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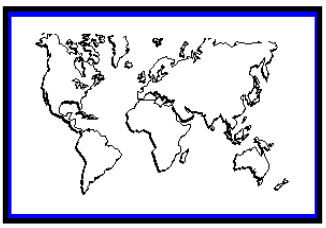

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Fiscal fatigue and debt sustainability: Empirical evidence from the Eurozone 1980-2013

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Abstract

Fiscal fatigue may lead a country to stop adjusting when debt continues rising in spite of a prolonged fiscal adjustment. Once fiscal fatigue sets in, the country may stop adjusting, thus compromising debt sustainability. However, the absence of sufficient adjustment may be the consequence of governments implementing delayed adjustment as a result of the domestic policy-making process. This paper investigates the factors that will lead to delayed adjustment instead of fiscal fatigue in the face of rising debt. Strong institutions and underlying macroeconomic conditions can be useful in averting the fiscal fatigue, and lead to an improvement in the fiscal balance once the debt limit has been reached.

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1. Introduction

The sharp rise in debt and long fiscal consolidation process in Eurozone countries has led some authors to believe that fiscal fatigue could occur, such that at some point the primary balance stops adjusting after a certain level of debt, as countries are no longer willing to continue improving their primary balances in response to rising debt.

Generally, one can think the relationship between the level of debt and fiscal adjustment process goes through three phases. In the first phase, when debt is low, sovereigns may not adjust because increases in debt are considered irrelevant at those levels. Secondly, once rising debt reaches a certain size, so that for instance markets start reacting to it, sovereigns will start a fiscal consolidation process. The fiscal fatigue introduces the third phase of fiscal adjustment: when debt is so high for a long period of time, the required adjustment is large and the sovereign decides to stop adjusting.

This concept is related to the fiscal limit in the sense of Leeper (2013), by which governments when debt reaches a certain level, no longer adjust. This can be either because markets do not deem further adjustment credible or, because the economic situation is so deteriorated that further cuts are not revenue-generating. Ghosh *et al*. (2013) focus on the former phenomenon, and calculate the level of debt at which markets would stop financing the government, as debt would become unsustainable.

This paper tries to contribute by shedding light on what may halt fiscal consolidation efforts. According to the narrative above, once a country reached the debt limit, the other circumstances do not matter, and the government stops adjusting the primary balance, regardless of whether it is growing or not or the institutional circumstances at that point. These factors, which they control for, may change the debt limit in their setting, but they will not affect the policy reaction once the debt limit is reached.

Our contribution lies in testing whether the result holds if circumstances vary. In other words, reaching the debt limit may not entail the end of fiscal adjustment if at that point the economy is growing or if the institutional makeup that determines fiscal policy improves

We enhance the fiscal reaction function, taking into account a wide set of factors that may bias the original result. The first issue we tackle are non linearities in the effect of the output gap on the primary balance. These non linearities arise for different reasons: for instance, it may be due to the fact that cutting spending in a downturn can be particularly damaging to the economy. Also, the asymmetry may stem from a government´s myopia, which leads to the fiscal balance not being neutral over the cycle.

Finally, the asymmetry could be due to the fact that agents change their behavior at different points in the cycle. For instance, they may increase the proportion of expenditure allocated to basic goods in the downturn. To the extent that these

goods are less heavily taxed than regular goods, the result could be a more procyclical fiscal balance. Also, tax compliance has a cyclical component (Sancak, 2010): in a downturn, there may be more incentives to evade taxes than in an upturn, when the marginal cost in terms of welfare of paying taxes may be lower.

We consider how institutional issues may alter the fiscal fatigue result. We analyze the evidences regarding political cycles. In particular, we focus on whether the delayed fiscal adjustment (Alesina et al, 1989) can affect the fiscal fatigue result: governments that are strong enough to carry out a fiscal adjustment may only be willing to do it when they do not have any other option, as in general they want to avoid restrictive fiscal policies that may be electorally costly. In other words, reaching the debt limit may lead to fiscal adjustment if the government has enough backing to implement it at that point.

Our main result is that growth and institutional factors play a key role in determining whether a government reacts to debt. We do find some evidence that there is fiscal fatigue, in the sense that the higher the level of debt, at the margin, fiscal adjustment will be lower. However, this can be mitigated if the economy is growing and if the government has support and does not have to worry about elections when the debt limit is reached.

Our sample of countries is the Eurozone as a whole. However, from a policy perspective, currently, it is clear that the fiscal fatigue results are important for countries with high debt and that have gone through large fiscal adjustments. In order to check the impact of our results on debt sustainability, we will run an exercise in which we create different debt forecasts for the Eurozone periphery. In these scenarios, we assume that the fiscal balance follows the enhanced fiscal reaction function we introduce in the paper, and we compare those results with a baseline, composed of forecast from the International Monetary Fund World Economic Outlook as of end 2014. This exercise will illustrate the importance of strong growth for debt sustainability.

The rest of the paper is organized as follows. Section 2 reviews the relevant literature. Section 3 introduces the data and the model we use, while the Section 4 analyzes the results. Section 5 shows the impact of the enhanced fiscal reaction function on debt sustainability. Finally, Section 6 offers some concluding remarks.

2. Literature Review

There are several strands of the literature that are relevant to this paper. First of all, the fiscal reaction function literature which usually models the primary balance as a function of growth, particularly of the output gap, while also controlling for inflation

The idea of Bohn's (1998) approach rests on the analysis of how the primary fiscal balance (i.e. fiscal balance excluding the interest payments on public debt) reacts to sovereign debt. He considers fiscal policy is sustainable once the government reacts systematically to a change in public debt by adjusting the primary fiscal balance: if a fiscal policy is considered sustainable prior to a certain

economic shock, the absence of any systematic policy reaction to this shock would cause the additionally issued debt to be uncovered by future surpluses, thus violating the no-Ponzi condition. Therefore, the government has to react systematically to the extended debt-to-Gross Domestic Product (GDP) ratio by increasing the primary surplus-to-GDP ratio, in order to maintain fiscal sustainability.

Bohn (1998) finds significant response coefficients for the period 1916 – 1995 as well as for the period 1793 – 2003 and thus concludes that U.S. fiscal policy has been in line with sustainability for these particular periods. Similarly, Semmler *et al.* (2007) investigate whether several Euro Area countries (Germany, France, Italy and Portugal) have restored their fiscal imbalance by appropriately adjusting their fiscal policy. Applying Bohn's approach on annual fiscal data over the period 1960-2003 they find positive and robust response coefficients, thus concluding that fiscal policy in these European countries follows a sustainable path.

Sustainability in the hard sense would require perfect knowledge of sovereign debt across different states of nature (Bohn, 1995).Therefore when testing sustainability with fiscal reaction functions, we define it as a policy which responds to surges in sovereign debt with increases in primary balance.

An essential contribution in the literature on fiscal fatigue has been Ghosh et al. (2013), who consider that fiscal fatigue appears when debt reaches a certain level, and so elaborate the concept of debt limit: a level of debt that marks when governments stop adjusting. They find evidence of fiscal fatigue in highly indebted countries in the past few years in the Eurozone.

Fatas and Mihov (2010)find no evidence of fiscal fatigue in the Eurozone, as measured by the impact of debt on the fiscal balance. However, they do not consider the crisis period.

In these papers, the output gap tends to affect the primary balance linearly. However, some of the literature has found that the reaction of the primary fiscal balance to the cycle does not behave this way. Sancak et al. (2010) shows that tax evasion is countercyclical and that consumer habits tend to change in downturns, so that their consumption of primary goods, which tend to be taxed at a lower rate, is greater. Also, the mere progressivity of the tax code can lead tax revenue to decline more than proportionally in downturns.

Secondly, when prices decline, households have an incentive to save more, while business can postpone investment decisions. As a result, one would expect, ceteris paribus, that a decline in inflation would have a negative impact on the fiscal balance, not just through the nominal growth channel described earlier, but also because deflation will lead to an increase in savings, which tend to be taxed at a lower rate than consumption Sancak (2010).

A large literature has analyzed the impact of institutions on the primary balance.

Note that the impact of the institutional independence variables on the primary balance is not a given. Some studies find that it tends to worsen the primary

balance, as shown by Eslava (2006). A strong judiciary may strike down certain spending cuts, or may pander more to pressure groups, that have the resources to appeal to them, unlike the median voter. However, the bureaucracy theory (Litan et al, 1983) suggests that governments that have the possibility of increasing spending discretionarily will use it. Our model will shed light on which effect dominates in the Eurozone.

Alesina and Drazen (1989) ´s war of attrition model shows why a government may implement delayed fiscal adjustment. In this literature there is little evidence that a strong government is more willing to undertake a fiscal adjustment.

However, they do find evidence that adjustments are more likely to occur in times of crisis, when new governments step into office, or when they are strong, in the sense that they are unified or have a large majority.

They think these facts are explained by their war-of-attrition model, which concludes that stabilizations are more likely to happen in crisis periods with a strong government. In their setting, delays in the stabilization emerge from diverging political preferences between two groups of voters. The groups have different views on how to allocate the cost of the stabilization; in particular, each group would like the other to pay for the bulk of the fiscal adjustment.

In their model, each group can veto the adjustment and is uncertain about the impact of the fiscal adjustment on the other group: they know the cost of waiting for stabilization in their own welfare function but they do not know the cost for the other group. As time passes, the less patient group will reveal their preferences and prefer an adjustment even if it has to bear part of the cost.

The game ends when the marginal benefit of waiting becomes lower than the marginal cost, and this will occur sooner for the group with the higher cost of waiting. So, in the end, the group that suffers more from the delay will concede. The result is delayed stabilization, which is costly for society as a whole, but is the result of the game described.

In terms of the effect of institutions, a key debate has been on rules vs institutions, some papers (Fatas and Milhov, 2010) have considered that rules are less important than institutions. The drawback of rules are that they tend to oversimplify, as a fiscal adjustment depends on a number of variables, and they are difficult to enforce. In contrast, appropriate institutions can have a positive impact, if they manage to affect the source of biases in fiscal policy: to the extent that institutions lead to a fiscal policy that is more aligned with the general interests and less prone for instance to be captured by interest groups, it will have a positive impact on the fiscal balance.

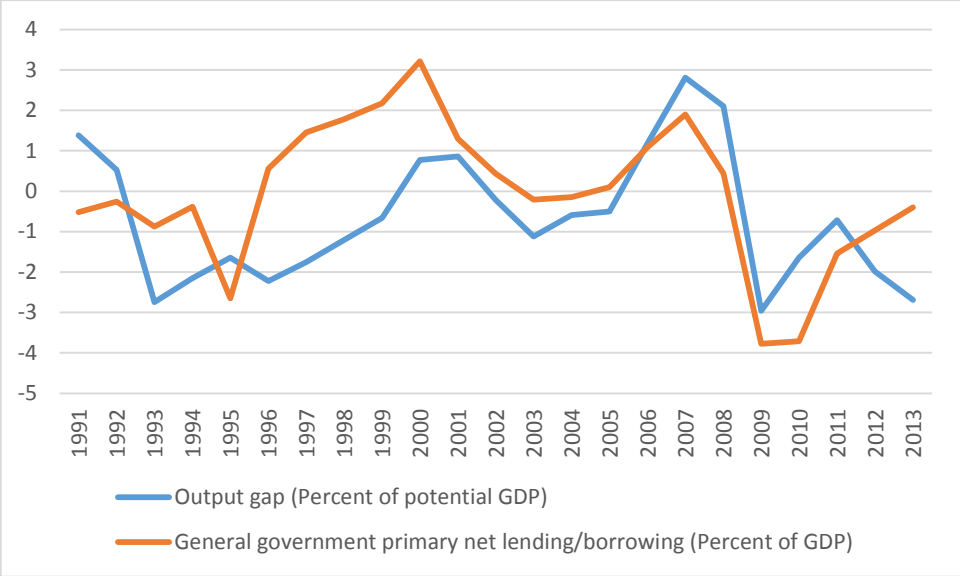
Overall the literature tends to find that first, fiscal policy is procyclical in downturns. Secondly, that procyclical nature may depend on the debt level: for high debt levels, fiscal policy tends to be procyclical, while it is countercyclical for low debt levels.

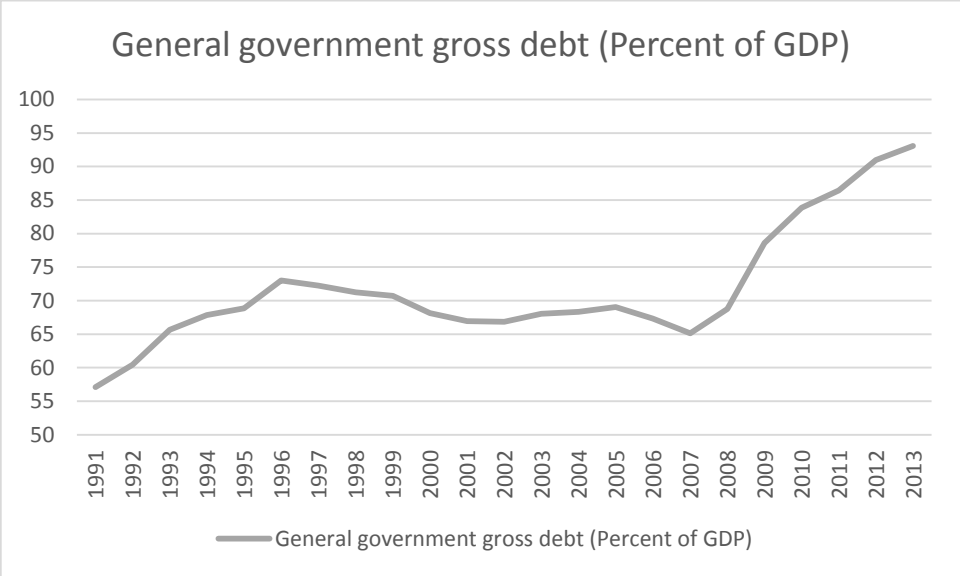
3. Data and Empirical Model

3.1 Data

Our model will use annual data, for the period 1980-2013 for the Eurozone member countries. The key macroeconomic variables: output gap, debt to GDP ratio and the primary balance are taken from the IMF World Economic Outlook (WEO) database. As chart 1 below show for the Eurozone as a whole, the recent period stands out as a time or large negative output gap and increasing government debt, in spite of the improvement in the primary balance.

Chart 1: Eurozone (1991-2013). Output gap, primary balance and Government debt (% of GDP).





Secondly, we use the support a government has as an explanatory variable. The variable is measured as the percentage of members of Parliament that have voted for a government in a given date. The literature tends to show a positive relationship between the primary balance and the degree of support for a government, which is explained by two aspects: first, the fact that governments

with broad support may be able to afford being more farsighted, and, secondly, governments that have broad support do not need to please a wide variety of pressure groups through a giveaways (Roubini and Sachs, 1989).

According to the political cycle theories (Alesina Et al, 1997 or Goeminne and Smolders 2014), governments tend to increase spending ahead of elections. The variable we use will be the number of government changes in a given year. This indicator will enter the equation with a lead, to capture the forward looking effect described by the literature. This is taken from the comparative political data sets of Bern University.

We also consider the impact on the type of government ruling the country. In particular, we distinguish whether the governing party has a large stable majority or not. The results refer to the existence of a multiparty minority government, which, in the classification we use, the weakest type of government.

3.2 Model specification

In the fiscal reaction function, the primary balance is a function of the previous level of debt, and then a series of controls such as the output gap and inflation and institutional variables as controls. Implicitly, the fiscal fatigue literature considers that the primary balance reacts linearly to changes in growth.

The equation to be estimated is the following:

$$y_{i,t} = \beta_0 + \beta_1 d_{i,t-1} + \beta_2 og_{i,t} + \beta_3 \pi_{i,t} + \beta_4 ins_{i,t} + \varepsilon_{i,t} \qquad (1)$$

where *y* denotes the primary balance, *d* is the debt-GDP ratio, *og* is the output gap (measured as the difference between actual and potential GDP[1]), π is inflation is measured as the rate of change in the consumer price index and *ins* represents the institutional variables.

As can be see, we start from the classic fiscal reaction function. This is estimated as a panel of current Eurozone countries, using annual data for the period 1980-2013.

Regarding the possible endogeneity of the primary balance, it is corrected by the introduction of an autoregressive (AR) term as a regressor, and using the lagged debt. One of the issues that must be considered is that debt depends on past values of the primary balance. As can be seen in table 1, which shows the autocorrelation function of the residual, we do have reason to believe that there is autocorrelation. As a result, we model the error term as an AR(1) process, which corrects for the autocorrelation, and so endogeneity that arises from the persistence in the error term, which arises even though debt is in lagged.This is useful, as it corrects from the fact that some of the error of the regressions is reflecting what is not captured of the effect of the primary balance on debt, so

[1] Potential GDP is estimated using the IMF WEO method, which draws upon several approaches and judgment by country desk officers. However, the institution checks that the methodology is robust and consistent across countries (De Masi, 1997).

past errors could affect present primary balance (we introduce the debt variable with a lag of one period). We introduce the AR term to control for the persistence in past errors that could be reflecting endogeneity.

Table 1. Residuals. Autocorrelation and Partial correlation

Lags	Autocorrelation	Partial Autocorrelation
1	0.668	0.668
2	0.407	-0.070
3	0.184	-0.108

An endogeneity issue arises from the fact that specific country characteristics may be captured by the impact of debt on the primary balance. These countries have heterogeneous institutional makeups, social welfare systems and tax systems, as result, a given rise in debt may not have the same effect in a country as in another. While some of this may be captured by our institutional controls, we introduce fixed effects in the regression. This is supported by the Hausman test results.

Finally, in order to check for endogeneity, and as a robustness check, we employ the methodology developed by Arellano and Bover (1997), which uses orthogonal deviations and tends to give more robust results that the original estimation method proposed by Arellano and Bond (1991). Note that the coefficients are similar to those obtained in the other regressions.

We explore the impact of growth and the impact of the cyclical position: just like downturns will impact revenues more than proportionally, recoveries should be more revenue intensive, as they capture the effect of consumer changing their habits back to normal.

As for the dilemma about using the growth rate or the output gap, we use both, although we expect the former to be the more important one. Recall that the output gap is the pure measure of cyclicality, while the growth rate is the one probably most relevant and most observed by policymakers.

Secondly, our main contribution regards the correct specification of growth in the fiscal reaction function. This accounts for the exponential effect that growth can have on the primary balance according to the literature on fiscal revenues. Since we consider it in quadratic form and we want to explore non-linearities, the standard fiscal reaction function is no longer valid, as we cannot just control for inflation linearly, to the extent that the exponential impact of nominal growth could be related to either the price or the growth factor. In particular, we explore whether it is output growth or inflation that generate the particular primary balance dynamics.

We run the regression using the output gap separating when it is positive and negative equation. This piecewise approach implemented in the literature by Egert (2010) is an alternative way of correcting for the non linearities in the response of the fiscal balance to changes in the cycle.

From the first regressions we will replicate the fiscal fatigue literature and calculate the debt limit, i.e. the debt level at which the government stops adjusting. At that point, we will interact the debt limit with a series of variables to analyze whether the state once you reach the debt limit is significant: variables that may or may not play a role in the whole period may be significant when interacted with the debt limit.

3.3. Empirical results

Table 2 reports the estimated coefficients and the associated p-values obtained from a fixed effects panel regression of the variables on the primary balance, for the current Eurozone countries in the period 1980-2013.

Table 2.A. Regression results

	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
OUTGAP	0.31	0.00	0.35	0.00		
OUTGAP^2			-0.05	0.00		
OGNEG					0.78	0.00
OGPOSITIVE					-0.07	0.61
GOVGROSSDEBT(-1)	-0.14	0.04	-0.18	0.01	-0.12	0.04
GOVGROSSDEBT(-1)^2	0.00	0.04	0.00	0.01	0.00	0.04
GOVGROSSDEBT(-1)^3	-0.20	0.05	0.00	0.11	0.00	0.15
GOV_SUP	0.03	0.23	0.03	0.18	0.02	0.29
GOVCHAN	-0.54	0.09	-0.47	0.13	-0.73	0.02
C	0.16	0.93	0.40	0.84	1.39	0.44
R^2	0.69		0.70		0.70	
number of countries	12.00		12.00		12.00	
observations	296.00		296.00		296.00	
AR(1) coefficient	0.80		0.80		0.80	
DW	2.08		1.99		1.98	

Table 2. B. Regressions results

Variable	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.	Arellano Bover	Prob.
OUTGAP	0,35	0,00	0,53	0,00	0,34	0,00	0,35	0,00	0,14	0,07	0,32	0,00
OUTGAP^2	-0,05	0,00	-0,06	0,00	-0,05	0,00	-0,04	0,00	-0,07	0,00	-0,10	0,00
GOVGROSSDEBT(-1)	-0,06	0,02	-0,06	0,02	-0,08	0,00	-0,06	0,03	-0,23	0,00	-0,13	0,00
GOVGROSSDEBT(-1)^2	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
DEBTLIM	-0,04	0,00	-0,06	0,00	-0,05	0,00	-0,04	0,00	-0,03	0,01	-0,07	0,00
DEBTLIM*OGNEG			-0,40	0,00								
DEBTLIM*RGROWTH					0,06	0,00						
DEBTLIM*GOVCHAN(1)							-0,08	0,06				
MULTIMIN*DEBTLIM									-0,06	0,02		
GOVCHAN(1)	0,50	0,11	-0,52	0,08	-0,38	0,20	-0,78	0,01	-0,81	0,01	2,47	0,27
C	0,83	0,39	0,85	0,37	1,22	0,19	0,87	0,38	3,89	0,00		
inflation	0,18	0,30	0,18	0,30	0,18	0,30	0,18	0,30				
R^2	0,72		0,73		0,73		0,73		0,73			
number of countries	15		15		15		15		15			
observations	324		324		324		324		324			
AR(1) coefficient	0,75		0,76		0,76		0,76		0,76			
DW	2,03		2,02		2,00		2,05		2,05			
Prob (F-statistic)	0,00		0,00		0,00		0,00		0,00			

Note: Prob. Denotes the p-value of the corresponding coefficient. The primary balance is the dependent variable in all cases.

Our regression analysis, overall, shows that the relationship between the fiscal balance and debt is not as clear cut as the traditional fiscal fatigue result shows. In particular we present evidence that, first, there are non linearities on the impact of the cycle on the primary balance (Lee et al., 1993), and, secondly, institutional aspects can have a significant impact. Furthermore, the debt limit result can be altered if, when a sovereign reaches that point, it is growing or it has enough political strength to act.

Regarding the reaction of the fiscal balance to the cycle, when using a piecewise explanatory variable, it turns out that the elasticity of the primary balance to the cycle is entirely driven by the observations with a negative output gap. When the output gap is positive, it does not have a significant impact on the primary balance.

This result is consistent with the asymmetric adjustment in the primary balance in the literature and suggests that standard fiscal reaction functions will underestimate the impact that recessions have in the primary balance: by not separating the output gap into a positive and negative component, the resulting elasticity may be capturing some of the lack of impact from the positive output gap.

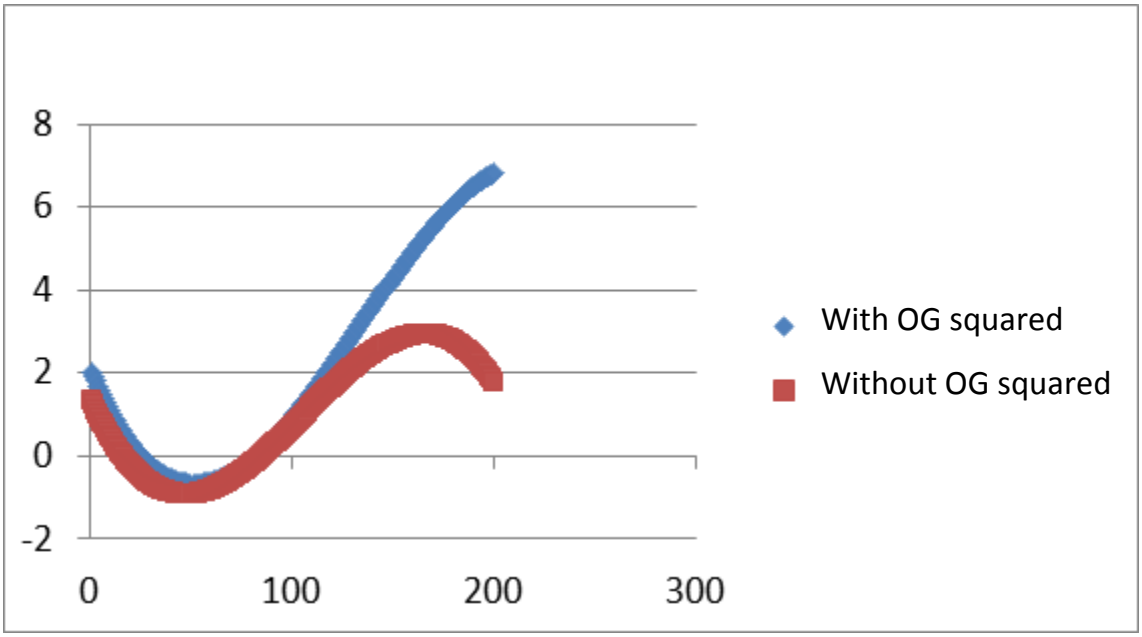
Similarly, the significance of the squared output gap term is evidence then that the primary balance will deteriorate more than expected when in recession. In addition, a subject of interest, particularly at this point in the Eurozone, is the reaction of the primary balance in recoveries. As we show by the interaction of growth and a negative output gap (which we capture by the interaction term of negative output gap, a variable that the takes the value of the output gap when it

is negative and 0 when it is positive, with positive nominal growth), the improvement in the fiscal balance is even greater, a sign that the elasticity of the fiscal balance increases in recoveries. This could be because countries tighten policy in the downturn (procyclical fiscal policy, in line with the results in Alesina, 2008) and then don´t loosen when they are growing again, but rather wait until the output gap is positive. So as we overestimate the primary balance in the downturn, we are likely to underestimate the primary balance in a recovery.

Further, in this case the coefficient on the cubed debt becomes insignificant or very low, so that it only becomes relevant when growth is not taken into account (chart 2). As charts below show, when we take account of these non linearities, the fiscal fatigue result disappears. This result suggests that the classic fiscal fatigue result is due to not accounting well for the impact of growth in the fiscal balance, so that the fatigue result may be more likely the case of the sharp recessions.

Our results point to a larger sensitivity of the primary balance to growth in certain conditions, such as a recession, or when inflation is negative. What this means is that the primary balance can be expected to be more procyclical.

Chart 2: Primary balance as a function of the level of debt to GDP (%)



Note that we do not distinguish explicitly the orientation of fiscal policy and automatic stabilizers (although the latter may be proxied by the reaction of the fiscal balance to the output gap). As a result, the impact on growth may refer from the consumption habits discussed above, but also from the fact that in recessions, fiscal multipliers tend to be higher, so that a government that wants to stabilize output would do well to post higher deficits. This would be the way of stabilizing output.

A key question remains whether once the supposed debt limit is reached, institutional and growth aspects can help a country avert the fiscal fatigue result.

In order to test this, we use interaction terms, to test whether aside from their whole sample effects, when at the debt limit, the effect is negative.

First, as can be expected, the debt limit itself has a negative effect on the primary balance. However, importantly, when the debt limit is interacted with institutional strength or growth, we find that this mitigates the debt limit effect. Finally, when the debt limit is coupled with a negative output gap, the impact on the primary balance is even more negative. Note that this is even true for some variables like government support, which are not significant determinants in the whole sample, but when coupled with the debt limit, they are significant.

We now test whether fiscal adjustment speeds up after a certain point, and then, whether it slows down after debt reaches its tipping point. This is the path of fiscal adjustment assuggested by the cubed form of debt in the fiscal reaction function In order to do this, we first calculate, from our canonical equation, the low point and high point of debt to fiscal adjustment for each country, taking on board the country fixed effects. Secondly, we calculate the debt limit. Single party majority: does not have an impact on the fiscal balance, but does make the reaction to the debt limit stronger.

A key takeaway from our results is that the debt limit can be avoided through other factors, growth being a prominent counterbalance to rising debt, or an improvement in the political situation. As a result, estimates for debt sustainability in the long term could be wrong if they do no model adequately the impact of these variables on growth.

4. Consequences for debt sustainability

Our results suggest that in recoveries, growth will be more revenue-enhancing than in normal times. One important point is that this may offset the effect from fiscal fatigue in countries where debt has risen after a downturn but are now recovering.

Since growth plays such a fundamental role in the determination of the primary balance, low growth may lead to unsustainable dynamics because the fiscal adjustment may not be enough to compensate the lack of nominal growth. Therefore, the debt limit is more related to growth than to the level of debt.

We incorporate these effects into a debt sustainability analysis. This can be interesting because the results will be different depending on which are the drivers of the debt sustainability dynamics: those countries that are growing well, and escape deflation, can be expected to have more positive dynamics than those that are not growing as much but have for instance a lower interest rate burden.

We input the results from the fiscal reaction function into our debt sustainability equation. We use IMF forecast for growth, while interest rate forecasts are determined endogenously. In particular, the risk premium over the risk free rate

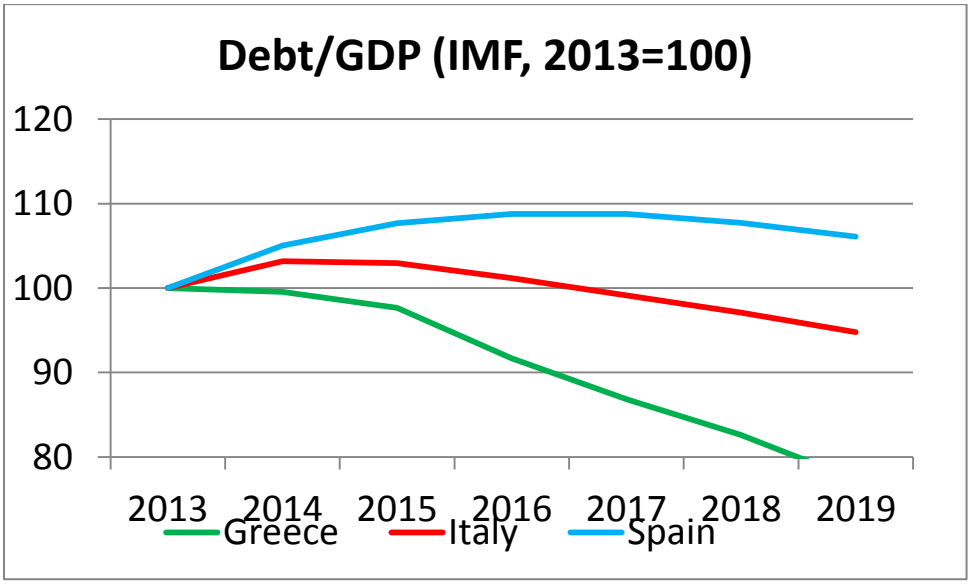
is equal to the probability that debt will not stabilize in the time horizon (i.e., to 2019).

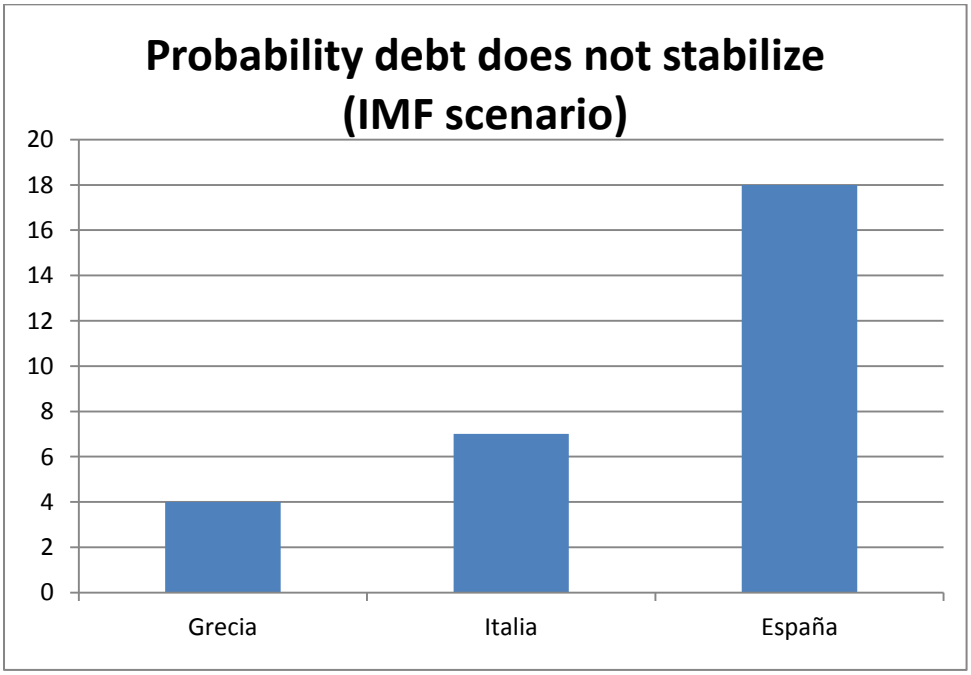
We run the stochastic process: we calculate shocks to our baseline scenario based on the probability distribution of the shocks that took place in the past. The distribution is based on a normal distribution, with mean the mean of the variable in the past, the variance the historical variance, and the covariance between all three determinants. As a result, we obtain different paths for debt and a probability associated to each of these paths. The risk premium is determined by these paths and in particular the probability that debt will follow a path in which it does not stabilize by 2019.

We illustrate this exercise for Spain, Italy and Greece. We consider that the comparison will allow us to understand the effects we are showing with respect to a baseline, which we consider to be the IMF´s debt scenario.

As shown in the charts 3 - 6, the debt dynamics for Spain and Italy are similar in the baseline scenario. This is due, however, to the different drivers of the debt path. While in Spain, growth will be favorable and provide a key source to reduce the debt ratio, its high primary deficit is the main driver of debt. In Italy, the key driver of better dynamics is the primary balance, while growth is expected to remain slow going forward, according to the IMF forecasts. Finally, the debt forecasts for Greece are extremely favorable, owing to the expected high growth and primary balances, combined with a low interest burden (relative to the size of its debt). The result is that in the baseline IMF scenario, debt declines substantially.

Chart 3: Debt dynamics in the baseline IMF scenario





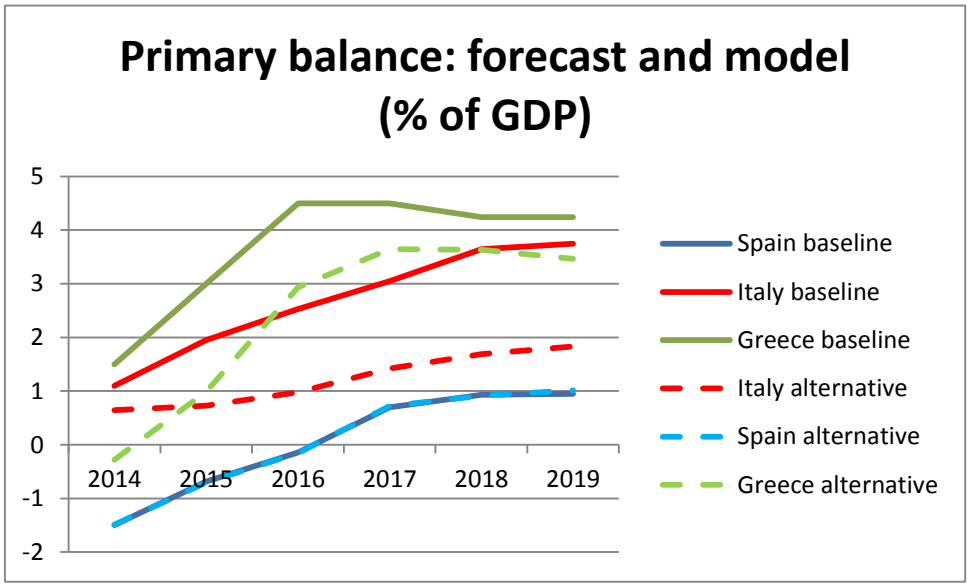
As can be seen in charts 4-6, the endogeneisation of the interest rate is particularly problematic for Greece. Given that a large share of its debt is in official hands and has been restructured, its interest rate burden is lower than would be suggested by the probability of not stabilizing debt. Note that to the extent that most of Greece´s debt is in official hands, this can be thought of as a counterfactual: what Greece´s cost of funding would be in this benevolent macroeconomic scenario, if it financed its debt at market conditions.

When these considerations are added to our debt equation, this points to a better behavior of Spain relative to the other countries, and , of course, a worse behavior

of Greece, which is in part due to a worse primary balance than expected in the baseline WEO scenario.

While in Spain vs Italy the relative difference reflects the importance of growth, this does not apply to Greece, which according to the WEO October 2014 forecasts was expected to growth the most. However, still, our fiscal reaction function leads to a lower primary balance that expected and the probability of default to a higher interest rate burden. These effects worsen the debt dynamics in Greece, although the favorable growth forecasts mean that it is still the country where debt declines the most (although the large variance of the distribution of shocks means that the probability of debt stabilization in lower than for instance in Span, even if the point forecast is better).

Chart 4: GDP Growth forecasts in the IMF scenario (%) and primary balance Model and IMF forecast, as a % of GDP)



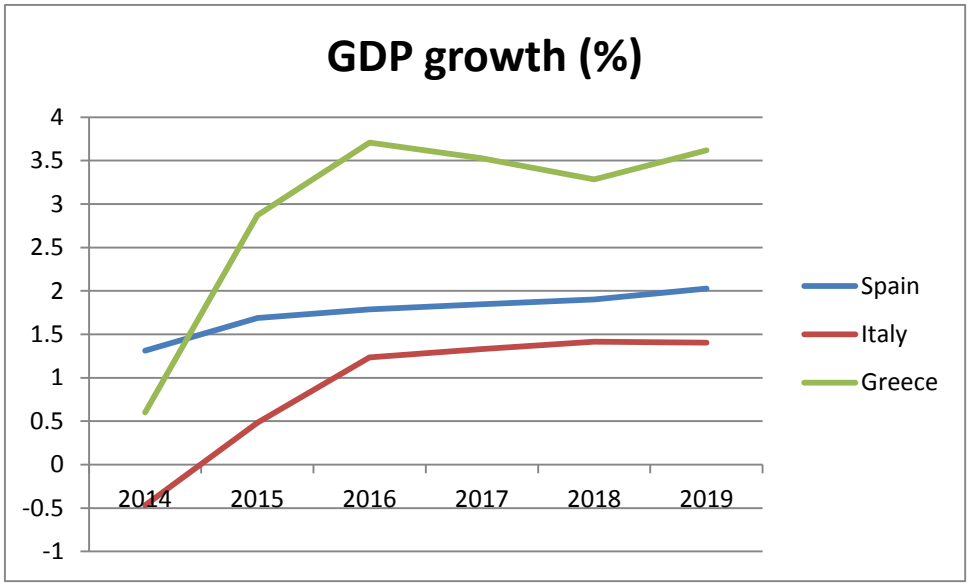


Chart 5: Probability of no debt stabilization by 2019 (%)

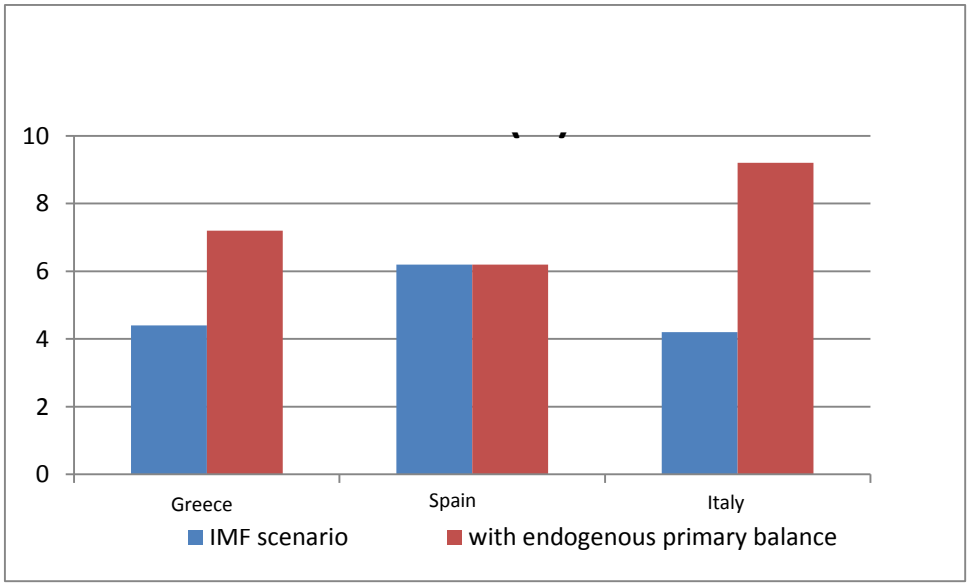


Chart 6: difference between debt stabilization and the effective interest rate

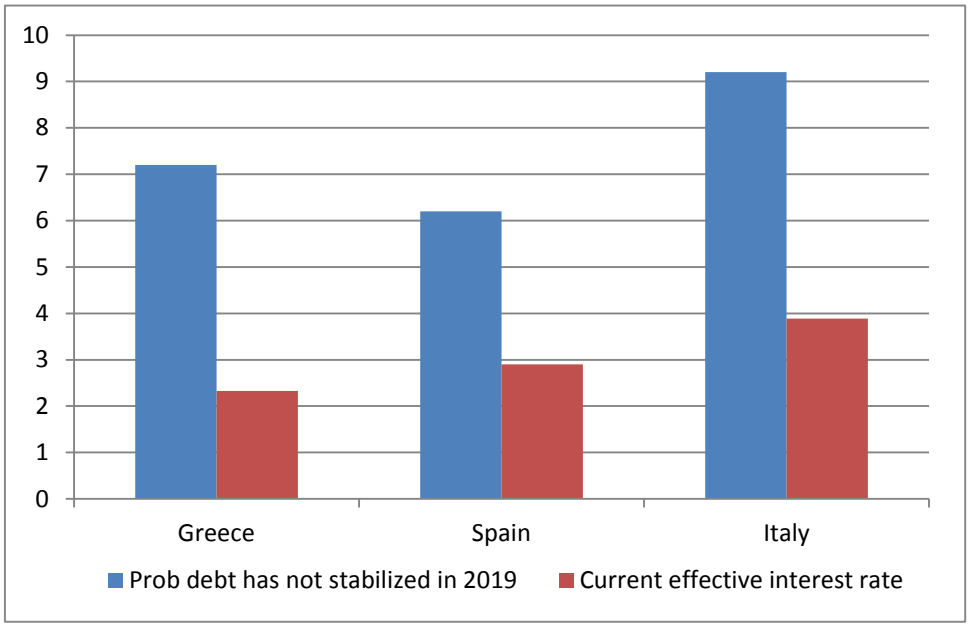
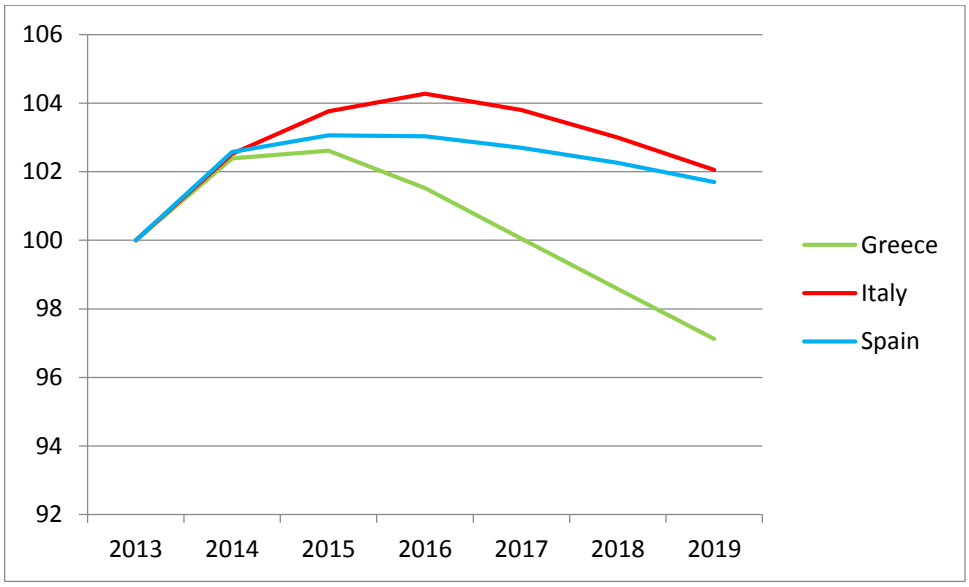


Chart 7: Debt/GDP ratios



5. Concluding remarks

The previous section has analyzed the determinants of the primary balance, and the impact of taking these determinants into account when analyzing debt sustainability. A key result from the previous section is the role that growth plays in determining the fiscal balance, both in a downturn and in a recovery. Taking this into accounts can be essential when forecasting debt dynamics: a low growth economy is more likely to stop adjusting than an economy which, in spite of rising debt, is growing.

Secondly, and relatedly, downturns will be more damaging to debt sustainability that would be suggested by a linear relationship. As has been shown above, growth has an exponential impact on the primary balance. Therefore, recessions could have a severe impact on debt dynamics.

Also, our results show that institutions, and inflation, play an important role. In general, our results hold policy lessons for both downturns and good times.

First, when output is growing above potential, governments would do well to have larger surpluses, as the primary balance is likely to overshoot in the downturn. Secondly, having appropriate political institutions that foster government stability can be of use.

This second result is true not only at all times, but can be particularly useful in times of distress. A government that has the power to implement a stabilization program at times of stress will help with the needed adjustment.

One avenue of research that stems from these results is the feedback loop between political results, fiscal fatigue, and the deterioration of fundamentals. In

particular, if a government with a worse economic performance is more likely to be voted out, and replaced by a fragmented government, then the overall result can be reinforcing vicious cycle: the worsening economic environment deteriorates a government´s ability to implement an adjustment, and the worsening in economic times further limits the government´s room for maneuver in stressful times (Coppedge, 1997).

In terms of policies to be implemented in a downturn, the key lesson is that the non linearities call for a pre-emptive approach from debt sustainability: these non linearities in the relationship between the output gap and the fiscal balance can lead to a rapid deterioration in the balance. When the market then incorporates this worsened balance into its analysis of debt sustainability, it is more likely to increase the cost of funding, which in itself can contribute to the unsustainability of debt.

These mechanisms call for swift action in downturns. Particularly, the promotion of growth can be effective in averting the negative spiral. Our paper does not analyze which growth-enhancing measures are best, however, it does suggest that a strong, pre-emptive approach to a downturn is appropriate. Given that fiscal space will often be limited, demand is likely to have to be promoted through other instruments, like monetary policy.

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