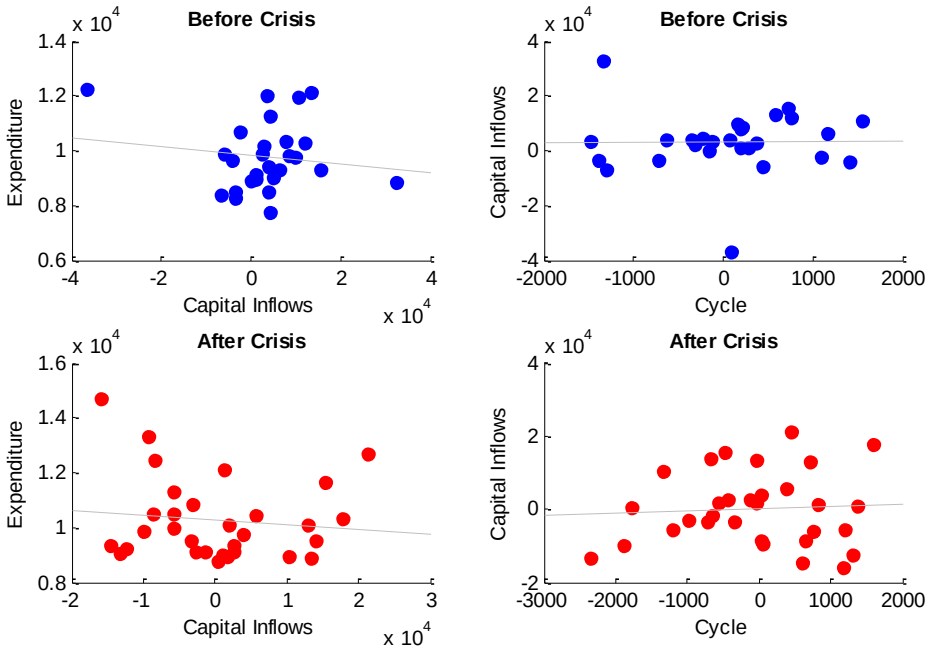


Figure 4.1: *Portugal. Scatter plots showing: a) the relation between spending and capital flows before the crisis, b) the relation between the cycle and capital flows before the crisis, c) the relation between spending and capital flows after the crisis, d) the relation between the cycle and capital flows after the crisis. Source: author's calculations based on Eurostat and IMF.*

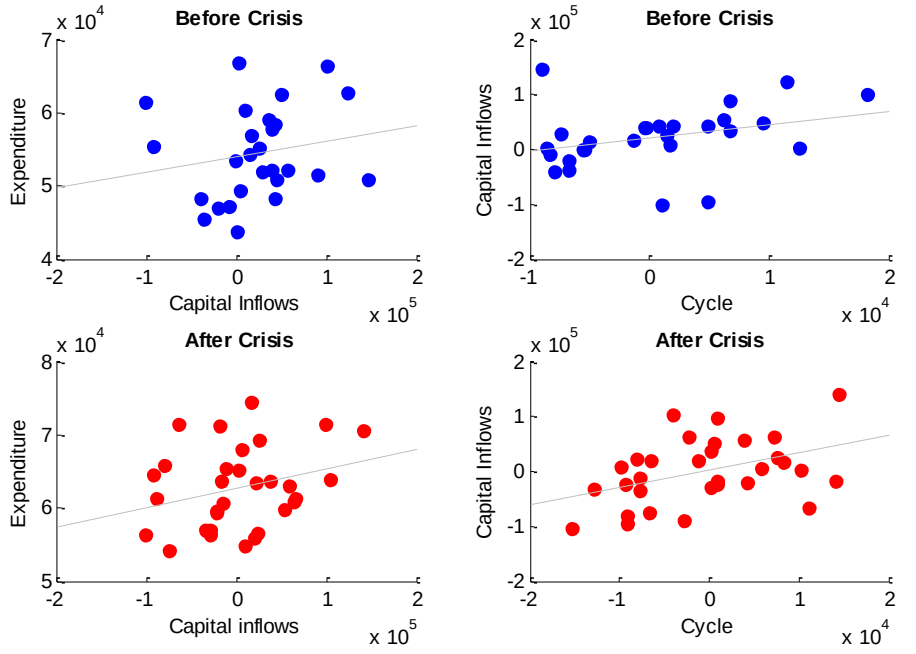


Figure 4.1: *Spain. Scatter plots showing: a) the relation between spending and capital flows before the crisis, b) the relation between the cycle and capital flows before the crisis, c) the relation between spending and capital flows after the crisis, d) the relation between the cycle and capital flows after the crisis. Source: author's calculations based on Eurostat and IMF.*

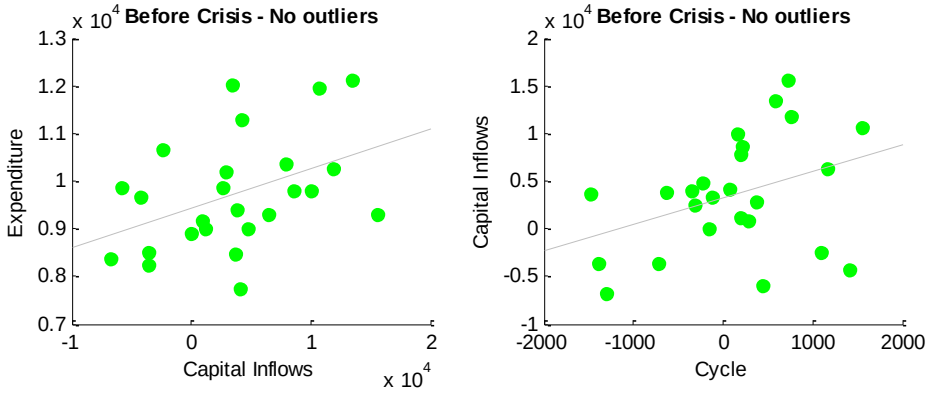


Figure 4.3: *Portugal. Scatter plots showing: a) the relation between spending and capital flows before the crisis, b) the relation between the cycle and capital flows before the crisis. The graphs exclude outlier observations. We consider as outliers those capital flows outside the interval* $[Q_1 - (Q_3 - Q_1); Q_3 + (Q_3 - Q_1)]$*, where* Q_1 *and* Q_3 *are respectively the first and the third quartile of our sample. Source: author's calculations based on Eurostat and IMF.*

4.4.3 Excessive political discretion

Let us now consider the question of policy discretion. According to Fatas and Mihov (2010), residuals in the policy reaction function (3.5b) can be interpreted as the exogenous component of discretionary spending, i.e. fiscal decisions that are not related to economic conditions, but to political considerations. As a result, Fatas and Mihov (2013) consider volatility of regression residuals a consistent measure of policy discretion: higher volatility means higher room for governments to spend for political reasons.

Country	St. Dev.	Country	St. Dev.
Greece	2.26%	**Austria**	0.77%
Ireland	3.68%	**Belgium**	0.74%
Italy	3.72%	**Finland**	0.68%
Portugal	4.28%	**France**	1.19%
Spain	2.26%	**Netherlands**	1.85%

Table 4.8: *Volatility of exogenous discretionary expenditure divided by GDP, listed by country. Author's calculations.*

Table 4.8 shows standard deviations of the ratio between residuals and GDP: PIIGS show a higher volatility with respect to core countries in the whole, which signifies that policymakers have had on average more discretionary power. In table 4.9, we consider the case of before and after the crisis: there are cases in which political discretion was

higher before the crisis and remained higher even after: this is the case of Italy and Portugal.

Country	St. Dev. Before the crisis	St. Dev. After the crisis
Greece	1.27%	2.78%
Ireland	5.28%	0.06%
Italy	4.28%	3.21%
Portugal	4.56%	4.05%
Spain	0.701%	1.365%

Table 4.9: *Volatility of exogenous discretionary expenditure divided by GDP, listed by country. Before and after the crisis. Author's calculations.*

The higher policy discretion may have, in some ways, contributed to fiscal procyclicality, especially for those countries that were not characterized by procyclical capital flows, for instance Italy.

CONCLUSIONS

The promulgation of austerity measures gave rise to a huge debate in the literature: a large part of it rejects the utility of these arrangements for the economic recovery of the Eurozone. Some concerns regard the likely impact of the austerity on fiscal decisions: stricter budgetary rules could have created a situation of impairment for the countries in crisis (the PIIGS), by no longer enabling the development of countercyclical budgetary policies to stimulate growth and investments. For this reason, the goal of this dissertation was to check if the PIIGS have been characterized by a change in fiscal policy cyclicality due to the austerity measures or to the situation of economic distress in general, in comparison to the pre-crisis situation. In our work, we relied on two hypotheses: that fiscal policies have been countercyclical or at least acyclical before the crisis and that the austerity or the crisis itself had an active role in turning these policies into procyclical, with the hidden assumption that core countries have always been 'careful'.

At the end of our analysis we can draw the following conclusions:

1. Spending policies in the Eurozone have been relevantly procyclical even in the periods preceding the economic crisis, in contrast to the findings of Gali and Perotti (2003) and Fatas and Mihov (2010): however, they rejected the hypothesis of procyclicality in the Eurozone in the pre-crisis period because they did not take into account some potential sources of bias that we, instead, considered. This conclusion is valid for most of the PIIGS and also for some core countries.
2. There is very little evidence that crisis and austerity played an important role in changing the cyclicality of spending policies: in most of the cases, countries that were procyclical before the crisis remained procyclical also afterwards. However, in some countries (Portugal and Spain) this behavior is more evident than in others (Greece and Italy).
3. Tax policy has been mostly countercyclical before the crisis, but in some countries it seemed to become consistently procyclical after the turmoil: this is

the case of Greece (but also Portugal in some ways). However, our analysis of tax policies is characterized by strong assumptions and by the lack of robustness checks that may further confirm this statement.

4. The most likely causes of pre-crisis fiscal procyclicality for the PIIGS have been the presence of procyclical capital flows (Spain, Portugal), confirming the findings of Kaminsky, Reinhart and Vegh (2005), and excessive policy discretion (Greece, Italy).

Taking all of this into account, we cannot exclude that pre-crisis procyclicality has had a major role in triggering the economic distress: as Aghion and Marinescu (2008) point out, procyclicality has an inverse relation with economic growth and, as Reinhart and Rogoff (2009), argue, procyclical capital flows together with procyclical fiscal policies may lead to situations of debt unsustainability. Post-crisis austerity is the only 'enemy' of economic welfare. However, too relaxed policies during good times should be avoided as well. One noticeable point is also that Ireland is the only country among the PIIGS that did not show consistent procyclicality and it is currently outside of the recession.

Although austerity did not have a role in increasing the already evident procyclicality in Southern Eurozone, we do not find evidence of the stylized fact of Gavin and Perotti (1997) either, according to which procyclicality turns into acyclicality or countercyclicality during downturns: in this framework austerity could have had the bad effect of obstructing effective countercyclical fiscal policy not by worsening their fiscal situation, but because it prevented countries from changing it.

Further research can be carried out in this field. First of all, there is the necessity to find a method to estimate cyclicality of fiscal policies, which is possibly unbiased and can lead to sure policy conclusions: in fact, recent literature tends to focus more on the expenditure side (especially for industrial countries), but, as we saw, important findings could be inferred by the analysis of taxation rather than the analysis of spending (especially because Gavin and Perotti, 1997, and Balassone et al., 2010, argue that spending and tax policies tend to be asymmetric). Another point is that we can increase the validity of our estimates with the implementation of more complex statistical tools: Aghion and Marinescu (2008) apply Markov Chain Montecarlo methods (MCMC) to

policy reaction functions similar to (3.1) in order to infer the evolution over time of the degree of cyclicality. Extending their model to model (3.5b) could implement the estimation as well, since Aghion and Marinescu (2008) do not take into account some methodological pitfalls that we solved in this analysis.

APPENDIX

A.1 The Hodrick-Prescott filter

According to Hodrick and Prescott (1997), a given time series Y_t is divisible into two components: a trend, or growth, component Y_t^T and a cyclical component Y_t^C. In particular, the decomposition is additive:

$$Y_t = Y_t^T + Y_t^C \tag{A.1}$$

Even if we assume that the value of Y_t is known, separating the cyclical and the trend component raises some issues. According to the authors, an alternative would be to consider trend component as a deterministic value and that cyclical component is the result of cyclical innovations. Actually, if the variable under exam is GDP, trend component may be regarded as the resulting output coming from a specified production function, while cyclical GDP would be the result of some short-term shocks.

Since this is not the case, Hodrick and Prescott assume that the trend component has a stochastic path over time as well, but it varies in a more smoothly way over time with respect to overall variable Y_t. Then, in order to isolate trend component (and calculate cyclical component as a residual) we have to smooth Y_t, getting, this way, an estimate of the trend.

The smoothing process consists in the following minimization problem:

$$\min_{\{Y_t^T\}_{t=-1}^{T}} \left\{ \sum_{t=1}^{T} Y_t^C + \lambda \sum_{t=1}^{T} [(Y_t^T - Y_{t-1}^T) - (Y_{t-1}^T - Y_{t-2}^T)]^2 \right\} \tag{A.2}$$

Where:

$$Y_t^C = Y_t - Y_t^T$$

And λ is an arbitrary positive number which works as smoothing parameter, i.e. it reduces variability of the trend component (this is way it is also called the "penalization"). The values of λ proposed by Hodrick and Prescott are the following:

- $\lambda = 400$ if we have yearly data;
- $\lambda = 1600$ if we have quarterly data;
- $\lambda = 6400$ if we have monthly data;

In Matlab the Hodrick-Prescott filter has been enshrined in the function

```
[T,C] = hpfilter(S,smoothing)
```

where 'S' is the time series to be smoothed (GDP in our case) and 'smoothing' represents the value of λ that has to be set arbitrarily. Since the GDP time series in the analysis has a quarterly frequency, it has been set equal to 1600.

A.2 Why we cannot use variables divided by GDP: an analytical explanation

Let us start with a specification as in (3.7):

$$\beta_{i,t} = \frac{\Delta(\frac{G_{i,t}^{d}}{Y_{i,t}})}{\Delta(\frac{Y_{i,t}^{C}}{Y_{i,t}})} \tag{A.3}$$

In Gali and Perotti (2003) such a beta should imply procyclicality when it is positive and a negative beta should imply countercyclicality. However, a positive beta means that $\Delta\frac{G_{i,t}^{d}}{Y_{i,t}} < 0$ and $\Delta\frac{Y_{i,t}^{C}}{Y_{i,t}} < 0$ or that $\Delta\frac{G_{i,t}^{d}}{Y_{i,t}} > 0$ and $\Delta\frac{Y_{i,t}^{C}}{Y_{i,t}} > 0$. If we restrict our attention to the first case, we would have:

$$\Delta\frac{G_{i,t}^{d}}{Y_{i,t}} < 0$$

if and only if:

$$\Delta Y_{i,t} \in \left]\Delta G_{i,t}^{d}\frac{Y_{i,t-1}}{G_{i,t-1}^{d}}; +\infty\right[\tag{A.4}$$

No matters about the sign of $\Delta G_{i,t}^{d}$. Instead, we would have:

$$\Delta\frac{Y_{i,t}^{C}}{Y_{i,t}} < 0$$

If and only if:

$$\Delta Y_{i,t} \in \left]\Delta Y_{i,t}^{C}\frac{Y_{i,t-1}}{Y_{i,t-1}^{C}};+\infty\right[\tag{A.5}$$

No matters about the sign of $\Delta Y_{i,t}^{C}$ and of $Y_{i,t-1}^{C}$ (which can have a negative sign). If we assume as follows, including that (A.5) no longer holds:

$$\begin{cases} \Delta G_{t}^{d} < 0 \text{ and } \Delta Y_{t}^{C} < 0 \\ \Delta G_{i,t}^{d}\frac{Y_{i,t-1}}{G_{i,t-1}^{d}} < \Delta Y_{i,t}^{C}\frac{Y_{i,t-1}}{Y_{i,t-1}^{C}} \\ \Delta Y_{i,t} \in \left]\Delta G_{i,t}^{d}\frac{Y_{i,t-1}}{G_{i,t-1}^{d}};\Delta Y_{i,t}^{C}\frac{Y_{i,t-1}}{Y_{i,t-1}^{C}}\right[\end{cases} \tag{A.6}$$

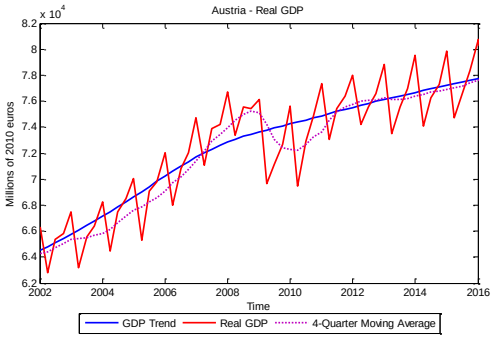
Then we will see that the beta is no longer positive despite spending policy is still procyclical. Conditions (A.6) are not far from reality, as it can be seen in table A.1 there can be some cases in which it is verified. As a result a beta expressed as in (A.3) will be negative in cases of fiscal procyclicality.

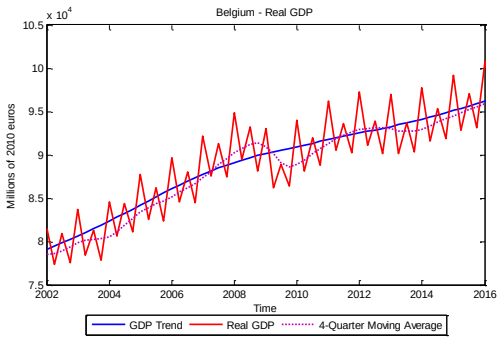
Case	$\Delta Y_{i,t}$	ΔG_{t}^{d}	ΔY_{t}^{C}	$\Delta G_{i,t}^{d}\frac{Y_{i,t-1}}{G_{i,t-1}^{d}}$	$\Delta Y_{i,t}^{C}\frac{Y_{i,t-1}}{Y_{i,t-1}^{C}}$
Greece 2003 Q1	-2358.2	-2428.92	-2982.11	-2737.71	2627665
Portugal 2014 Q1	-1465.9	-1786.95	-1415.7	-2089	170382.9

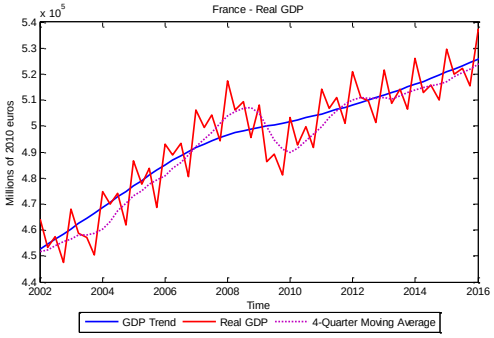
Table A.1: *Realizations of assumption A.6. Author's calculations based on Eurostat database.*

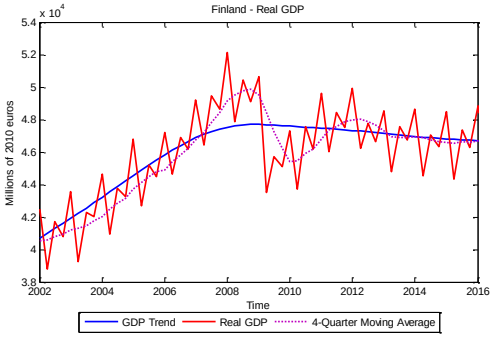
A.3 GDP graphs

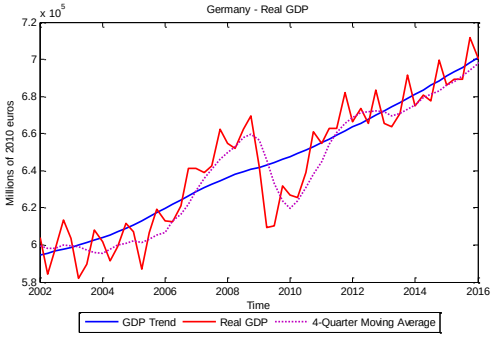
Figures below plot the pattern of quarterly real GDP over time for the countries in the sample: red line shows actual real GDP, blue line represents the Hodrick-Prescott filtered trend and the dashed purple line is the 4-quarter simple moving average.

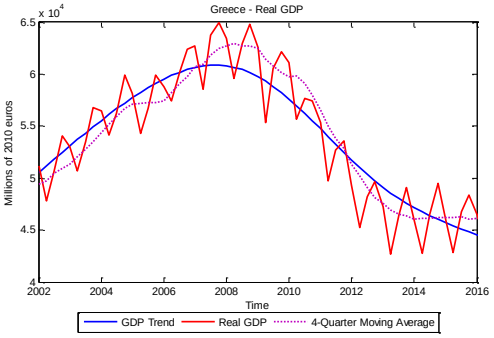


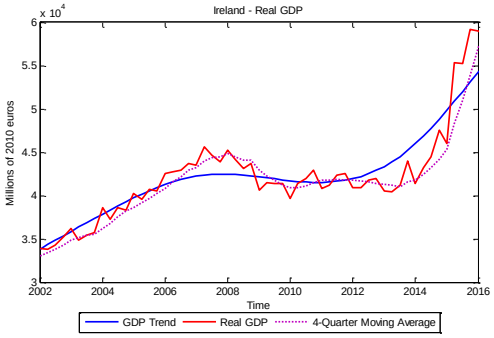


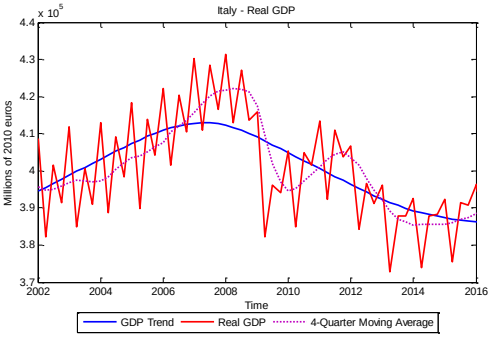

France - Real GDP
x 10^5
Millions of 2010 euros
Time
GDP Trend
Real GDP
4-Quarter Moving Average

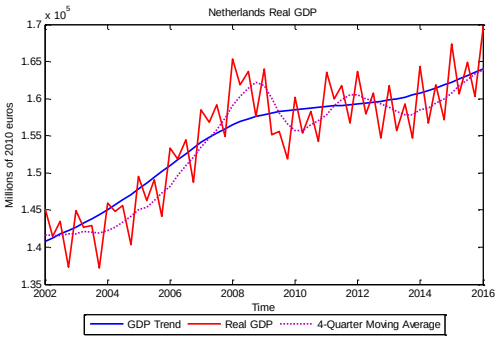

Finland - Real GDP
x 10^4
Millions of 2010 euros
Time
GDP Trend
Real GDP
4-Quarter Moving Average

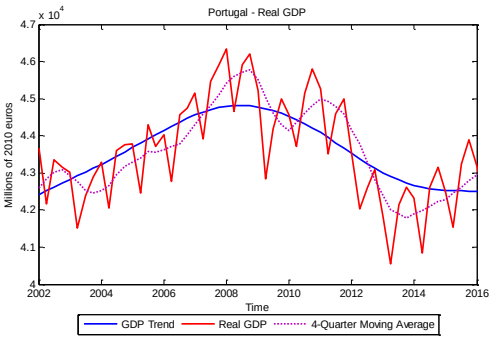

Germany - Real GDP
x 10^5
Millions of 2010 euros
Time
GDP Trend
Real GDP
4-Quarter Moving Average


Greece - Real GDP
x 10^4
Millions of 2010 euros
Time
GDP Trend
Real GDP
4-Quarter Moving Average


Ireland - Real GDP
x 10^4
Millions of 2010 euros
Time
GDP Trend
Real GDP
4-Quarter Moving Average


Italy - Real GDP
x 10^5
Millions of 2010 euros
Time
GDP Trend
Real GDP
4-Quarter Moving Average


Netherlands Real GDP
x 10^5
Millions of 2010 euros
Time
GDP Trend
Real GDP
4-Quarter Moving Average


Portugal - Real GDP
x 10^4
Millions of 2010 euros
Time
GDP Trend
Real GDP
4-Quarter Moving Average

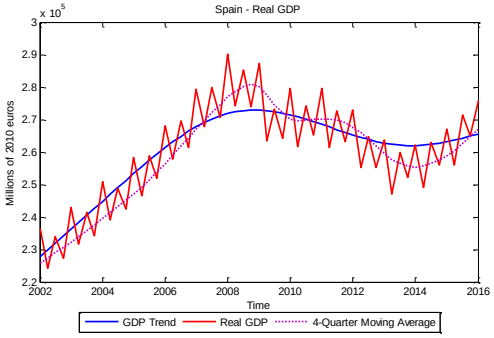


Figure A.1: *Real GDP for each country in the sample. Red graph represents Real GDP, blue graph represents Hodrick-Prescott filtered trend and dashed purple graph represents the 4-quarter simple moving average. Source: Eurostat and author's calculations based on Eurostat.*

Source of data about real GDP: Eurostat. Trend and moving average are from author's calculations. These plots helped to define the quarter in which economic/sovereign debt crisis began and end (if it ended). Crisis Periods are summarized in the following table:

Country	**Crisis interval (extrema included)**
Austria	2009 Q1 – 2010 Q4
Belgium	2009 Q1 – 2010 Q4
Finland*	2009 Q1 – Ongoing
France	2008 Q4 – 2010 Q4
Germany	2008 Q4 – 2011 Q3
Greece*	2008 Q3 – Ongoing
Ireland*	2007 Q3 – 2014 Q3
Italy*	2008 Q3 – Ongoing
Netherlands	2009 Q1 – 2013 Q4
Portugal*	2008 Q4 – Ongoing
Spain*	2009 Q1 – Ongoing

Table A.2: *Crisis period for each country.*

Countries with * experienced a reversion of the output trend with the crisis, however for Ireland, and Spain it has returned upwards in more recent times (see figures above).

A.4 Jaimovich and Panizza's external shock variable as instrument for GDP

In order to solve the problem of endogeneity for the cyclical GDP, we can exploit two alternative ways, by relying either on Gali and Perotti (2003) either on Jaimovich and Panizza (2007).

Gali and Perotti proposed to use a double instrument together by performing a TSLS estimation: in particular the first stage consisted to regress country i's cyclical GDP on its one period lagged cyclical GDP and on lagged US cyclical GDP, in statistical terms:

$$Y_{i,t}^{C} = \varphi_{i,0} + \varphi_{i,1} Y_{i,t-1}^{C} + \varphi_{i,2} Y_{USA,t-1}^{C} + \eta_{i,t} \quad \text{(A.7)}$$

In which $\eta_{i,t}$ represents the stochastic innovation: $\eta_{i,t} \sim iid.(0, \sigma_{i,t}^{\eta})$.

This is the most used instrument in the literature, among others Fatas and Mihove use it in order to perform their analysis on EEMU 12 countries. Criticism has raised towards the use of this instrument, in particular Jaimovich and Panizza (2007) argued that such an instrument could be ineffective, especially in panel data analyses, because of the presence of US GDP for all the countries. Moreover $Y_{i,t-1}^{C}$ could in principle directly affect $G_{i,t-1}^{d}$, which is used in the model as independent explanatory variable, and eventually create a problem of collinearity.

The use of Jaimovich and Panizza's external shock variable can solve these problems and can represent a better instrument for our analysis. The shock variable is defined as follows:

$$Shock_{i,t} = \frac{\overline{Exp_i}}{\overline{GDP_i}} \sum_{j=1}^{N} \phi_{j,t-1} GDPGR_{j,t} \quad \text{(A.8)}$$

Where:

- $\frac{\overline{Exp_i}}{\overline{GDP_i}}$ is the temporal average export-to-GDP ratio of country *i* throughout the sample;
- *j=1,...,N* represent each trade partner of country *i*;
- $\phi_{j,t-1}$ represent the lagged fraction of exports going from country *i* to each country *j*;
- $GDPGR_{j,t}$ is the rate of growth of real GDP of country *j* at time *t*.

To ease the computation we selected the 5 biggest trade partners (N=5) for each country in our sample, where possible[24], according to the latest data of the Observatory for the Economic Complexity of the MIT.

According to Jaimovich and Panizza (2007), the use of this variable as an instrument for the cycle is suitable because it is strong, has zero correlation with the innovation in the

[24] This has not been possible for Portugal and Germany because we needed systematic data about Angola (for Portugal) and China (for Germany) that was not available.

regression model and do not directly affect the dependent variable; nevertheless, they advise that for panel data estimation time fixed effects should be used in order to correct for global shocks that are not taken into account by the instrument (which instead takes into account country specific ones). However, since we are performing a country-by-country estimation and since the global shock we are considering (i.e. the sovereign debt crisis) is taken into account by the use of dummy variables, the use of time fixed effects can be considered as superfluous.

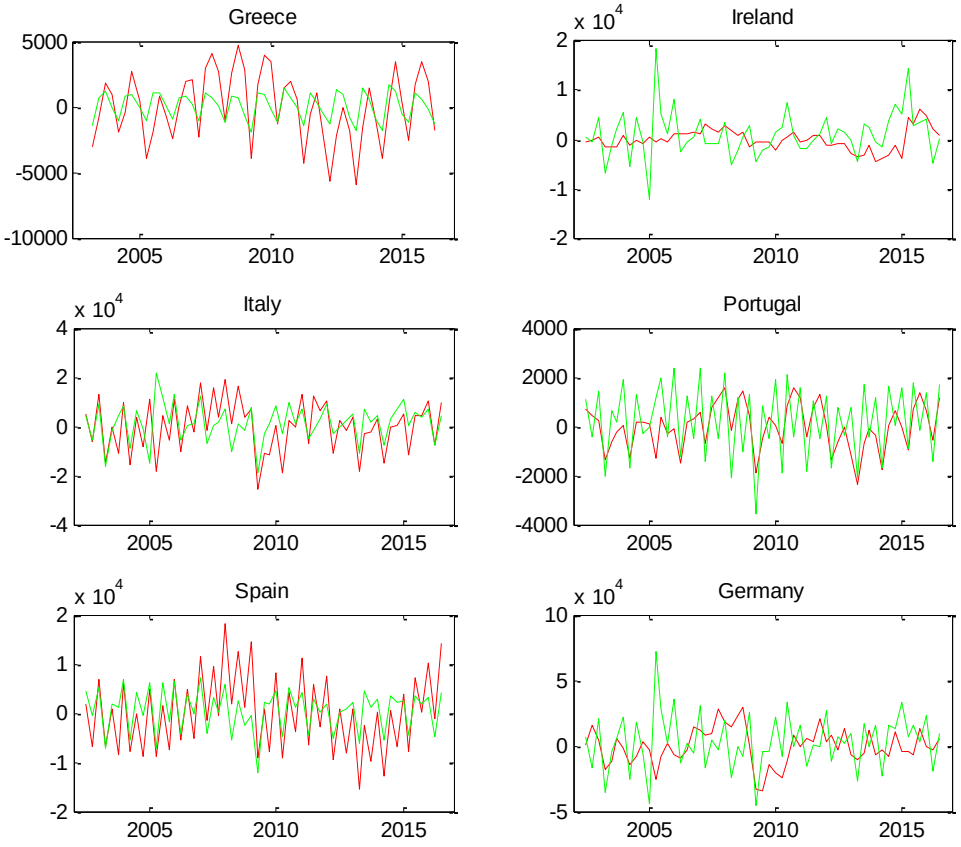


Figure A.1: *Hodrick-Prescott filtered Cyclical GDP (red) and External Shock (green), multiplied by 10, for PIIGS and Germany. Multiplication by 10 has been necessary for these plots in order to have comparable graphs. For the PIIGS, except for Ireland, the Shock variable performs well, since it captures very well cyclical variations of GDP; for Ireland and Germany it performs worse: one possible reason could be that the number of partners included in the variable is too small for these countries, or, as for Germany, we excluded relevant partners like China (because there was a lack of data). Source of data:*

- *Cyclical GDP: author's calculation based on Eurostat;*
- *External Shock: author's calculations (see paragraph A.4) based on Eurostat, IMF, European Central Bank, MIT (Observatory of Economic Complexity).*

A.5 Econometric assumptions

To estimate coefficients in (3.5b) we follow Jaimovich and Panizza (2007) and we use a TSLS approach. Ilzetzki and Vegh (2008) suggest that GMM (generalized method of moments) estimation would yield a better performance but under some assumptions they may be equivalent (Jaimovich and Panizza, 2007). Let us define with X as the matrix of independent variables for each country, whose dimension is $T \times K$ (T is the sample size and K the number of variables), and with Z the matrix of instruments, whose dimension is $T \times L$ (L number of instruments, in our case $L = K$, no problems of over-identification), then we assume as follows:

a. $E[\boldsymbol{Z}'\boldsymbol{\varepsilon}] = 0$ ($\boldsymbol{\varepsilon}$ is the vector of innovations);
b. $E[\boldsymbol{Z}'\boldsymbol{Z}] = L$ and $E[\boldsymbol{Z}'\boldsymbol{X}] = K$

Under these conditions (and under the order condition $L = K$) beta coefficients can be correctly identified and TSLS estimator is consistent. The use of the Jaimovich and Panizza's shock variable is consistent with these assumptions.

Moreover we do not assume heteroscedasticity, namely that $E[\boldsymbol{Z}'\boldsymbol{\varepsilon}'\boldsymbol{\varepsilon}\boldsymbol{Z}] = \sigma^2 E[\boldsymbol{Z}'\boldsymbol{Z}]$, with $\sigma^2 = E[\boldsymbol{\varepsilon}'\boldsymbol{\varepsilon}]$, because this would be a too restrictive assumption in our case. Then the asymptotic variance to estimate standard errors and to perform hypothesis testing with is given by the following equation:

$$Avar(\widehat{\boldsymbol{\beta}}) = \frac{T}{(T-K)} (\widehat{\boldsymbol{X}}'\widehat{\boldsymbol{X}})^{-1} \left(\sum_{t=1}^{T} \hat{\varepsilon}_{\boldsymbol{t}} \widehat{\boldsymbol{x}}_t \widehat{\boldsymbol{x}}_t \right) (\widehat{\boldsymbol{X}}'\widehat{\boldsymbol{X}})^{-1}$$

Where $\widehat{\boldsymbol{\beta}}$ is the vector of the estimated coefficients in the regression model (3.5b), $\hat{\varepsilon}_{\boldsymbol{t}}$ are the second-stage residuals and $\widehat{\boldsymbol{X}}$ is the matrix of independent variables (composed by T vectors $\widehat{\boldsymbol{x}}_t$) that result from the first stage regression. Under these assumptions and with no problems of over-identification we can say that there would not be difference between a GMM and a TSLS estimation.

A.6 OLS estimates

In the following table you can find the OLS estimation for model (3.5b), used to check for the presence of endogeneity problems.

Greece (T=53)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	5637,47***	4,894	5675,39***	4,74	6031,54***	4,98
Cycle	0,0713	1,0118	0,1294	1,4623	0,1206	1,3892
D1 (Crisis)	-	-	-0,0882	-0,6822	0,0320	0,1827
D2 (Austerity)	-	-	-	-	-0,2343	-1,1184
Expenditure (t-1)	0,0243	0,1859	0,0175	0,1311	-0,0506	-0,3526
Debt	0,0194***	3,7475	0,0196***	3,7930	0,0210***	4,1421
Spread (BP)	-0,0593	-0,1417	-0,0939	-0,2234	-0,1645	-0,3900

* Significant at 10%, ** significant at 5%, *** significant at 1%

Ireland (T=57)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	1313,26**	2,1766	1276,87**	2,1151	1422,40**	2,0834
Cycle	-0,0262	-0,9003	-0,0396	-1,1945	0,0093	0,1774
D1 (Crisis)	-	-	0,0352	0,7318	0,0305	0,5980
D2 (Austerity)	-	-	-	-	-0,0644	-0,9481
Expenditure (t-1)	0,8414***	10,2250	0,8440***	10,2019	0,8224***	8,5732
Debt	-0,0018*	-1,9965	-0,0015*	-1,7464	-0,0015*	-1,7879
Spread (BP)	0,4076	1,2328	0,3588	1,1249	0,4068	1,2114

* Significant at 10%, ** significant at 5%, *** significant at 1%

Italy (T=58)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	38713,07***	4,5303	40559,09***	4,2991	39834,53***	4,1218
Cycle	0,5017***	3,5913	0,5647***	3,8887	0,5888***	4,0644
D1 (Crisis)	-	-	-0,1800	-0,8493	-0,3091	-1,3541
D2 (Austerity)	-	-	-	-	0,3677	1,4264
Expenditure (t-1)	0,2331	1,6374	0,1926	1,2962	0,2364	1,5797
Debt	0,0099	1,5106	0,0105	1,6064	0,0088	1,4283
Spread (BP)	16,6554	1,4339	17,2229	1,4288	21,1325*	1,7111

* Significant at 10%, ** significant at 5%, *** significant at 1%

Portugal (T=58)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	9917,29***	10,3415	9782,87***	10,0668	9755,51***	9,8162
Cycle	0,2928**	2,4782	0,4579**	2,3094	0,4589**	2,2859
D1 (Crisis)	-	-	-0,2519	-1,0755	-0,1717	-0,4846
D2 (Austerity)	-	-	-	-	-0,1384	-0,3825
Expenditure (t-1)	-0,2582***	-2,7233	-0,2401**	-2,4633	-0,2379**	-2,3613
Debt	0,0060**	2,5737	0,0058**	2,5375	0,0059**	2,5096
Spread (BP)	-0,1446	-0,2707	-0,1575	-0,2935	-0,2391	-0,3826

* Significant at 10%, ** significant at 5%, *** significant at 1%

Spain (T=58)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	15644,9***	5,8234	15158,56***	5,1025	14304,14***	4,6766
Cycle	0,6057***	12,5931	0,5680***	13,0860	0,5681***	12,9637
D1 (Crisis)	-	-	0,0809	0,7771	0,2265*	1,4807
D2 (Austerity)	-	-	-	-	-0,223	-1,3022
Expenditure (t-1)	0,6169***	8,7273	0,6319***	7,9794	0,6521***	7,8804
Debt	0,0026	1,0251	0,0023	0,8691	0,0024	0,9181
Spread (BP)	13,5442***	3,1658	13,7597***	3,2865	11,7187***	2,6456

* Significant at 10%, ** significant at 5%, *** significant at 1%

A.7 TSLS Estimates for Expenditure

Here there are TSLS estimates both for model (3.5b) and (3.15) using both expenditure aggregates. Tables are listed country-by-country starting from the PIIGS.

a) Greece (T=53) – Model (3.5b) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	6110,33***	4,22	6170,20***	4,15	6170,74***	3,86
Cycle	-0,0415	-0,3551	0,0525	0,4474	0,0524	0,4371
D1 (Crisis)			-0,1450	-0,9363	-0,1447	-0,6671
D2 (Austerity)					-0,0004	-0,0014
Expend. (t-1)	-0,0731	-0,4429	-0,0854	-0,4902	-0,0855	-0,4529
Debt	0,0220***	3,6747	0,0223***	3,5671	0,0223***	3,6145
Spread (BP)	-0,1955	-0,3706	-0,2596	-0,4738	-0,2597	-0,4755

* Significant at 10%, ** significant at 5%, *** significant at 1%

b) Greece (T=52) – Model (3.15) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0269	0,8628	0,0261	0,8482	0,0281	0,9164
Cycle	0,5254	1,6151	1,2652**	2,5133	1,2675**	2,4960
D1 (Crisis)			-1,0101	-1,5822	-0,7079	-0,9355
D2 (Austerity)					-0,5013	-0,5926
Debt	-0,3673	-0,7851	-0,4716	-1,0391	-0,5571	-1,1433
Spread (%)	-0,1494	-0,3288	-0,1439	-0,3221	-0,1506	-0,3369

* Significant at 10%, ** significant at 5%, *** significant at 1%

c) Greece (T=53) – Model (3.5b) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	10483,08***	5,131	10712,73***	5,010	10851,57***	4,659
Cycle	-0,0633	-0,3923	0,0471	0,3480	0,0414	0,2989
D1 (Crisis)			-0,1857	-0,7815	-0,1483	-0,4915
D2 (Austerity)					-0,0724	-0,1689
Expend. (t-1)	-0,1380	-0,7986	-0,1694	-0,9019	-0,1883	-0,9064
Debt	0,0204**	2,5097	0,0213**	2,4902	0,0218**	2,5807
Spread (BP)	-1,1189	-1,5105	-1,2543	-1,5598	-1,3050	-1,5838

* Significant at 10%, ** significant at 5%, *** significant at 1%

d) Greece (T=52) – Model (3.15) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0220	0,6693	0,0216	0,6596	0,0235	0,7096
Cycle	0,8086*	1,9949	1,1172*	2,9671	1,1193*	2,9445
D1 (Crisis)			-0,4213	-0,6682	-0,1397	-0,1829
D2 (Austerity)					-0,4670	-0,4304
Debt	-0,4913	-0,9017	-0,5348	-0,9892	-0,6144	-1,0376
Spread (%)	-0,0398	-0,0738	-0,0375	-0,0694	-0,0437	-0,0810

* Significant at 10%, ** significant at 5%, *** significant at 1%

a) Ireland (T=57) – Model (3.5b) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	1721,07	1,2730	1976,95	0,6499	1454,07	0,0143
Cycle	-0,0986	-0,4623	-0,7238	-1,0276	-1,5918	-0,0098
D1 (Crisis)			1,0410	0,8670	0,8866	0,0315
D2 (Austerity)					0,9713	0,0053
Expend. (t-1)	0,7928***	4,7847	0,7098**	2,0374	0,8448	0,0329
Debt	-0,0022	-1,5323	0,0065	0,5922	0,0036	0,0066
Spread (BP)	0,3564	0,8489	-1,1894	-0,6513	-1,4735	-0,0274

* Significant at 10%, ** significant at 5%, *** significant at 1%

b) Ireland (T=56) – Model (3.15) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0013	0,1795	0,0033	0,3146	0,0033	0,2846
Cycle	-0,4666	-0,9300	-0,7404	-1,5051	-0,7427	-0,2718
D1 (Crisis)			2,1598	0,8096	2,1604	0,8285
D2 (Austerity)					0,0026	0,0010
Debt	0,1727**	2,1202	0,2293	1,1837	0,2293	1,0806
Spread (%)	-0,0037	-0,9842	-0,0030	-0,6431	-0,0030	-0,6255

* Significant at 10%, ** significant at 5%, *** significant at 1%

c) Ireland (T=57) – Model (3.5b) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	4307,14**	2,0854	4146,36	1,2073	9832,88	0,1660
Cycle	0,1092	0,1654	-0,9433	-0,5933	6,2575	0,0755
D1 (Crisis)			1,7452	0,6061	1,8280	0,1012
D2 (Austerity)					-7,6297	-0,0831
Expend. (t-1)	0,5442***	2,8455	0,4974*	1,8864	-0,4475	-0,0408
Debt	-0,0040	-1,1135	0,0107	0,4053	0,0193	0,0798
Spread (BP)	1,083676	0,7957	-1,7292	-0,4041	1,4418	0,0430

* Significant at 10%, ** significant at 5%, *** significant at 1%

d) Ireland (T=56) – Model (3.15) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	-0,0010	-0,0433	-0,0009	-0,0376	-0,0052	-0,2112
Cycle	0,3517	0,2306	0,3381	0,2012	3,3345	0,7081
D1 (Crisis)			0,1070	0,0229	-0,6471	-0,1212
D2 (Austerity)					-3,4045	-0,7058
Debt	0,6120**	2,6345	0,6148***	2,6746	0,6840*	1,7728
Spread (%)	-0,0080	-1,1107	-0,0080	-1,0677	-0,0076	-0,8354

* Significant at 10%, ** significant at 5%, *** significant at 1%

a) Italy (T=58) – Model (3.5b) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	3690,87	0,1080	2797,994	0,0701	798,3361	0,0175
Cycle	2,0157	1,5628	2,2099	1,1549	2,3896	1,0509
D1 (Crisis)			-0,2368	-0,2583	-0,7605	-0,5335
D2 (Austerity)					1,1845	0,7789
Expend. (t-1)	1,4457	1,3962	1,4833	1,1879	1,6503	1,0810
Debt	-0,0239	-0,8478	-0,0251	-0,7270	-0,0322	-0,7216
Spread (BP)	41,4903*	1,7038	42,3295	1,5103	57,9907	1,3230

* Significant at 10%, ** significant at 5%, *** significant at 1%

b) Italy (T=58) – Model (3.15) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0540**	2,3129	0,0558**	2,4706	0,0551**	2,3427
Cycle	5,2778***	6,1552	5,7140***	5,4876	5,7253***	5,4545
D1 (Crisis)			-0,7460	-0,5608	-1,0766	-0,5560
D2 (Austerity)					0,6569	0,3452
Debt	-6,3283***	-4,6173	-6,5566***	-4,9901	-6,5890***	-5,0879
Spread (%)	0,0113	0,9323	0,0113	0,9288	0,0121	0,9173

* Significant at 10%, ** significant at 5%, *** significant at 1%

c) Italy (T=58) – Model (3.5b) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	7462,712	0,2004	7341,439	0,2011	6110,513	0,1539
Cycle	1,8650*	1,6824	1,8330	1,3648	1,9404	1,2738
D1 (Crisis)			0,0489	0,0590	-0,4470	-0,4076
D2 (Austerity)					1,1641	0,9826
Expend. (t-1)	1,2669	1,5447	1,2677	1,5732	1,3719	1,4814
Debt	-0,0199	-0,8888	-0,0199	-0,8860	-0,0253	-0,9190
Spread (BP)	40,3510*	1,7222	40,2539*	1,6739	55,0712	1,6460

* Significant at 10%, ** significant at 5%, *** significant at 1%

Italy (T=58) – Model (3.15) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0444**	2,1190	0,0442**	2,1489	0,0433**	2,0184
Cycle	4,6324***	6,0714	4,6017***	5,0274	4,6178***	5,0122
D1 (Crisis)			0,0525	0,0429	-0,4213	-0,2380
D2 (Austerity)					0,9415	0,5213
Debt	-5,4684***	-4,4323	-5,4524***	-4,5332	-5,4987***	-4,6840
Spread (%)	0,0106	0,9537	0,0106	0,9447	0,0116	0,9555

* Significant at 10%, ** significant at 5%, *** significant at 1%

a) Portugal (T=58) – Model (3.5b) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	6682,385***	3,0788	5504,617*	1,7567	5318,487	1,6289
Cycle	1,8936**	2,4821	2,9232*	1,8786	2,9308*	1,8506
D1 (Crisis)			-1,2071	-0,9224	-0,6014	-0,3402
D2 (Austerity)					-1,1673	-0,7971
Expend. (t-1)	0,2148	0,7335	0,3716	0,8926	0,3814	0,8745
Debt	-0,0020	-0,3313	-0,0034	-0,5019	-0,0021	-0,3277
Spread (BP)	1,7585	1,3574	1,7913	1,3080	0,9921	0,6295

* Significant at 10%, ** significant at 5%, *** significant at 1%

b) Portugal (T=58) – Model (3.15) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0363	0,8002	0,0324	0,6781	0,0373	0,7256
Cycle	9,5647***	5,3226	10,2471***	4,5239	10,1980***	4,5253
D1 (Crisis)			-1,2512	-0,3391	4,2265	0,4726
D2 (Austerity)					-9,1200	-1,0591
Debt	-1,2588	-1,0681	-1,0533	-0,7311	-1,0388	-0,6027
Spread (%)	0,0035	0,2743	0,0032	0,2525	0,0029	0,2055

* Significant at 10%, ** significant at 5%, *** significant at 1%

c) Portugal (T=58) – Model (3.5b) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	8516,685***	3,4693	7754,599**	2,3468	7451,96**	2,2003
Cycle	2,4032**	2,6138	3,1059*	1,9468	3,1202*	1,9267
D1 (Crisis)			-0,8377	-0,5993	0,0758	0,0355
D2 (Austerity)					-1,7534	-0,8990
Expenditure (t-1)	0,2164	0,8523	0,2944	0,8830	0,3083	0,8943
Debt	-0,0076	-1,1408	-0,0079	-1,1890	-0,0058	-1,0569
Spread (BP)	2,4357	1,5564	2,4032	1,4969	1,2041	0,6697

* Significant at 10%, ** significant at 5%, *** significant at 1%

d) Portugal (T=58) – Model (3.15) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0335	0,7153	0,0369	0,7446	0,0423	0,7986
Cycle	10,16***	5,3903	9,5429***	4,7587	9,4883***	4,7613
D1 (Crisis)			1,1315	0,2814	7,2254	0,7016
D2 (Austerity)					-10,1458	-1,0016
Debt	-1,1891	-0,9601	-1,3748	-0,9378	-1,3587	-0,7574
Spread (%)	0,0038	0,2785	0,0041	0,2811	0,0038	0,2321

* Significant at 10%, ** significant at 5%, *** significant at 1%

a) Spain (T=58) – Model (3.5b) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	15556,64***	5,1444	14976,63***	4,6179	14661,44***	4,1972
Cycle	0,6809***	7,7860	0,6402***	7,4116	0,6422***	7,3135
D1 (Crisis)			0,1027	0,6348	0,1534	0,6580
D2 (Austerity)					-0,0951	-0,3447
Expend. (t-1)	0,6243***	7,8298	0,6431***	7,2388	0,6498***	6,9027
Debt	0,0015	0,5458	0,0010	0,3100	0,0011	0,3702
Spread (BP)	16,9453***	3,3914	17,6812***	3,3408	16,5656***	2,7444

* Significant at 10%, ** significant at 5%, *** significant at 1%

b) Spain (T=58) – Model (3.15) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0149**	2,2895	0,0149**	2,2992	0,0149**	2,2838
Cycle	2,2088***	18,7410	2,2295***	16,7235	2,2294***	16,5508
D1 (Crisis)			-0,0451	-0,1815	-0,0617	-0,1803
D2 (Austerity)					0,0324	0,0712
Debt	0,0049	0,0177	0,0003	0,0012	-0,0043	-0,0144
Spread (%)	-0,0034	-0,6012	-0,0034	-0,5849	-0,0033	-0,5506

* Significant at 10%, ** significant at 5%, *** significant at 1%

c) Spain (T=58) – Model (3.5b) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	17602,19***	4,8808	17694,74***	4,7566	17570,34***	4,3006
Cycle	0,7555***	8,4540	0,7637***	8,3400	0,7643***	8,2128
D1 (Crisis)			-0,0190	-0,1071	-0,0022	-0,0091
D2 (Austerity)					-0,0319	-0,1037
Expend. (t-1)	0,6964***	10,2885	0,6943***	9,6857	0,6962***	9,0756
Debt	-0,0018	-0,6445	-0,0017	-0,5853	-0,0016	-0,5404
Spread (BP)	13,8353***	2,5264	13,6813***	2,3657	13,3142***	1,9667

* Significant at 10%, ** significant at 5%, *** significant at 1%

d) Spain (T=58) – Model (3.15) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,012***	2,765	0,012***	2,8170	0,012***	2,8014
Cycle	1,8879***	20,052	1,9677***	30,1095	1,9662***	29,5944
D1 (Crisis)			-0,1739	-0,8502	-0,3497	-1,4724
D2 (Austerity)					0,3425	0,8463
Debt	0,090968	0,4246	0,0732723	0,3461	0,0247	0,1056
Spread (%)	-0,006292	-1,445	-0,0061	-1,3567	-0,0054	-1,1703

* Significant at 10%, ** significant at 5%, *** significant at 1%

a) Austria (T=58) – Model (3.5b) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	7561,349*	1,800	7461,92*	1,824	7409,594*	1,759
Cycle	-0,1937	-1,1306	-0,1965	-1,0803	-0,1788	-0,8141
D1 (Crisis)			0,0251	0,1647	0,0096	0,0572
D2 (Austerity)					-0,0516	-0,2835
Expenditure (t-1)	0,02408	0,043654	0,038239	0,071211	0,0466	0,0836
Debt	0,029018*	1,720446	0,02854*	1,735076	0,0282	1,6305
Spread (BP)	2,181196	0,695371	2,3703	0,6168	2,4157	0,6085

* Significant at 10%, ** significant at 5%, *** significant at 1%

b) Austria (T=58) – Model (3.15) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0064	0,8777	0,0069	0,9702	0,0086	1,2454
Cycle	0,0789	0,4945	0,2355	0,9658	0,6212	1,5976
D1 (Crisis)			-0,3831	-1,1992	-0,8081*	-1,7478
D2 (Austerity)					-0,7396*	-1,9102
Debt	-0,0606	-0,5570	-0,1566	-1,0581	-0,3400	-1,6397
Spread (%)	-0,0024	-0,2045	-0,0003	-0,0279	0,0003	0,0221

* Significant at 10%, ** significant at 5%, *** significant at 1%

c) Austria (T=58) – Model (3.5b) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	-263,148	-0,057	748,9013	0,196	756,194	0,201
Cycle	0,4131	1,2246	0,4031	1,3255	0,4542	1,3976
D1 (Crisis)			-0,2300	-1,3660	-0,2753	-1,4348
D2 (Austerity)					-0,1609	-1,0865
Expenditure (t-1)	1,0694*	1,965201	0,9406**	2,098011	0,9446**	2,1241
Debt	-0,0043	-0,21461	0,0009	0,054609	0,0005	0,0291
Spread (BP)	4,275127	1,19212	2,2079	0,770205	2,4516	0,7860

* Significant at 10%, ** significant at 5%, *** significant at 1%

d) Austria (T=58) – Model (3.15) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0064	0,7136	0,0073	0,8465	0,0096	1,1210
Cycle	0,5056***	2,4343	0,7944***	2,6672	1,3094***	2,8434
D1 (Crisis)			-0,7064**	-1,7656	-1,2739**	-2,2475
D2 (Austerity)					-0,9874**	-2,1742
Debt	-0,0354	-0,2453	-0,2125	-1,1327	-0,4573	-1,7383
Spread (%)	-0,0036	-0,2453	0,0003	0,0221	0,0011	0,0764

* Significant at 10%, ** significant at 5%, *** significant at 1%

a) Belgium (T=58) – Model (3.5b) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	3374,24***	3,2347	3442,94***	3,0795	3168,06***	2,6943
Cycle	-0,0581	-1,5856	-0,0543	-1,5658	-0,0779*	-1,7712
D1 (Crisis)			-0,0281	-0,2248	0,0031	0,0244
D2 (Austerity)					0,0833	0,9971
Expenditure (t-1)	0,621072***	4,218857	0,609***	3,653666	0,6511***	4,0373
Debt	0,012318*	1,884159	0,0128*	1,7447	0,0112	1,6505
Spread (BP)	3,6373*	1,8046	3,6595*	1,8183	3,6857*	1,8588

* Significant at 10%, ** significant at 5%, *** significant at 1%

b) Belgium (T=58) – Model (3.15) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0081*	1,7536	0,0081*	1,7591	0,0077	1,6696
Cycle	0,1580	1,6242	0,2120***	2,8732	0,1529	1,6600
D1 (Crisis)			-0,2359	-1,0081	-0,1764	-0,7393
D2 (Austerity)					0,1612	1,6335
Debt	-0,8651**	-5,5023	-0,9140***	-7,3789	-0,8990***	-7,5114
Spread (%)	0,0089*	1,7312	0,0097*	1,9815	0,0103**	2,0109

* Significant at 10%, ** significant at 5%, *** significant at 1%

c) Belgium (T=58) – Model (3.5b) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	3306,05***	3,1661	3237,03***	2,9097	2646,41**	2,1658
Cycle	-0,0845**	-2,3967	-0,0882**	-2,5242	-0,1394***	-2,9758
D1 (Crisis)			0,0258	0,2222	0,0915	0,8053
D2 (Austerity)					0,1716**	2,1410
Expenditure (t-1)	0,6635***	4,808567	0,6746***	4,263369	0,7588***	4,9999
Debt	0,0119*	1,775745	0,0115	1,479422	0,0078	1,1527
Spread (BP)	3,8393*	1,869013	3,804*	1,806656	3,7627*	1,8077

* Significant at 10%, ** significant at 5%, *** significant at 1%

d) Belgium (T=58) – Model (3.15) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0092*	1,9365	0,0092*	1,9191	0,0084*	1,8059
Cycle	-0,2885***	-3,4502	-0,2707***	-3,4669	-0,3886***	-4,4670
D1 (Crisis)			-0,0779	-0,3823	0,0409	0,2019
D2 (Austerity)					0,3217***	3,5704
Debt	-0,7154***	-5,0791	-0,7316***	-5,7228	-0,7017***	-6,1348
Spread (%)	0,0066	1,2667	0,0068	1,3344	0,0082	1,5319

* Significant at 10%, ** significant at 5%, *** significant at 1%

a) Finland (T=58) – Model (3.5b) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	834,084	0,9256	736,57	0,7895	498,76	0,5945
Cycle	0,2081***	5,0653	0,1971***	4,3510	0,1598***	3,4108
D1 (Crisis)			0,0345	0,4124	0,0356	0,4706
D2 (Austerity)					0,1317*	1,8168
Expenditure (t-1)	0,8741***	5,771699	0,89456***	5,549597	0,9346***	6,3549
Debt	0,003319	0,421951	0,0019	0,2142	0,0002	0,0282
Spread (BP)	13,7663***	3,0655	13,9595***	2,9323	11,9229***	2,9470

* Significant at 10%, ** significant at 5%, *** significant at 1%

b) Finland (T=58) – Model (3.15) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	-0,0021	-0,3670	-0,0021	-0,3716	-0,0021	-0,3691
Cycle	0,4530***	3,9320	0,4283***	2,5519	0,4313***	2,5578
D1 (Crisis)			0,0377	0,1905	-0,0650	-0,2550
D2 (Austerity)					0,1956	0,7932
Debt	-0,0523	-0,3957	-0,0599	-0,4149	-0,0557	-0,3892
Spread (%)	0,0441	1,5362	0,0449	1,5372	0,0446	1,5139

* Significant at 10%, ** significant at 5%, *** significant at 1%

c) Finland (T=58) – Model (3.5b) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	1646,6*	1,8253	1286,49	1,3551	945,67	1,0668
Cycle	0,2904***	6,007	0,2514***	4,9489	0,2106***	3,9256
D1 (Crisis)			0,1243	1,2725	0,1274	1,4289
D2 (Austerity)					0,1461*	1,8795
Expenditure (t-1)	0,7809***	6,0201	0,844***	5,992115	0,8920***	6,7536
Debt	0,0087	1,0686	0,0036	0,393039	0,0012	0,1437
Spread (BP)	19,6794***	3,579	20,546***	3,191782	18,129***	2,9077

* Significant at 10%, ** significant at 5%, *** significant at 1%

d) Finland (T=58) – Model (3.15) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	-0,0024	-0,5018	-0,0025	-0,5113	0,0041	5,1299
Cycle	0,3203***	3,8578	0,1667	0,9349	-0,3916**	-2,2308
D1 (Crisis)			0,2347	1,1902	1,4013***	3,6575
D2 (Austerity)					-1,0271***	-4,6110
Debt	-0,1704	-2,0242	-0,2176	-2,0327	-0,4212	-7,3677
Spread (%)	0,0537***	3,0038	0,0582***	2,7831	0,0542***	10,3667

* Significant at 10%, ** significant at 5%, *** significant at 1%

a) France (T=58) – Model (3.5b) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	3610,995	0,1179	13555,74	0,5014	6784,249	0,2571
Cycle	0,6328*	1,8661	0,6831*	1,8021	0,3627	1,3183
D1 (Crisis)			-0,2573	-0,5967	0,0665	0,1770
D2 (Austerity)					1,1835	1,3012
Expenditure (t-1)	0,9973**	2,503159	0,868**	2,485173	0,9577***	2,7244
Debt	-0,0029	-0,28231	0,0002	0,0170	-0,0021	-0,2039
Spread (BP)	46,2531	1,1387	45,7658	1,1248	53,6394	0,7977

* Significant at 10%, ** significant at 5%, *** significant at 1%

b) France (T=58) – Model (3.15) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	-0,0064	-1,5993	-0,0062	-1,4466	-0,0074	-2,2040
Cycle	0,6743***	5,1190	0,7372***	4,1248	0,4650***	2,4033
D1 (Crisis)			-0,2439	-1,0372	0,0313	0,1278
D2 (Austerity)					0,8008***	2,8450
Debt	0,7999***	5,7652	0,7944***	5,6362	0,8092***	6,4356
Spread (%)	-0,0027	-0,4809	-0,0027	-0,4749	0,0004	0,0648

* Significant at 10%, ** significant at 5%, *** significant at 1%

c) France (T=58) – Model (3.5b) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	9684,35	0,4232	18888,72	0,7886	10613,67	0,4412
Cycle	0,6015**	2,1022	0,6615**	2,0031	0,3923	1,4339
D1 (Crisis)			-0,2508	-0,5919	0,0129	0,0338
D2 (Austerity)					1,0106	1,2109
Expenditure (t-1)	0,9413***	3,947053	0,8449***	3,424518	0,9316***	3,6123
Debt	-0,002	-0,3165	0,0002	0,037949	-0,0018	-0,2343
Spread (BP)	49,143	1,26411	50,803	1,258922	55,0570	0,8990

* Significant at 10%, ** significant at 5%, *** significant at 1%

d) France (T=58) – Model (3.15) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	-0,0050	-1,5171	-0,0048	-1,3409	-0,0056*	-1,9167
Cycle	0,4103***	3,7638	0,4733***	3,3152	0,2922*	1,8150
D1 (Crisis)			-0,2442	-1,2015	-0,0611	-0,2834
D2 (Austerity)					0,5327***	2,4157
Debt	0,7022***	6,0510	0,6967***	5,7658	0,7065***	6,5146
Spread (%)	-0,0041	-0,9779	-0,0041	-0,9501	-0,0021	-0,4698

* Significant at 10%, ** significant at 5%, *** significant at 1%

a) Germany (T=57) – Model (3.5b) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	124733,6	3,0776	99513,47	2,5391	98087,6	1,2743
Cycle	-0,8026	-1,5980	-0,7489	-1,2967	-0,3751	-0,4119
D1 (Crisis)			1,0315	0,9259	0,6778	0,3892
D2 (Austerity)					-6,7497	-0,2538
Expenditure (t-1)	-0,67197	-1,28263	-0,24453	-0,4732	-0,2254	-0,2379
Debt	0,04239***	3,158322	0,0289**	2,0523	0,0282	1,0318
Spread (BP)						

* Significant at 10%, ** significant at 5%, *** significant at 1%

b) Germany (T=56) – Model (3.15) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	-0,0629	-0,1986	0,0209	0,5553	0,0208	0,5463
Cycle	-35,1813	-0,2658	-10,0620	-0,7436	-10,5198	-0,4483
D1 (Crisis)			16,6126	0,8986	17,1068	0,6033
D2 (Austerity)					1,0946	0,0457
Debt	8,4949	0,2460	-0,7982	-0,3168	-0,7763	-0,2842
Spread (%)						

* Significant at 10%, ** significant at 5%, *** significant at 1%

c) Germany (T=57) – Model (3.5b) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	-99903,8	-0,1695	6850,23	0,1474	6366,02	0,0339
Cycle	-19,001	-0,1584	-4,0656	-0,5867	-1,2612	-0,3356
D1 (Crisis)			5,3336	0,8006	2,6532	0,5640
D2 (Austerity)					-46,391	-0,1961
Expenditure (t-1)	0,181203	0,039185	0,7921***	2,950858	0,8610	0,7885
Debt	0,122345	0,179474	0,0196	0,597108	0,0124	0,0787
Spread (BP)	-	-	-	-	-	-

* Significant at 10%, ** significant at 5%, *** significant at 1%

d) Germany (T=53) – Model (3.15) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	-0,0645	-0,1568	0,0412	0,7991	0,0418	0,7722
Cycle	-45,1802	-0,2612	-13,5475	-0,7188	-10,3245	-0,4097
D1 (Crisis)			20,9202	0,8915	17,4407	0,5800
D2 (Austerity)					-7,7058	-0,2463
Debt	10,6382	0,2362	-1,0646	-0,3794	-1,2193	-0,4231
Spread (%)						

* Significant at 10%, ** significant at 5%, *** significant at 1%

a) Netherlands (T=58) – Model (3.5b) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	8920,234**	2,4064	8214,823**	2,1060	10016,52**	2,0142
Cycle	0,8736***	3,7280	0,8263***	3,2077	1,0664**	2,4495
D1 (Crisis)			0,2043	0,4256	0,2126	0,4094
D2 (Austerity)					-0,7468	-1,6622
Expenditure (t-1)	0,6515***	3,638698	0,6938***	3,454952	0,6081**	2,4771
Debt	0,00792	0,722066	0,0050	0,3669	0,0091	0,5919
Spread (BP)	85,583**	2,1882	92,8537*	1,7377	90,7270	1,4540

* Significant at 10%, ** significant at 5%, *** significant at 1%

b) Netherlands (T=58) – Model (3.15) – Final Consumption Expenditure						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0106	0,9955	0,0102	0,9594	0,0108	1,0048
Cycle	1,4703***	7,4807	1,3554***	5,8212	1,5574***	5,2883
D1 (Crisis)			0,3761	1,0652	0,4874	1,2610
D2 (Austerity)					-0,7721**	-2,4053
Debt	0,5114***	3,3628	0,5628***	3,5353	0,6187***	3,9091
Spread (%)	-0,0406	-0,9061	-0,0412	-0,9051	-0,0468	-1,0362

* Significant at 10%, ** significant at 5%, *** significant at 1%

c) Netherlands (T=58) – Model (3.5b) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	12458,7**	2,5924	12235,94**	2,5925	14619,56**	2,3424
Cycle	0,8786***	3,8015	0,8669***	3,2715	1,1358**	2,5595
D1 (Crisis)			0,0497	0,1075	0,0686	0,1328
D2 (Austerity)					-0,8343*	-1,8149
Expenditure (t-1)	0,6199***	3,68657	0,6293***	3,601661	0,5458**	2,4806
Debt	0,0075	0,748685	0,0069	0,573583	0,0105	0,7891
Spread (BP)	94,292**	2,276761	96,02*	1,84997	94,2200	1,5053

* Significant at 10%, ** significant at 5%, *** significant at 1%

d) Netherlands (T=58) – Model (3.15) – Final Consumption Expenditure + Investments						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0072	0,8421	0,0071	0,8246	0,0077	0,8778
Cycle	1,0785***	6,2024	1,0369***	4,7228	1,2413***	4,6601
D1 (Crisis)			0,1361	0,4432	0,2487	0,7419
D2 (Austerity)					-0,7811***	-2,6701
Debt	0,4963***	4,1555	0,5149***	4,1613	0,5714***	4,7810
Spread (%)	-0,0344	-0,9730	-0,0346	-0,9593	-0,0402	-1,1518

* Significant at 10%, ** significant at 5%, *** significant at 1%

A.8 TSLS estimates for Taxation

Here you can find TSLS estimations for model (3.19) for both PIIGS and core countries by using tax on income – relevant data for Germany and Italy are not available.

Greece (T=53)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0382***	2,9891	0,0356***	2,7321	0,0359***	2,7852
Cycle	0,0500	1,3094	0,1415***	3,2211	0,1415***	3,2237
D1 (Crisis)			-0,1254*	-1,8798	-0,1551**	-2,6181
D2 (Austerity)					0,0490	0,5666
TR/GDP (t-1)	0,2771**	2,1839	0,3209**	2,4679	0,3039**	2,2796
Debt	0,00004	0,7967	0,00004	0,7495	0,00004	0,8353
Spread (%)	0,1337***	2,8649	0,1298**	2,5250	0,1302**	2,6081

* Significant at 10%, ** significant at 5%, *** significant at 1%

Ireland (T=57)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,1947***	7,5934	0,2029***	5,6662	0,1960***	3,5394
Cycle	0,2086	0,6136	0,0895	0,2490	2,0730	0,5313
D1 (Crisis)			0,7224	0,5196	0,6285	0,2509
D2 (Austerity)					-2,3186	-0,5898
TR/GDP (t-1)	-0,4124***	-3,2233	-0,4688**	-2,2867	-0,4457	-1,2785
Debt	-0,0002**	-2,1518	-0,0002*	-1,8458	-0,0002	-1,4667
Spread (%)	0,0026	0,8300	0,0029	0,7115	0,0031	0,4607

* Significant at 10%, ** significant at 5%, *** significant at 1%

Portugal (T=58)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0483***	3,8395	0,0506	4,1382	0,0505	3,9481
Cycle	0,2818	1,2772	0,4771**	2,0299	0,4830**	2,0146
D1 (Crisis)			-0,4468*	-1,9317	-0,5654	-1,5368
D2 (Austerity)					0,1966	0,4857
TR/GDP (t-1)	-0,0152	-0,0600	-0,1030	-0,3989	-0,0939	-0,3572
Debt	0,0003**	2,4555	0,0003**	2,7625	0,0003**	2,7517
Spread (%)	-0,0007	-0,4520	-0,0012	-0,7789	-0,0011	-0,7487

* Significant at 10%, ** significant at 5%, *** significant at 1%

Spain (T=58)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0942***	5,0014	0,0946***	4,8312	0,0943***	4,7302
Cycle	0,1177**	2,1147	0,1775**	2,0714	0,1777**	2,0609
D1 (Crisis)			-0,1297	-1,2160	-0,1600	-1,1892
D2 (Austerity)					0,0645	0,4491
TR/GDP (t-1)	0,0553	0,3744	0,0425	0,2908	0,0487	0,3221
Debt	0,0000	-0,5866	0,0000	-0,4797	0,0000	-0,5491
Spread (%)	0,0023	0,9536	0,0021	0,8693	0,0022	0,9141

* Significant at 10%, ** significant at 5%, *** significant at 1%

Austria (T=58)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,1973***	2,7928	0,1949***	2,7632	0,1839***	2,7571
Cycle	-0,3762	-1,2911	-0,3539	-1,2027	-0,3781	-1,2414
D1 (Crisis)			-0,0492	-0,3832	0,0183	0,1294
D2 (Austerity)					0,2113	1,4751
TR/GDP (t-1)	-0,8589	-1,3798	-0,8365	-1,3514	-0,7413	-1,2620
Debt	0,0002*	1,9799	0,0002*	1,9988	0,0002**	2,0871
Spread (%)	-0,0198	-1,7030	-0,0194	-1,7310	-0,0183	-1,7022

* Significant at 10%, ** significant at 5%, *** significant at 1%

Belgium (T=58)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,1699***	9,0746	0,1690***	8,9605	0,1688***	8,5898
Cycle	0,2776***	4,1792	0,2917***	4,4226	0,2788***	3,5349
D1 (Crisis)			-0,0648	-0,4049	-0,0487	-0,2872
D2 (Austerity)					0,0456	0,5757
TR/GDP (t-1)	-0,3797***	-3,5091	-0,3726***	-3,3766	-0,3657***	-3,3444
Debt	0,0001	3,1416	0,0001	3,0796	0,0001	3,1331
Spread (%)	-0,0022	-0,5350	-0,0021	-0,5026	-0,0017	-0,4030

* Significant at 10%, ** significant at 5%, *** significant at 1%

Finland (T=58)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0598**	2,5964	0,0584**	2,4167	0,0569**	2,2809
Cycle	-0,4494***	-5,8934	-0,4073***	-4,4106	-0,4089***	-4,3655
D1 (Crisis)			-0,0767	-0,6363	-0,0408	-0,2832
D2 (Austerity)					-0,0718	-0,4394
TR/GDP (t-1)	0,5610***	3,7262	0,5665	3,7740	0,5767**	3,7215
Debt	0,0002	1,2744	0,0002	1,3086	0,0002	1,2720
Spread (%)	-0,0189	-0,8365	-0,0194	-0,8323	-0,0194	-0,8371

* Significant at 10%, ** significant at 5%, *** significant at 1%

France (T=58)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0935***	4,0910	0,0935***	3,8922	0,0941***	3,9788
Cycle	0,0118	0,0673	0,0131	0,0654	-0,0378	-0,1589
D1 (Crisis)			-0,0039	-0,0163	0,0502	0,1860
D2 (Austerity)					0,1584	0,8496
TR/GDP (t-1)	-0,1313	-0,4506	-0,1321	-0,4331	-0,1346	-0,4530
Debt	0,00002**	2,2528	0,00002**	2,2084	0,00002**	2,0990
Spread (%)	0,0017	0,2300	0,0017	0,2277	0,0028	0,3416

* Significant at 10%, ** significant at 5%, *** significant at 1%

Netherlands (T=58)						
	Estimation	**t-stat**	**Estimation**	**t-stat**	**Estimation**	**t-stat**
Constant	0,0842***	4,5436	0,0861***	4,8295	0,0679***	3,1603
Cycle	0,1058	1,4954	0,1807***	2,1032	0,3184***	3,5384
D1 (Crisis)			-0,2280	-1,4104	-0,2251	-1,3422
D2 (Austerity)					-0,4358**	-2,0584
TR/GDP (t-1)	-0,1072	-0,9075	-0,1428	-1,2438	0,0417	0,2344
Debt	0,0001	1,6225	0,0001	1,5914	0,0001*	1,8488
Spread (%)	-0,0286	-1,0919	-0,0317	-1,1588	-0,0390	-1,3904

* Significant at 10%, ** significant at 5%, *** significant at 1%

A.8 Data and composition of the sample

Sources of Data:

Data	**Measured as**	**Frequency**	**Source**
GDP (Eurozone)	Volumes, millions of 2010 euros	Quarterly	Eurostat
General Government Final Consumption Expenditure	Volumes, millions of 2010 euros	Quarterly	Eurostat
General Government Consolidated Gross Debt	Current prices, millions of euros	Quarterly	Eurostat
General Government Fixed Capital Expenditure	Volumes, millions of 2010 euros	Quarterly	Eurostat
Interest rates on 10-year government bonds	Percentages	Quarterly (averages)	OECD
Expenditure elasticities	-	-	OECD
Deficit-to-GDP ratio	Percentages	Yearly	AMECO (European Commission)
Primary Deficit-to-GDP ratio	Percentages	Yearly	AMECO (European Commission)
Private debt-to-GDP ratio	Percentages	Yearly	Eurostat
Current Account balance	Percentages	Quarterly	Eurostat

(as % of GDP)			
Exports of goods	Current prices, millions of dollars	Quarterly	IMF (Department of Trade Statistics)
US GDP	Current prices, billions of dollars	Quarterly	IMF
US GDP Deflator	Index	Quarterly	OECD
Turkish GDP	Current Prices, millions of Turkish liras	Quarterly	IMF
Turkish GDP deflator	Index	Quarterly	OECD
Exchange rate USD/EUR	Percentage	Quarterly (averages)	European Central Bank statistics
Exchange rate TRY/EUR	Percentage	Quarterly (averages)	European Central Bank statistics
Net International Investment Positions	Current prices, millions of dollars	Quarterly	IMF
Taxes on Income, receivable	Current prices, millions of euros	Quarterly	Eurostat
Lists of trade partners	Names	-	MIT Observatory of European Complexity

Countries in the Sample:

Peripheral Eurozone countries (PIIGS)	**Core Eurozone countries**
Greece Ireland Italy Portugal Spain	Austria Belgium Finland France Germany Netherlands

Trade Partners for the building of the Shock variable:

Country in the sample	**5 main Trade Partners**
Austria	Germany Hungary Italy Switzerland US
Belgium	France

	Germany Italy Netherlands UK
Finland	Germany Netherlands Sweden UK US
France	Belgium Germany Italy UK US
Germany	France Italy Netherlands UK US
Greece	Bulgaria Cyprus Germany Italy Turkey
Ireland	Belgium France Germany UK US
Italy	France Germany Switzerland UK US
Netherlands	Belgium France Germany Italy UK
Portugal	France Germany Spain UK US
Spain	France Germany Italy Portugal UK

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Sources of Tables and Figures

All the table and the figures in the dissertation have been created by the author. Sources of data used to build each table or figure are specified in the caption below the table or figure itself.

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Dipartimento di Economia e Finanza, Cattedra Macroeconomic Analysis

Eurozone crisis and fiscal procyclicality:

An econometric approach

- Riassunto -

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Abstract

Post-crisis austerity measures gave rise to a huge debate in the economic literature. Some critics claim that these measures prevent countries in crisis, the so-called PIIGS, from implementing efficient countercyclical fiscal policies, which are required for the recovery. The thesis will focus on this aspect: we are going to analyse fiscal cyclicality of the Southern Eurozone countries. Moreover, we are going to check if there is a tendency towards procyclicality after the crisis and after the issuance of the austerity policies; especially in comparison with core countries. We will use the tools of the econometric analysis, relying on the mainstream literature in this field, and we will point out and correct any potential weakness present in the standard methodology.

Resume

Introduction

The recent economic and financial crisis in the Eurozone forced European Institutions to undertake a program of unprecedented reforms with the aim to recover damaged economies and to smooth away situations of imbalances and unsustainability, which almost led some of the Eurozone countries to the edge of default. Considering this second objective as the most important one, a series of austerity measures have been issued. However, these policies received huge criticism both in the economic and political debate (among others: Frankel, 2012, Whelan, 2012, and Krugman, 2013): the major claim was that Member States were no longer able to implement the necessary fiscal stimulus to recover the economy. In addition to this, Vegh and Vuletin (2014) stated that the crisis has created a situation of fiscal procyclicality in the Southern countries of the Eurozone.

Procyclicality means that fiscal policies tend to move in the same direction of GDP over time, namely they are expansionary during booms and contractionary during recessions, contrariwise they are said to be countercyclical (acyclical if they do not react at all to cyclical movements of GDP). According to both Neoclassical and Keynesian schools, procyclicality is an important pathology of the economy, because it can yield negative effect, principally, on both growth and debt sustainability, but also on employment and economic welfare in general.

The aim of this work is to analyse cyclical behaviour of fiscal policy in the Eurozone in order to see if the criticism raised by Vegh and Vuletin (2014) is verified. In particular, we are going to observe how it changes with crisis and austerity and compare these results with previous literature, implementing also a policy discussion about the results observed. If the presence of procyclicality is verified then implications for the Eurozone would be undoubtedly negative.

Literature review

Departing from the results in the past literature about fiscal policies in the Eurozone (principally Fatas and Mihov, 2010, and Vegh and Vuletin, 2014), we are going to set up the empirical analysis relying on the method developed by Gavin and Perotti (1997) – with the use of policy reaction functions. This is the mainstream method, used, among others, in the important works of Gali and Perotti (2003), Strawczynski and Zeira (2007), Jaimovich and Panizza (2007), Fatas and Mihov (2010). An alternative methodology for measuring cyclicality consists of observing country-by-country correlations between cyclical GDP and the fiscal aggregate that is the object of the analysis. This second method has been used by Kaminsky, Reinhart and Vegh (2005) and by Vegh and Vuletin (2014), but it has received an important criticism by Rigobon (2005): in particular, it does not take into account the reverse causality problem, which will be discussed later. More recent approaches, in particular Blanchard and Perotti (1999) and Ilzetzki and Vegh (2008), use Vector Auto-Regressive (VAR) models to perform the same analysis or, as in Aghion and Marinescu (2008), MCMC modelling (Markov-Chain Montecarlo).

1. Macroeconomic implication of fiscal procyclicality

Policy discretion represents the autonomy of the government in designing fiscal policies, with the aim to achieve predetermined political and economic goals, in this case fiscal policies are said to be discretionary. Non-discretionary policies, on the other hand, are called automatic stabilizers, because their role is to adjust fiscal decisions to cyclical contingencies. It is very important that discretionary budget decisions are designed in a way so that they do not exacerbate output fluctuations in the short run, otherwise there would be important negative effects on the overall economy.

As we stated above, fiscal policies are procyclical when they replicate the business cycle, namely if they are expansionary during booms and contractionary during recessions. Contrariwise, they are countercyclical, while if fiscal policies do not react to the cycle at all, they are said to be acyclical. Economic literature generally agrees in considering procyclicality as a pathology of the economic system, for several reasons. There are several ways in which procyclicality may harm the economy. Firstly, Barro (1979) enhances the tax smoothing principle: tax/GDP ratio should be maintained constant through time as much as possible, in order to avoid an excessive tax burden for citizens. To make this possible, temporary negative output fluctuations should be corrected through an expansionary fiscal policy: with an increase in public spending that must be covered by raising further debt. Procyclicality, then, will make tax raising very costly for households. Secondly, Reinhart and Rogoff (2009) point out that procyclicality may create situations of debt unsustainability: procyclical capital flows may prompt public borrowing during booms, but, if inflows dry up during recessions, they may create stressful situations with high public debt and high sovereign risk. In order not to default, government is forced to implement tight fiscal policies during the recession ("*when it rains it pours*" phenomenon, Kaminsky, Rehinart and Vegh, 2005). Thirdly, Fatas and Mihov (2008, 2013) argue that if policies are procyclical they are likely to increase GDP fluctuations in the short term and undermine economic growth on a longer run (especially if fiscal policies are very volatile). Other authors point out that procyclicality may undermine the correct implementation of social insurance mechanisms (Balassone and Kumar, 2007) or that it may prevent countries from recovering the economy after productivity shocks in the short run (Aghion et al., 2009).

Procyclical fiscal policies have typically affected developing markets, but some evidence is observed also for industrial countries. More specifically these countries are usually more procyclical during booms, but they tend to be more countercyclical during recessions. Moreover, procyclicality is driven especially by expenditure (Gavin and Perotti, 1997).

1.1. Likely determinants of fiscal procyclicality

There are several reasons why countries are sometimes procyclical. First of all, they do not possess good economic institutions for economic analyses and cycle forecasting

(Frankel, 2013). This is evident in emerging markets, mostly because they are more prone to exogenous shocks and flawed by unstable political power and their institutions do not possess the same know how in economic forecasting of the industrial economies. Secondly, an excessive political discretion or the lack of benevolence in the government may prompt non-careful fiscal policies: as an example, Frankel, Vegh and Vuletin (2013) find that countries with *good institutions* are more likely to perform countercyclical fiscal policies and that a change in institutional quality may seriously affect how fiscal policy is conducted over the business cycle.

Thirdly, because of the presence of financial constraints: high interest rates or imperfect access to financial markets may prevent them from borrowing during downturns, but also the presence of procyclical capital flows (supra) may play an important role. There is also the claim that some international agreements may act as a financial barrier, such as Eurozone's Stability and Growth Pact. Actually, SGP poses a cap on overall level of deficit and debt that a country may accumulate each year, then, but Gali and Perotti (2003) systematically exclude that SGP is a source of procyclicality.

2. The rise of the austerity

2.1. The crisis

The economic crisis has created a stressful situation for the PIIGS, i.e. the Southern Eurozone countries (Portugal, Ireland, Italy, Greece and Spain). Detractors of the Eurozone claim that such a situation was the result of the Eurozone not being an OCA, however as many authors pointed out the non-careful management of macroeconomic policies at national level in the pre-crisis period, together with the financial turmoil of 2008, generated the sovereign debt crisis.

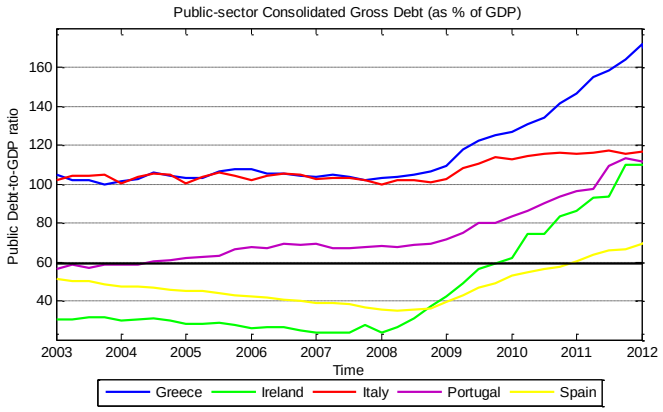

Figure 1: *General government consolidated gross debt expressed as percentage of GDP over time. Quarterly data. The black horizontal line displays the threshold imposed by the TFEU. Source of data: Eurostat database.*

Some countries, in particular Greece and Italy, were characterized by high levels of public debt (Figure 1), because governments underestimated the burden associated with high levels of debt and, despite the recommendations of European Institutions, no important effort has been made in order to reduce the debt exposure in the years before the crisis. Moreover, according to Lane (2012), very low interest rate spreads facilitated borrowing (Figure 2).

Moreover, low interest rates, together with the presence of a single currency, which removed exchange rate related risk and transactional costs, created a situation favourable to credit also for the private sector (Lane 2012). Ireland, Portugal and Spain, in particular, saw an exponential increase of private borrowing in very few years: e.g. Spanish gross private debt was 93.6% of GDP in 1999 and 191.2% of GDP in 2007. This facilitated the insurgence of financial and real estate bubbles (Fernandez-Villaverde et al., 2013).

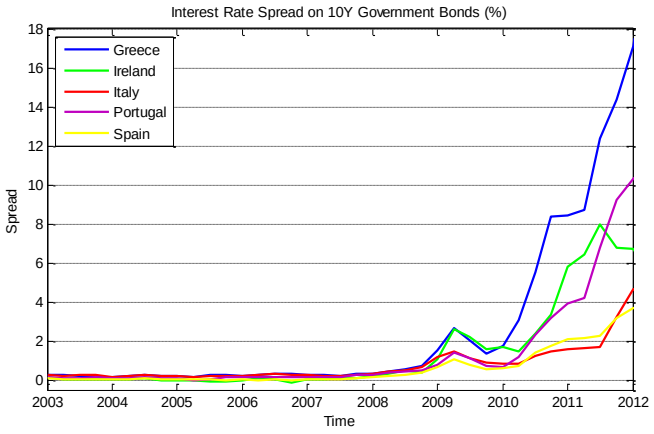

Figure 2: *Interest rate spread between 10-year national government bond and 10-year German government bonds, expressed as percentages. Quarterly averages. Source of data: author's calculations based on OECD database.*

Another structural problem inside the Eurozone was the presence of external imbalances, i.e. the presence of increasing and persistent current account imbalances between the PIIGS and the core countries: the first ones were running very high deficits, the second ones, instead were experiencing high surpluses (Figure 3). In fact, according to Chen et al. (2012), a certain degree of over-optimism in the convergence process, together with the absence of exchange-rate associated risks, fostered trade inflows to peripheral countries.

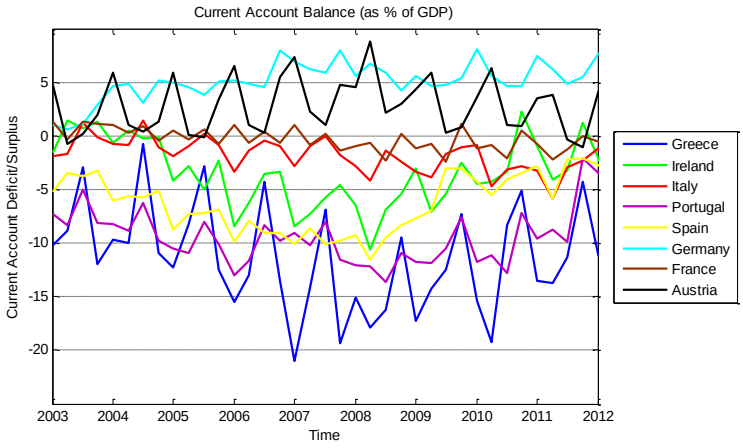

Figure 3: *Current Account Balance as percentage of GDP. Quarterly data. Source: Eurostat database.*

Because of these disequilibria, when the financial crisis broke out, the economies of the PIIGS collapsed. Actually, financial turmoil just triggered the self-destruction

mechanism of real economy, which, in turn, has been built with several years of non-careful fiscal policies and financial disequilibria.

2.2. The austerity

European Institutions planned and undertook a recovery action for Eurozone economies, although giving more importance to fixing the structural rather than solving the recession (which however remained a major goal). For this reason, and with the support of a part of the literature (Reinhart and Rogoff, 2010), a series of austerity measures have been implemented.

First of all, the European Semester has been issued in 2011, with the aim of strengthening the monitoring and of ensuring coordination of national budgetary decisions. This way, fiscal policies would have been more harmonized. Moreover, still in 2011, there has been the *Sixpack*, that is to say, a series of 6 legislation amendments, whose aim was to correct macroeconomic imbalances and reduce deficits. In 2012, Member States of the Eurozone signed the Fiscal Compact, a supranational treaty, whose aim was to reduce overall amount of debt, which in accordance with Reinhart and Rogoff (2010) and Alesina and Ardagna (2010) was a precondition for the restoration of economic growth.

Fiscal compact imposed new and stronger budgetary constraints (with respect to SGP) and established that the budget balance should have been the ultimate goal of fiscal policy and for its relevance it should have been embodied in the national constitutional law. This treaty was subjected to heavy criticism: on the one side authors like Frankel (2012) and Krugman (2013) argued that it could constitute a threat to economic recovery and social welfare, on the other side Fabbrini (2013) criticized the fact that Fiscal Compact was really intrusive in aspects of the economy that have always been national prerogative. In addition to this, Vegh and Vuletin (2014) state that austerity generated procyclicality in the Eurozone, which, in turn, reduced the likelihood of exiting from the crisis in a relatively short time.

3. The methodology for the empirical analysis

The aim of the dissertation at this point is to test if there has been procyclicality in the Eurozone and, in particular, if it has been caused by crisis or austerity measures.

For the purpose of our analysis, we will rely on the following assumptions:

3. Fiscal policy was mostly countercyclical or acyclical in the Eurozone before the crisis, in accordance with what has been stated by Fatas and Mihov (2010) and, partially, by Gali and Perotti (2003).

4. Fiscal policy turned into procyclicality with the economic crisis, especially as a consequence of the new budgetary constraints imposed by the Fiscal Compact.

As it has been stated in the introduction, to test these two hypotheses, we rely on a regression analysis based on policy reaction functions of the form:

$$F_{i,t} = \beta_{i,0} + \beta_{i,1} Y_{i,t}^{C} + u_{i,t} \qquad (1)$$

Where $F_{i,t}$ is the fiscal variable under analysis and $Y_{i,t}^{C}$ is the cyclical component of GDP (usually computed through Hodrick-Prescott filter). An important *caveat* in the empirical analysis is that we cannot use tax and spending policies together, because the estimation of the betas would yield biased result. This is due to the fact that tax revenues can be expressed as a function of aggregate income and this would yield important endogeneity problems. To solve this issue we firstly start by analysing spending and then we move to taxation.

3.1. Analysis of the expenditure

Since we are interested in measuring cyclical behaviour of discretionary policies we need to find a way to distinguish them from automatic stabilizers. To do so, we rely on IMF (2009) and we compute cyclically-adjusted expenditure (CAE), which is a good proxy for discretionary expenditure (this method is used, among others, by Gali and Perotti, 2003):

$$\frac{G_t^d}{G_t} = \left(\frac{Y_t^*}{Y_t}\right)^{\varepsilon} \qquad (2)$$

Where G_t is the expenditure, G_t^d is the CAE, Y_t is real GDP and Y_t^* is Hodrick-Prescott filtered trend GDP (ε is the elasticity of expenditure to output – OECD, 2015). For spending we use two aggregates: general government final consumption expenditure, as the main aggregate, and general government final consumption expenditure plus gross fixed capital formation (which represents investments) for a robustness check.

Our sample of countries is composed by the original Eurozone countries (except for Luxembourg). Using quarterly data, we regress, country by country, the following reaction function for the expenditure, which is based on equation (1):

$$G_{i,t}^d = \beta_{i,0} + \beta_{i,1} Y_{i,t}^C + \gamma_{i,1} d_{i,1} Y_{i,t}^C + \gamma_{i,2} d_{i,2} Y_{i,t}^C + \beta_{i,2} G_{i,t-1}^d + \beta_{i,3} B_{i,t-1} + \beta_{i,4} s_{i,t} + \varepsilon_{i,t} \quad (3)$$

We added in this latter some explanatory variables, in particular: lagged expenditure ($B_{i,t-1}$), lagged debt outstanding ($B_{i,t-1}$)and contemporaneous interest rate spread ($s_{i,t}$) expressed in basis points. Moreover, to observe the impact of crisis and austerity on the cyclical behaviour of policies we used two dummy variables ($d_{i,1}$ and $d_{i,2}$). In our analysis, we considered austerity as beginning in the first quarter of 2012 for every country, because at this time Fiscal Compact has been issued. However, some discretion has been applied to determine the beginning (and the eventual end) of economic crisis. Since previous literature did not furnish enough support, we looked for abnormal negative variations in GDP between 2007 and 2008: more specifically, the beginning of the crisis is the first quarter in which we register this abnormal fall in GDP, the end is when GDP reaches back pre-crisis level (an example is given in Figure 4).

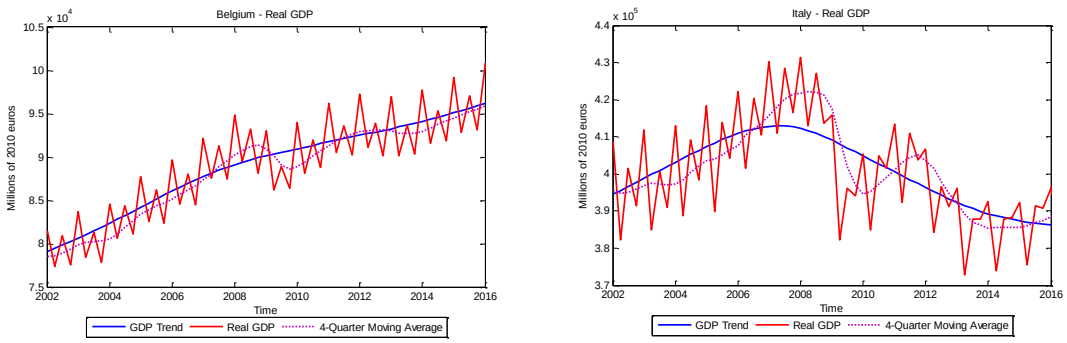

Figure 4: *Real GDP for Belgium and Ireland. Red line represents real GDP, blue line is Hodrick-Prescott filtered trend and dashed line represents simple 4-quarter moving average. Source: Eurostat database.*

Several authors[25] divide variables in model (3) by real GDP, in our analysis we do not do the same, because this correction may be a source of bias. In our specification a negative $\beta_{i,1}$ implies countercyclicality, positive $\beta_{i,1}$ implies procyclicality and a, theoretically, null $\beta_{i,1}$ implies acyclicality. To estimate betas we rely on a TSLS approach: we use Jaimovich and Panizza's (2007) external shock variable to instrument the cycle and we use lagged spread to instrument contemporaneous spread, mimicking what Gali and Perotti (2003) did with cyclical output in their empirical analysis.

At this stage the issue is represented by the interpretation of nonzero coefficients, which are not statistically significant. Fatas and Mihov (2010) argue that we can interpret them either as a sign of acyclicality or as a sign of time-inconsistent countercyclicality (if negative) or procyclicality (if positive). To distinguish the two cases, we need a deeper analysis and to get clearer results we proceed with the analysis of rates of growth (in Jaimovich and Panizza, 2007, this analysis is a substitute for the previous one, under some assumprions). Our new regression model is the following:

$$g_{i,t}^{d} = \alpha_{i,0} + \alpha_{i,1} g_{i,t}^{Y} + \alpha_{i,2} g_{i,t-1}^{B} + \alpha_{i,3} s_{i,t}^{\%} + \omega_{i,t} \tag{4}$$

Where we have rates of growth respectively of CAE, real GDP, debt (lagged) and, in the end, we have interest rate spread (as percentage). We, then, transform model (4) in the following:

$$g_{i,t}^{d} = \alpha_{i,0} + \alpha_{i,1} \hat{g}_{i,t}^{C} + \alpha_{i,2} g_{i,t-1}^{B} + \alpha_{i,3} s_{i,t}^{\%} + \omega_{i,t} \tag{5}$$

In this case $\hat{g}_{i,t}^{C}$ can be expressed as the cyclical contribution to output growth, i.e. how much of the output growth can be explained by cyclical variations. We can obtain it starting from Hodrick and Prescott (1997):

$$Y_t = Y_t^C + Y_t^T \tag{6}$$

Which, after simple calculations can be transformed into:

$$g_t^Y = g_t^C \frac{Y_{t-1}^C}{Y_{t-1}} + g_t^T \frac{Y_{t-1}^T}{Y_{t-1}} \tag{7}$$

With:

[25] Among others: Gali and Perotti (2003) and Fatas and Mihov (2010).

$$\hat{g}_{i,t}^{C} = g_t^{C} \frac{Y_{t-1}^{C}}{Y_{t-1}} \tag{8}$$

The $\alpha_{i,1}$ captures the reaction of expenditure growth to cyclical growth: in our case it is not a direct measure of cyclicality, but if we obtain a positive (negative) non-significant beta in model (3), and a positive (negative) significant alpha in model (5), then we could in principle exclude the presence of acyclicality because we have some evidence that expenditure policy effectively reacts to the cycle, maybe in a time-inconsistent way as for Fatas and Mihov (2010). Also in this case we use dummies to capture the effect of both crisis and austerity.

3.2. Taxation

A broad definition of tax revenues is that they are a simple product between a tax base and a (statutory) tax rate, an income tax would have as a tax base the so-called taxable income, which is a function of total income. This is why including tax revenues in a model like (1) or (3) would yield biased result. Instead, if we assume that taxable income is a linear function of real income, namely GDP minus some deductions, and that these deductions can be expressed as a share of GDP itself (several deductions are income-based), we can eliminate the bias by simply dividing tax revenues by GDP. This way we would have an "average tax rate which takes into account" changes operated by the government on statutory rates and on the share of deductions:

$$\frac{TR_t}{Y_t} = \tau_t(1 - d_t) \tag{9}$$

However, this method has been criticized by Vegh and Vuletin (2014), but there is a lack of alternatives: they propose to consider adjustments in statutory tax rates, but in industrial countries these adjustments do not happen with sufficient frequency. In the end, we run, country by country, the following model:

$$\frac{TR_{i,t}}{Y_{i,t}} = \delta_{i,0} + \delta_{i,1}\hat{g}_{i,t}^{C} + \delta_{i,2}\frac{TR_{i,t-1}}{Y_{i,t-1}} + \delta_{i,3}B_{i,t-1}^{bil} + \delta_{i,4}s_{i,t}^{\%} + u_{i,t} \tag{10}$$

Where $\frac{TR_{i,t}}{Y_{i,t}}$ are tax revenues[26] divided by GDP and $B_{i,t-1}^{bil}$ is nominal debt expressed in billions of euros and $\hat{g}_{i,t}^{C}$ is cyclical contribution to GDP growth. Also in this case, we use dummy variables to distinguish the impact of crisis and austerity. In model (10) the interpretation of $\delta_{i,1}$ is the opposite with respect to model (3): in this case a negative coefficient implies procyclicality and a positive one countercyclicality.

Data sample cover the following period: 2002 Q1 – 2016 Q2, with some exceptions from Ireland, Germany (2002 Q2 – 2016 Q2) and Greece (2003 Q2 – 2016 Q2).

4. Results and policy discussion

In the analysis of expenditure[27] our results seem to contradict the empirical evidence of Fatas and Mihov (2010): in fact, they documented pre-crisis cyclicality of Eurozone's fiscal policies and they documented that spending policies were mainly acyclical or (in some rare cases) countercyclical. In our analysis, we find that for the PIIGS (excluded Ireland) and some core countries (Finland and France) spending is consistently procyclical in the period before the crisis and there is, in almost every case, no change in cyclicality due to crisis or austerity. The difference in the results can be explained by the fact that Fatas and Mihov used a model similar to (3) with variables divided by GDP, therefore their results are likely to be biased. For other core countries we find a slight shift to countercyclicality after the crisis. The results that we observe are confirmed with both expenditure aggregates (consumption and consumption plus investment), an indication that the likelihood that our results are robust is high. For expenditure, our initial hypotheses are both rejected.

For taxation we have the opposite, in fact, we observe consistent countercyclicality before crisis and, for some countries, a significant shift to procyclicality after the crisis: this is for example the case of Greece and Portugal, among the PIIGS, and the Netherlands for core countries. However, since we do not have an alternative tax aggregate with which we can repeat the analysis, we cannot take these results as

[26] Our tax aggregate is composed by taxes on income (both corporate and personal).
[27] We are synthetically referring to the estimation of both models (3) and (5) – this latter in case of non-significance of previous model's coefficients.

completely robust and to give a precise policy conclusion we would need further evidence.

4.1. Effective determinants of procyclicality in the Eurozone

Now we turn our attention to investigate which are the most likely factors that have caused pre-crisis procyclicality in the Eurozone since, as we saw, this is a phenomenon "more ancient" than the crisis itself and then not solely reliable to austerity measures. First of all, we can exclude the lack of good economic institutions: all Eurozone countries can rely on the same European Institutions (such as the Commission or the ECB) to have economic forecasts, so this would not explain why some countries show procyclicality and others do not. For this reason, we focus our attention on financial markets and discretionary power of governments.

In model (3) and (5) we obtained no significant relation between budgetary decisions and interest rate spreads, this is a sign that they may not have had an important effect on spending decisions (instead, for Greece, there is a positive relation between taxation and interest rate spread). Therefore, we analyze the cyclical properties of capital flows to check if they have been procyclical or not:

$$\Delta NIIP_{i,t} = \beta_{i,0} + \beta_{i,1} Y_{i,t}^{C} + u_{i,t} \qquad (11)$$

Where NIIP is the net international investment position (expressed as national total liabilities minus total assets for the ease of computations). By regressing model (11) we find that Portugal and Spain experienced procyclical capital flows, in particular in the period before the crisis and that there is a positive relation between inflows and rises in spending. This confirms the "when it rains it pours" phenomenon documented by Kaminsky, Reinhart and Rogoff (2005).

In addition, we find evidence also of excessive policy discretion. In order to measure excessive discretion, we take innovation term $\varepsilon_{i,t}$ of model (3), which, according to Fatas and Mihov (2013), is a measure of exogenous discretionary policy, i.e. those spending decisions that do not rely on cycle, debt and other macroeconomic dimensions but solely on political reasons. The higher is the volatility of $\varepsilon_{i,t}$, the higher is discretion. In our framework, we find that discretionary power of the government is

higher for the PIIGS than for core countries and for some of them, namely Ireland, Italy and Portugal it is higher in the pre-crisis period than for the post-crisis period (surprisingly, for Greece it is the contrary, despite its fiscal policy, after the crisis it is controlled by the so-called *Troika*).

Conclusions

At the end of our analysis, we can draw the following conclusions. First of all, we noticed that Southern Eurozone economies have experienced a certain degree of spending procyclicality before the crisis, in contrast to the finding of Gali and Perotti (2003) and Fatas and Mihov (2010), moreover, there is little evidence that austerity contributed to modifying cyclical behaviour of these countries: in most of the cases, countries that were procyclical before the crisis remained procyclical also afterwards. Secondly, our results are in line with Gavin and Perotti (1997) that claim that procyclicality is mainly driven by expenditure: pre-crisis tax policy was countercyclical or acyclical in our sample. Finally, we can state that the most likely causes of procyclicality have been procyclical capital flows (Spain, Portugal) and excessive policy discretion (Greece, Italy and Portugal).

Taking all of this into account, we cannot exclude that pre-crisis procyclicality has had a major role in triggering the economic distress: excessively relaxed pre-crisis policies have certainly generated imbalances. Moreover, although austerity did not have a role in increasing the already evident procyclicality in Southern Eurozone, it could have had the bad effect of obstructing effective countercyclical fiscal policy not by worsening their fiscal situation, but because it prevented countries from changing it.