Fiscal Rules and Macroeconomic Stability *

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Abstract

In this paper we analyze the impact of fiscal rules on the effectiveness of fiscal policy as a macroeconomic stabilizing instrument. First, we review the available evidence on the effects of fiscal policy to affect output in the short run and real interest rates and investment and growth in the long run, and we show how the use of fiscal rules has proved useful in restraining debt and deficits. Secondly, we discuss whether debt consolidation rules trade off higher output instability in exchange for lower deficits, using three alternative representations of the intertemporal substitution mechanism in a SDGE framework. Our main conclusion is that both the impact of discretionary fiscal policy and the strength of automatic stabilizers are largely unaffected by the 'tightness' of these rules. Therefore, there is nothing in the design of fiscal rules aimed at preventing huge and long-lasting deviations of debt from the steady state level, which makes them an impediment to fiscal policy carrying out its job as a significant stabilizing policy instrument.

Keywords: Fiscal rules, output volatility, automatic stabilizers.
JEL Classification: E32, E52, E63.

1. Introduction

Modern macroeconomic policy making has become progressively constrained by the concern about the long run effects of misguided monetary and fiscal policies. Whereas the extent to which monetary and fiscal policies are able to affect output in the short run is still a matter of debate, the fact that an imprudent use of these instruments may

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have harming medium or longer term effects is widely accepted nowadays. Credibility, transparency and accountability are the features of modern monetary policy that are very often represented by simple rules, whose properties have been analyzed in detail by academics and policy makers alike. Properly designed rules are those capable of ensuring low and stable inflation while at the same time allowing the Central Bank to fight downturns in economic activity when these occur. Fiscal policy making is rapidly evolving along similar lines. The high level of debt accumulated in most advanced economies from the mid-seventies to mid-nineties has brought sustainability and fiscal consolidation to the forefront of economic authorities' concerns. Fiscal rules, such as the Stability and Growth Pact in Europe aim to achieve these goals, while keeping public finances in good shape to perform their stabilizing duties. In this paper we set up a framework to discuss whether or not these rules may succeed on both counts, namely consolidation and stabilization.

We proceed in three steps. In Section 2 we review the available evidence on the effects of fiscal policy with three particular purposes. We want to confirm first that taxes and government spending have a non-negligible effect on output in the short run; next we show that high debt and deficits lead to higher real interest rates and lower investment and growth in the long run. Finally we look into the recent EMU experience that suggests that the Stability and Growth Pact (SGP hereafter) has proved to be useful in restraining debt and deficits.

Fiscal policy seems to be a useful stabilizing instrument in the short run, while high debt and deficits have harming long-run growth effects. Fiscal rules have been, at least moderately, successful in preventing fiscal indiscipline, but they have also been blamed for the limits they impose on active stabilization. In Section 3 we discuss how to answer this question, namely whether debt consolidation rules trade off higher instability in exchange for lower deficits. The econometric evidence on the matter is scant and cannot always be interpreted easily. Output variability is the outcome of many different shocks and policies and it is difficult to pin down the influence of fiscal policy on it. Instead we resort to counterfactual analysis in dynamic general equilibrium models calibrated to reproduce the most salient features of fiscal policy as described in Section 2. We choose three models that differ from each other in one mechanism, which turns out to be crucial to understand the effects of fiscal policy: the intertemporal substitution of consumption and leisure. One word of caution about the definition of fiscal rules is required here . By fiscal rules, which are defined in more detail below, we mean a feedback reaction of some component of the budget balance to prevent huge deviations of the debt to GDP ratio from its steady-state value. In particular we do not discuss other matters such as the 3 per cent limit to budget deficits in the SGP. From a theoretical perspective this issue is of

less relevance, since well functioning fiscal rules do not require such an additional limit to achieve an equilibrium over-the-cycle budget balance. Also, its empirical relevance is limited, despite the fact that some countries are experiencing difficulties on this front; as we shall discuss below a more prudent fiscal position in periods of high growth would have allowed these economies sufficient room for manoeuvre to increase their fiscal deficits without hitting the 3 per cent ceiling in the current recession.

In Section 4 we conduct our policy evaluation by comparing several statistics in our three model economies under alternative fiscal rules. The main results we obtain can be summarized as follows. Fiscal rules designed to prevent huge and long lasting deviations of public debt from its steady-state level ('tight rules') do not significantly reduce the strength of discretionary fiscal policy as compared with 'loose rules'. Nor do tight rules diminish the effect of automatic stabilizers to a significant extent. These results offer an alternative explanation of the empirical evidence for the US states analysed by Canova and Pappa (2005), who find that the transmission of fiscal disturbances to the real economy is both qualitatively and quantitatively unaltered by the presence of strict budget or debt constraints. The extent to which households are able to substitute current versus future consumption turns out to be the crucial determinant of our outcomes. Unlike in the text-book Keynesian model, in a dynamic general equilibrium framework a fiscal expansion generates a negative wealth effect that counteracts the demand effect of public spending and/or taxes; when the rule is designed to achieve fast consolidation this wealth effect is weaker, thus allowing a stronger consumption increase and lower investment fall as a result of the fiscal shock. Interestingly, in models in which intertemporal substitution is limited the final outcome is the same, although the explanation differs. In this case the wealth effect is very weak and consumption depends on the size of the fiscal shock that turns out to be bigger, the tighter the fiscal rule.

Section 5 concludes. In general output and consumption volatility, as the ultimate aims of stabilization policies, are not inevitably higher under rules that put more emphasis on fast debt consolidation. We do not claim that fiscal rules cannot be destabilizing in practice. What we uphold is that such an effect cannot be found easily in three SDGE models particularly suitable for policy evaluation.

2. Fiscal Policy and Macroeconomic Stabilization: The Empirical Evidence.

2.1 Short-run effects of fiscal policy

What are the effects of expansionary fiscal policies in the short and medium run? The empirical evidence in this field is relatively scarce, at least compared with the abundant

literature on monetary policy, but in recent years there have been very interesting contributions by Blanchard and Perotti (2002), De Castro (2003), Fatás and Mihov (1998), Galí, López-Salido and Vallés (2003), Mountford and Uhlig (2004), Perotti (1999, 2002), or Burnside, Eichenbaum and Fisher (2004), among others. Blanchard and Perotti (2002), Galí, López-Salido and Vallés (2003) and Fatás and Mihov (1998) estimate a VAR for the US economy in which government purchases are a predetermined variable, that is, contemporaneous causality runs only in one direction, from government purchases to the rest of the economic variables in the VAR. Perotti (2002) has extended this methodology to Australia, Canada, the United Kingdom and Germany, with somewhat different results for some variables such as investment and the real short-run interest rate. Mounford and Uhlig (2004) use a sign restriction methodology to identify the effects of fiscal shocks on the main macroeconomic variables. In line with Blanchard and Perotti (2002) investment falls in response to a government spending increase. However, in contrast with Blanchard and Perotti (2002) and Galí, López-Salido and Vallés (2003), Mounford and Uhlig find that private consumption does not change significantly in response to an unexpected increase in government spending. Some authors such as Ramey and Shapiro (1997), Edelberg, Eichenbaum and Fisher (1999) or McGrattan and Ohanian (2003) have focused on particular and well identified episodes of military spending increases which occurred in the United States. The main conclusion of this literature is that there is a significant and positive short-run effect on output of these fiscal expansions, which fade away after some years.

These results are in clear contrast with the other stream of literature in which contractionary policies have expansionary effects on output. These are the well-known non-Keynesian effects of fiscal policy. Beginning with the work of Giavazzi and Pagano (1990) many studies have analyzed the macroeconomic effect of fiscal consolidations. In their survey to this literature, Hemming, Kell and Mahfouz (2002) conclude that there are many examples in which fiscal contractions have had expansionary effects on output, private consumption and investment. As Perotti (1999) has analyzed, the initial conditions of some key variables can explain why fiscal expansions have a positive effect in 'good times' but a negative one in 'bad times', where fiscal consolidations are needed.

The studies reviewed so far have focused on the effects of discretionary fiscal policies on output. The effects of automatic stabilizers are less well known and the empirical evidence is more scarce. Fatás and Mihov (2001), Galí (1994) and Andrés, Doménech and Fatás (2004) find a negative correlation between government size and output volatility, that is, economies with a large government sector exhibit smaller business cycle fluctuations as a consequence of automatic stabilizers. This basic result is shown in Figure **??** for a sample of OECD countries from 1960 to 2002. Martinez-Mongay (2002) and

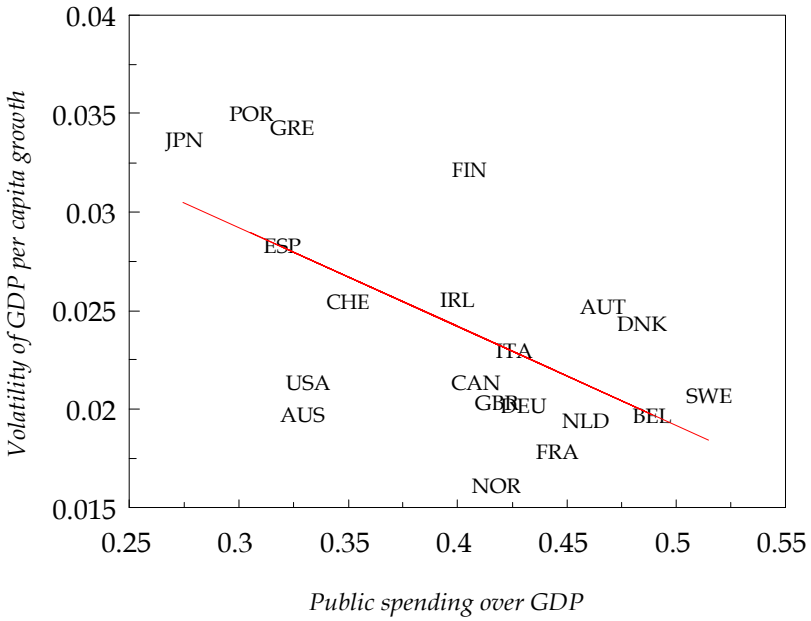

Figure 1: *Standard deviation of GDP per capita growth and government size as a share of GDP in the OECD, 1960-2002. Source: Andrés, Doménech and Fatás (2004).*

Martinez-Mongay and Sekkat (2003) have looked at which measure of government size best captures this correlation (e.g., personal versus indirect taxes), while other authors argue that the pattern in Figure 1 might be non linear and that it could even be reversed for a very large government size (see Silgoner, Reitschuler and Crespo-Cuaresma, 2003).

Using a different approach Barrell and Pina (2000) analyze the effects of automatic stabilizers by performing stochastic simulations in a forward-looking multi-country macroeconometric model (NiGEM) for 10 eurozone economies. They find that automatic stabilizers make output volatility fall in all countries, but that such decreases, ranging from 5 to 18 per cent, are smaller than commonly believed and display significant international variation. In a similar paper, Brunila, Buti and Veld (2003) using the QUEST model of the European Commission show that automatic stabilizers are a powerful tool to stabilize shocks to private consumption, but less so in the case of shocks to private investment and exports. Moreover, in the case of supply side shocks, the simulations show that automatic stabilizers are largely ineffective. What this literature shows is that it is very difficult to obtain reliable estimates of the effect of automatic stabilizers on

output volatility. For this reason, other authors rely on simulations with SDGE models. One important result of these simulations (see, for example, Galí, 1994, and Andrés and Doménech, 2005) is that the effects of automatic stabilizers are very sensitive to some structural features of the economy, in particular the degree of nominal and real rigidities.

2.2 Long-run effects of fiscal policy

Fiscal policies also have long-run effects, which may or may not go in the same direction as the ones analyzed so far. Assessing the importance and sign of such effects is of the utmost importance to ascertain the extent to which governments face an intertemporal trade-off in pursuing stabilization using fiscal instruments. As we have mentioned, the VAR literature concludes that fiscal expansions are followed by lower private investment. This effect is crucial in the debate about Ricardian equivalence: if the private sector responds to a fiscal expansion with an increase in private saving which compensates the deterioration of the government budget surplus then we will observe that private investment and interest rates remain unchanged. In their surveys of this literature Seater (1993) and Elmendorf and Mankiw (1999) portray a discouraging picture of the empirical literature on Ricardian equivalence plagued with serious econometric problems in the specification, in the data, in the endogeneity of the regressors and in the non-stationarity of the main variables. The global assessment of this literature depends more often than not on the researcher's beliefs. Doménech, Taguas and Varela (2000), taking into account these potential sources of misspecification, estimate that private saving in the OECD between 1960 and 1995 has compensated for only 40 per cent of the augments in public deficits, a result that is robust to the exclusion of countries in the sample. The empirical evidence for the United States and EMU is that the deterioration of public saving, which is the main cause of larger government deficits, was not compensated by private saving, resulting in a lower national saving rate, as shown in Figures 2 and 3.[2] Although the recent evidence by Blanchard and Giavazzi (2002) is that the correlation between domestic saving and investment (the Feldsteisn and Horioka, 1980, puzzle) has declined in more recent years, implying a more frequent resort to foreign savings, this correlation is still very high as depicted in Figures 4 and 5.

Consistent with the VAR results above, the deterioration of budget surpluses has resulted in lower investment rates. Nevertheless, the debate about Ricardian equivalence has further important implications for the trade-off between the effects of fiscal policy in the short and long run. If we accept Ricardian equivalence there is not much sense

[2] The data for Figures 2 to 7 have been taken from different issues of the OECD Economic Outlook. EMU figures refer to non-weighted averages.

in pursuing discretionary fiscal policies with a stabilization objective, since all fiscal measures are equivalent to balanced budget policies whose multiplier effect is very small; by the same token, the long-run negative effect of these actions is limited to the distortions introduced by income and value added taxes, since neither debt levels nor real interest rates would be affected. On the contrary, if we reject Ricardian equivalence, discretionary fiscal policies may have substantial stabilizing effects in the short run but with important costs in the long run.

If private saving compensates for only a fraction of public deficits, then fiscal expansions financed with public debt should increase real interest rates. Although the preliminary empirical evidence both in the United States and EMU is that the periods with higher deficits in the eighties and the first half of the nineties have coincided with higher (ex-post) long-run real interest rates, as shown by Figures 6 and 7, the econometric evidence is mixed and controversial.[3] Gale and Orszag (2002) review the literature on the effects of government deficits and interest rates (see Table 1) and find that all general equilibrium models used for simulations in the USA, both estimated econometrically or calibrated, yield a positive relationship between public deficit and interest rates. They also find that the empirical evidence based on reduced form equations is not conclusive, although those models which incorporate future deficit expectations always find a positive and statistically significant relationship. Most papers using the Congress Budget Office (CBO) deficit projections find that high deficits are associated with increases in the real interest rate between $40 - 60$ basis points. A representative paper of this stream in the literature is the research by Canzoneri, Cumby and Diba (2002). These authors find that the interest rate differential between short and long-run maturities in the United States has diminished when the CBO has improved its expectations of budget surplus in a horizon of 5 to 10 years, that is, financial markets have reacted by lowering the interest rate when the expectations about future fiscal discipline improve. Engen and Hubbard (2004) reach similar results in the case of public deficit, although much more moderate estimates in the case of public debt. A similar exercise has been done by the European Commission (2004), finding that one additional point of deficit raises long-term interest rates by about $15 - 20$ basis points.

Canzoneri, Cumby and Diba (2002) also estimate a VAR similar to Blanchard and Perotti (2002) but introducing inflation, commodity prices, bank reserves, FED funds rates and 10 year Treasury bond rates (constant maturity), finding that an increase in public spending produces a positive and significant interest rate response, mainly at long-

[3] To the point that the actual debate about the public deficits in the United States is also political (see Stiglitz, 2004), with republicans cutting taxes and causing huge deficits and democrats defending fiscal orthodoxy.

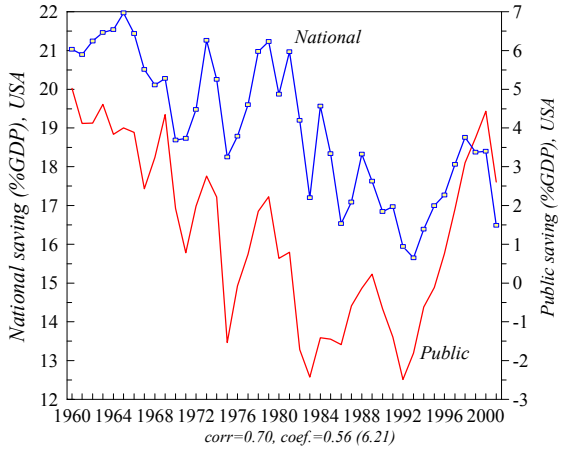

Figure 2: *National and public saving in the United States, 1960-2001. The correlation between both variables (corr) is* 0.7*, and the cooeficient of the regression of the national saving rate on public saving is 0.56 (t-ratio equal to 6.21).*

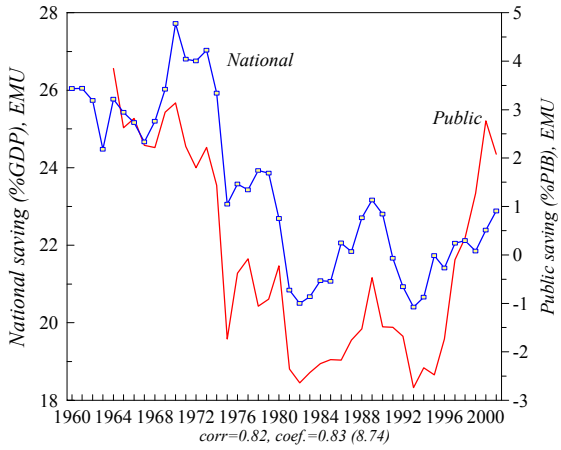

Figure 3: *National and public saving in EMU, 1960-2001. The correlation between both variables (corr) is* 0.82*, and the cooeficient of the regression of the national saving rate on public saving is 0.83 (t-ratio equal to 8.74).*

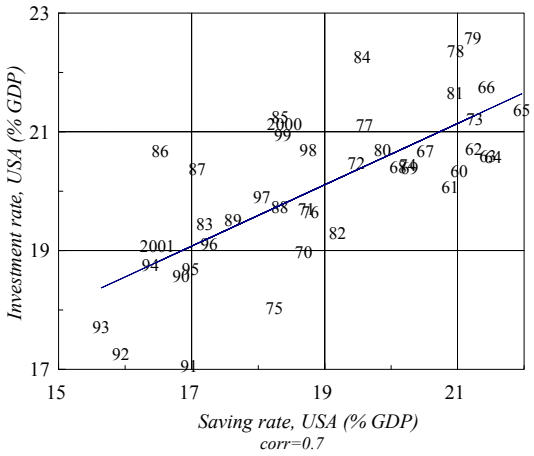

Figure 4: *Correlation between saving and investment rates in the USA, 1960-2001. The correlation between both variables (corr) is* 0.7.

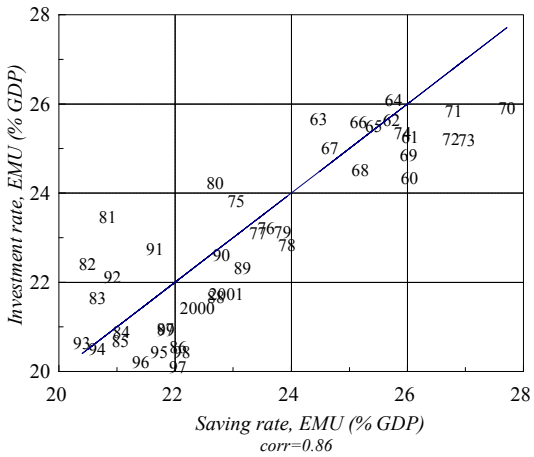

Figure 5: *Correlation between saving and investment rates in EMU, 1960-2001. The correlation between both variables (corr) is* 0.86.

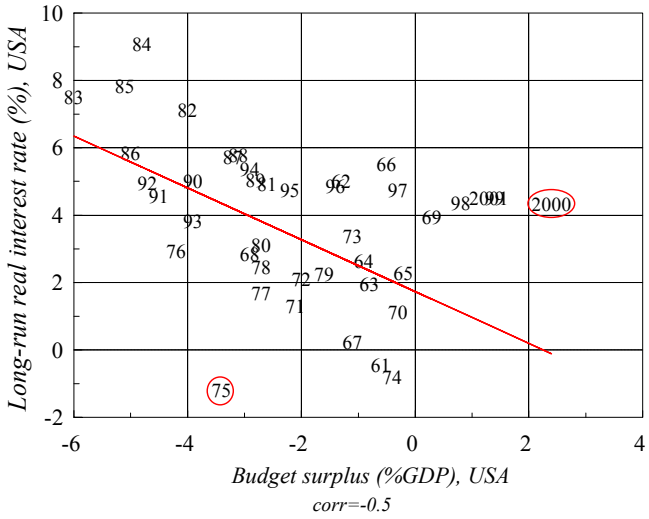

Figure 6: *Real interest rates and budget surpluses in the United States, 1962-2001. The correlation between both variables (corr) is* -0.5.

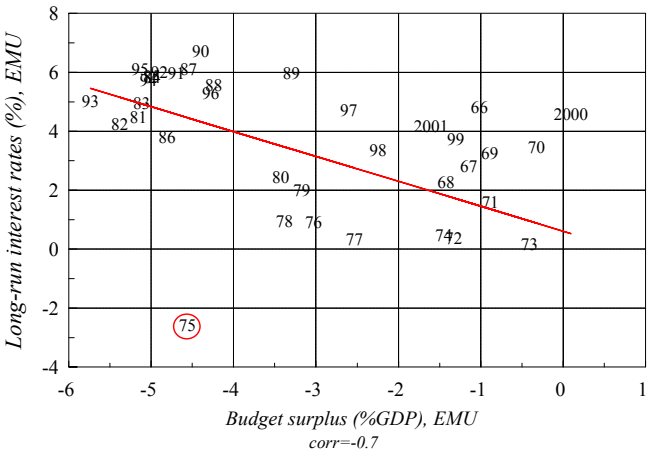

Figure 7: *Real interest rates and budget surpluses in EMU, 1966-2001. The correlation between both variables (corr) is* -0.7.

Table 1
Deficit and interest rates in the literature

	Number of papers finding a correlation...		
Measure of deficit and debt	Positive	Mixed	Non-sig.
Future and non-anticipated	12	4	1
VAR	2	2	6
Current	14	5	12
Total	28	11	19

Source: Gale and Orszag (2002)

run horizons, in contrast with previous results in this literature (Plosser, 1982 and 1987, Evans, 1987a and 1987b). Other evidence on the effects on interest rates is presented by Poterba and Rueben (1999) and Bayoumi and Woglom (1995), who find that the cost of financing public debt increases with the ratio of public debt to GDP, mainly because of a higher risk premium. A similar effect has been found by Bayoumi, Goldstein and Woglom (1995): those rules promoting fiscal discipline give place to lower interest rates and risk premia through better ratings. The empirical evidence for EMU countries seems to confirm these results even in a monetary union since those countries with a higher public debt to GDP ratio face on average a higher internal return of public debt. For example, Bernoth, von Hagen and Schuknecht (2004) have studied the bond yield differentials among EU eurobonds issued between 1991 and 2002, finding that interest rate differentials contain risk premia which increase with debt, deficit and the debt-service ratio. Thus, a reduction in the risk premia induces a considerable reduction in the interest rate. In a recent paper, Ardagna, Caselli and Lane (2004) have used a panel of 16 OECD countries over several decades to analyze the effect of government deficits and debts on long-term interest rates. Their results show that in static specifications a one-percentage-point increment in the primary deficit as a share of GDP leads to a 10-basis point increase in the interest rate. This effect is larger (150 basis points) after 10 years according to the cumulative response estimated with a vector autoregression. Domestic public debt affects interest rates only in countries with above-average levels of debt, whereas higher levels of public debt in the sample of OECD countries also increase each country's interest rates.

If deficit spending implies higher interest rates and lower private investment, most growth theories (for example, Mankiw, Romer and Weil, 1992) predict a lower per capita income or long-run growth. Therefore, fiscal deficits have an indirect effect upon growth through capital accumulation. However, a negative direct effect has been directly confirmed empirically by some authors, even after controlling by the investment rate. For example, Fischer (1993) and Andrés, Doménech and Molinas (1996) estimate

growth equations for a wide sample of countries, including the investment rate (indirect effect) and fiscal deficit (direct effect), finding a negative and significant effect of deficits on growth. More recently, Kneller, Bleaney and Gemmell (1999) have confirmed these results using a sample of OECD countries and controlling for differences in the composition of public spending and revenues. Their estimates show that budget deficits have a negative effect on economic growth, with a coefficient even larger than that for distortionary taxes (labour and capital income).

It is also important to notice that the composition of the public expenditure financed with debt may be very relevant in order to asses the effects upon economic growth. For example, Kneller, Bleaney and Gemmell (1999) find that public investment has a positive effect on growth which is non-significant in the case of public consumption. Nevertheless, very high public investment may render it unproductive, as it has been pointed out, among others, by Devarajan, Swaroop and Zou (1999). Therefore the trade-off between short-run and long-run effects of fiscal policy is quite sensitive to the fiscal policy instrument (the type of public consumption or investment) being used.

2.3 Fiscal rules and debt consolidation

Fiscal rules are designed to reduce the level of debt or at least to prevent the debt/GDP ratio from increasing further in each economic cycle. In the case of EMU countries, fiscal consolidations were forced by the Maastricht Treaty and the Stability and Growth Pact. For these countries the evidence analyzed by the European Commission (2004) confirms a change in the response of primary budget surpluses to public debt in 1994, after the approval of the Maastricht Treaty. The type of fiscal rules estimated by the European Commission is similar to the ones estimated by Ballabriga and Mongay (2002) or Gali and Perotti (2003), and consists in regressing the primary budget surplus expressed as a percentage of HP trend output (pbs) for country i in year t on the output gap (y^c), the lagged public debt to trend output ratio (d) and the lagged dependent variable:

$$pbs_{it} = \alpha_i + \beta y^c_{it} + \gamma d_{it-1} + \rho pbs_{it-1} + u_{it} \quad (1)$$

where α_i is a country fixed effect.[4] Equation (1) is estimated for 11 EU countries for the period 1970-93 (the pre-Maastricht period) and 1994-2003.

The estimation results confirm some previous findings by Gali and Perotti (2003). First, before the Maastricht Treaty the primary budget balance showed little correlation with the output gap, whereas this (partial) correlation is positive and statistically significant in the consolidation period. Therefore, fiscal consolidation has not been an obstacle

[4] To account for possible problems of endogeneity, the output gap is instrumented with its own one-year lag and the lagged output gap for the United States.

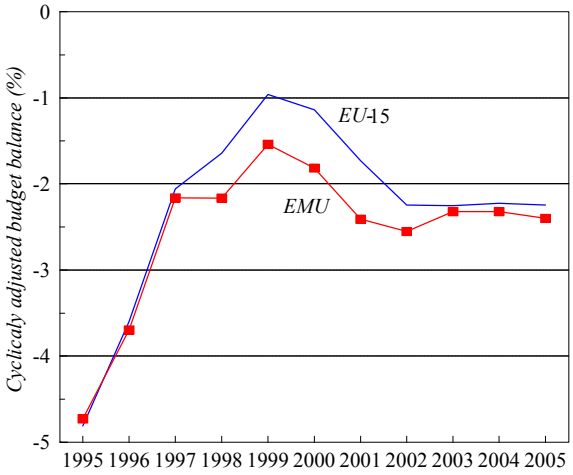

Figure 8: *Cyclically adjusted budget balance in percetage of trend GDP. Source: European Commission AMECO Data Set, June 2004.*

for the primary budget surplus to become even more countercyclical after 1993. Secondly, the coefficient γ, which measures the response of the primary budget surplus to the lagged debt to trend GDP ratio, is more than three times larger in the consolidation period than in the pre-Maastricht one. Finally, there has been a reduction in the persistence of primary budget balances in the second period. Therefore, the results indicate that fiscal policy has been more stabilizing, more debt consolidating and less persistent after the introduction of the current fiscal framework in EMU.

Nevertheless, some symptoms of fiscal fatigue in this process of debt consolidation have arisen in the last downturn, when some countries in EMU are no longer complying with the rules imposed by the SGP, exhibiting a budget deficit in terms of GDP above the 3 per cent threshold. Although the slow growth in these countries has been blamed for this deterioration of public finances, this can be traced back to the previous years of high growth during which there was a relaxation of fiscal consolidation after countries entered EMU. In fact, the recent recession has been much milder than previous ones but the structural budget balances had been worsening even before the downturn in 2000 (Figure 8), due to discretionary fiscal changes. This is one of the main conclusions of Hughes-Halles, Lewis and von Hagen (2004), who measure consolidation efforts by means of the likelihood of starting a consolidation (probit models) and the duration of these (hazard models). Their findings coincide with what Figure 8 shows, namely that

the period of stronger consolidation efforts and fiscal discipline has been the run up to the Euro in which countries made the greatest sustained efforts to meet Maastricht criteria. Since then fiscal discipline has been weakening steadily. According to these authors, at this pace, the beneficial effects of the Maastricht Treaty and the SGP will be over in less than a decade. Therefore, sound public finances in terms of the SGP cannot be achieved if countries do not consolidate more strongly in periods of high growth. Another interesting remark of Figure 8 is that given the actual size of the cyclical component of the budget surplus, EMU countries would have satisfied the SGP if their cyclically adjusted budget balance had been close to zero. This conclusion is reinforced by the evidence presented in Table 2, which offers a similar conclusion to the evidence presented by Buti, Franco and Ongena (1998). Using estimates of the cyclical component of the budget balance in terms of GDP by the European Commission we have checked which has been the greatest value of the cyclical deficit from 1970 onwards, as well as the minimum growth rate of GDP during those particular episodes.[5] As we can see, deficits greater than 3 per cent of GDP have been the exception rather than the rule, in particular in big countries such as Germany, France, Italy, the UK and Spain. Moreover, in all the cases in which the deficit exceeded 3 percent of GDP, the rate of growth of GDP was negative, so the excessive deficit procedure of the SGP would not have been applied. In other words, if EMU countries had exhibited close to balance structural budgets, they would have faced in general the big recessions of the last three decades without breaching the limits imposed by the SGP.

3. Modeling the effect of fiscal policy.

As we have discussed in the previous section, there are still many points of disagreement among researchers as to the macroeconomic effects of fiscal policy. However, our reading of the recent evidence and the literature suggests three major findings in this field that motivate our analysis in this section. First, there is a sufficient amount of empirical evidence on the matter to conclude that discretionary fiscal policy has substantial, though short-lived, effects on aggregate spending and employment. The effect of automatic stabilizers is more difficult to gauge, but the existing evidence and model simulations lead us to conclude that these are also useful to dampen macroeconomic fluctuations, at least in economies with real and nominal rigidities. Secondly, as far as the long-run incidence of fiscal policy is concerned, the available evidence points towards a non-negligible growth-reducing effect of excessive debt and deficits. Finally, fiscal rules, such as the SGP, are useful to impose some restraints on budget balances; furthermore,

[5] The evidence for the Spanish economy comes from Corrales, Doménech and Varela (2002).

Table 2
Minimum cyclical component of budget balance

Country	Year	Deficit	GDP growth rate
Belgium	1983	1.42	0.31
Denmark	1993	3.24	-0.01
Germany	1987	1.58	1.47
Greece	1996	0.76	-1.16
Spain	1993	1.79	-1.17
France	1997	0.88	1.10
Ireland	1994	2.42	2.70
Italy	1993	0.95	-0.88
Netherlands	1983	2.40	-1.28
Austria	1987	0.75	1.63
Portugal	1985	1.74	-1.99
Finland	1993	5.86	-6.39
Sweden	1993	3.66	-2.00
UK	1982	2.06	-1.44

Source: see text.

the current 3 per cent deficit limit does not seem to be an impediment to pursuing active stabilization during recessions, provided that fiscal consolidation is achieved when output is close to its potential level.

In principle, fiscal discipline and active stabilization are not necessarily incompatible. There is nothing preventing a close-to-zero over-the-cycle budget balance from incorporating an active discretionary policy as well as taxes and transfers that are cyclically sensitive. However, the evolution of debt to output ratios during the eighties and, to a lesser extent, since EMU started, indicates that economic authorities are keen on relying heavily on fiscal stimuli to avoid low growth rates, but do not retrench public spending in booms, or at least not in the proportion needed to maintain structural budget surpluses. Programs of fiscal restraint, aimed at maintaining fiscal discipline incorporate some form or another of fiscal rules. These rules are designed to prevent deficits from exceeding some given target level, or to avoid further increases in the debt to output ratio, or even to seek substantial reductions in it.

On what grounds is the success of these rules to be assessed? There would be little disagreement about the matter if it had to be settled merely on the basis of the observed path of debts and deficits. If these are substantially reduced, then rules are fine, otherwise they are flawed. However, these are not the grounds on which rules are

to be appraised. In some quarters, the blame on fiscal rules does not refer so much to their observed performance in terms of consolidation but mainly to their alleged effects on the capability of fiscal policy in helping to achieve output stabilization. Whatever their design, these regulations impose some sort of limitation on the power of governments to run public finances. In some cases there are limits to deficits, but in any case medium-term equilibrium requires that current changes in public revenues and/or public spending ought to be reversed at some time in the future. Thus, fiscal rules have been blamed for the restriction they pose on fiscal policy. First, limits to current deficits do simply prevent further tax cuts and/or spending increases when the economy is operating near the ceiling. Secondly, rules designed to ensure consolidation do signal future fiscal actions that may affect the stabilizing capability of current fiscal policy.

Not much can be said as regards the first criticism. There are two issues at stake here. One is related to the fiscal rule itself: if it is ill-designed it may be too tight and the economy would be likely to jump into it in moderate recessions. Whether some of the existing regulations, and in particular the 3 per cent deficit limit in the SGP, are too strict is a matter of empirical evidence but, as we discussed before, running a balanced budget or even a small deficit at potential output would have given fiscal policy in EU economies substantial room for manoeuvre.[6] If the economy has a structural deficit close to 3 percent of GDP, it is obvious that the SGP constitutes an important restriction for the stabilization effects of both automatic stabilizers or countercyclical discretionary fiscal policy in a downturn. However, in this singular scenario the issue about the effects on output stabilization of this deficit limit is of little theoretical interest. It is self-evident that if the 3 per cent limit becomes binding, the government is forced to follow a procyclical public expenditure policy. On the other hand, fiscal rules do not need any additional limit. On purely theoretical grounds a rule that aims at keeping the debt level under control only needs some kind of contemporaneous or delayed feedback from some of the components of the budget. Thus, we find a more interesting exercise in analyzing the influence of fiscal rules when that limit is not binding and it merely aims at stabilizing the level of public debt around a target level. This is the spirit of the current proposals made by the European Commission about how to improve the implementation of the SGP.

The second criticism is more relevant and it is the one we are going to focus on. The evidence discussed in the previous section pertains to a time span in which fiscal discipline was not at its best and then a natural question arises: to what extent will

[6] It must also be borne in mind that the effectiveness of fiscal shocks is greatly diminished if the public sector is running a deficit in the first place, and that the aforementioned non-Keynesian fiscal multipliers are likely to arise in such situation.

the effectiveness of fiscal policy be altered by the imposition of fiscal discipline? Most existing rules impose limits either on the debt to output ratio or on the deficit level or on both, implying that a current deficit must turn into future surpluses and viceversa, thus inducing procyclical movements in fiscal policies. This must have an effect on the behavior of forward-looking agents that take into account the whole path of expected future events when making their decisions. A proper understanding of the implications of these rules requires a full blown dynamic general equilibrium framework. Policy evaluation should be carried out in models specified at the level of preferences and technology. The exercises that follow are model specific and should be taken as such, but in order to ensure a broad scope for our results we take special care in the choice of the models as well as in the parameter values.

We choose a fairly general model that features a number of frictions that have been found relevant to reproduce the observed response to fiscal shocks. Since fiscal polices involve a trade-off between current and future disposable income, the opportunity set available to households and the mechanism of intertemporal substitution are crucial determinants of the effects of fiscal policy on output. Thus we consider three alternative views of the intertemporal substitution channel in an otherwise common theoretical framework; when necessary, we allow for some differences in parameter values to make the impulse response functions of each model as close to the empirical ones as possible. The first one is a standard neo-Keynesian model in which all consumers are fully rational and behave as intertemporal maximizers (R, hereafter).[7] The second model is one in which infinitely lived households may lend and borrow in the financial market only limited by the market interest rate, but in which a fraction of consumers choose to maximize on a period-by-period basis, without engaging in intertemporal substitution of any kind. This friction has been introduced in an otherwise neoclassical framework by Galí, López-Salido and Vallés (2003) who show that a non-negligible proportion of such 'rule-of-thumb' consumers (RoT hereafter) is needed to reproduce some of the effects of fiscal policy obtained in the VAR literature.[8] The third model is based on Andrés, Doménech and Leith (2006), who consider households with full access to unrestricted financial markets, but whose intertemporal behavior is affected by a positive probability of death (Blanchard, 1985, and Yaari, 1965); in this setting, consumers are finitely lived (FL, hereafter) affecting their discount rate. All three models are calibrated to mimic the average market European economy.

In the RoT model the fraction of rational households choose leisure $(1 - l_t)$ and consumption (c_t) to maximize fairly general, non-separable utility function as,

[7] The model is described in detail in Andrés and Doménech (2005).

[8] The model used here is taken from Andrés, Doménech and Fatás (2004).

$$U(c_t, 1-l_t) = \frac{\left(c_t^{\eta}(1-l_t)^{1-\eta}\right)^{1-\sigma} - 1}{1-\sigma} \tag{2}$$

Households allocate their income (labor income, capital income, interest payments on bond holdings (B_t), their share of profits of the firms (Ω_{it}), and public transfers ($P_t g_t^s$)) and current cash holdings to buy consumption and investment goods (e_t), and to accumulate savings either in bonds or money holdings for $t+1$:

$$\begin{aligned} & M_{t+1} + \frac{B_{t+1}}{(1+i_{t+1})} + P_t(1+\tau_t^c)c_t + P_t e_t \\ = \;& P_t(1-\tau_t^w)w_t l_t + P_t(1-\tau_t^k)r_t k_t + B_t + M_t + \tau_t^m + P_t g_t^s + \int_0^1 \Omega_{it} di \end{aligned} \tag{3}$$

Money is needed for transactions and there is a cash-in-advance constraint that links money demand (M_t) and current cash transfers (τ_t^m) to consumption,

$$P_t(1+\tau_t^c)c_t \leq M_t + \tau_t^m \tag{4}$$

The tax structure includes taxes on labor income (τ_t^w), capital income (τ_t^k) and consumption (τ_t^c). The accumulation of capital is made by households, who face a constant depreciation rate (δ) and installation costs $\Phi\left(e_t/k_t\right)$. Rule-of-thumb consumers (of whom there is a proportion λ) solve the optimization problem in a static manner, since they do not have access to the financial market, nor do they decide to save for the future.

The economy is populated by i intermediate goods producing firms. Each firm faces a downward sloping demand curve for its product (y_i) with finite elasticity ε

$$y_{it} = y_t \left(\frac{P_{it}}{P_t}\right)^{-\varepsilon} \tag{5}$$

where $\left[\int_0^1 \left(y_{it}\right)^{\frac{\varepsilon-1}{\varepsilon}} di\right]^{\frac{\varepsilon}{\varepsilon-1}} = y_t$ and $P_t = \left[\int_0^1 \left(P_{it}\right)^{1-\varepsilon} di\right]^{\frac{1}{1-\varepsilon}}$. Following Calvo (1983), each period a measure $1-\phi$ of firms set their prices, $\widetilde{P}_{it}$, to maximize the present value of future profits,

$$\widetilde{P}_{it} = \frac{\varepsilon}{\varepsilon-1} \frac{\sum_{j=0}^{\infty}(\beta\phi)^j E_t\left[\rho_{it,t+j} P_{t+j}^{\varepsilon+1} mc_{it+j} y_{t+j} \overline{\pi}^{-j\varepsilon}\right]}{\sum_{j=0}^{\infty}(\beta\phi)^j E_t\left[\rho_{it,t+j} P_{t+j}^{\varepsilon} y_{t+j} \overline{\pi}^{j(1-\varepsilon)}\right]} \tag{6}$$

where $\rho_{t,t+j}$ is a price kernel representing the marginal utility value to the representative household of an additional unit of profits accrued in period $t+j$, β the discount factor,

$mc_{t,t+j}$ the marginal cost at $t+j$ of the firm changing prices at t and κ a fixed cost of production. The remaining (ϕ per cent) firms set $P_{it} = \overline{\pi} P_{it-1}$ where $\overline{\pi}$ is the steady-state rate of inflation. The aggregate price index at t is

$$P_t = \left[\phi \left(\overline{\pi} P_{t-1}\right)^{1-\varepsilon} + (1-\phi)\widetilde{P}_t^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}} \tag{7}$$

The optimal combination of capital (k) and labor (l) is obtained from the cost minimization process of the firm:

$$\min_{k_{it}, l_{it}} \left(r_t k_{it} + w_t l_{it}\right) \tag{8}$$

subject to

$$y_{it} = A_t k_{it}^{\alpha} l_{it}^{1-\alpha} - \kappa \tag{9}$$

where w_t is the real wage, r_t is the rental cost of capital and κ is a fixed cost that ensures zero profits at the steady state. Total factor productivity, A_t, follows the process,

$$\ln A_t = \rho_z \ln A_{t-1} + z_t^a \tag{10}$$

where z_t^a is white noise and $0 < \rho_z < 1$.

The budget constraint is given by

$$P_t \tau_t^w w_t l_t + P_t \tau_t^k r_t k_t + P_t \tau_t^c c_t - P_t(g_t^c + g_t^s) = -\frac{B_{t+1}}{(1+i_{t+1})} + B_t - M_{t+1} + M_t \tag{11}$$

Monetary policy is represented by a standard Taylor rule:

$$i_t = \rho_r i_{t-1} + (1-\rho_r)\overline{i} + (1-\rho_r)\rho_\pi(\pi_t - \overline{\pi}) + (1-\rho_r)\rho_y \widehat{y}_t + z_t^i \tag{12}$$

in which the monetary authority sets the interest rate (i_t) to prevent inflation deviating from its steady-state level ($\pi_t - \overline{\pi}$) and to counteract movements in the output gap ($\widehat{y}_t$); $\overline{i}$ is the steady-state interest rate and the current rate moves smoothly ($0 < \rho_r < 1$). Finally, the calibrated parameters in Table 3 are taken from Andrés, Doménech and Fatás (2004).

The R model can be understood as a particular case of the previous one in which $\lambda = 0$. In order to produce positive responses of output to fiscal shocks, preferences are calibrated in a slightly different manner; we also change the tax structure somewhat to match the steady-state values.[9] The FL model also incorporates a few changes with

[9] In particular, $\sigma = 3, \eta = 0.4453, \tau^w = 0.43, \tau^k = 0.21, \tau^c = 0.14$. We have chosen a lower elasticity of intertemporal substitution than in model R. We do so to obtain a positive fiscal multuplier

Table 3
Calibration of baseline model, from Andrés, Doménech and Fatás (2004)

σ	β	η	α	ε	δ	π	ρ_z	λ	κ
1.0	0.993	0.44	0.40	6.0	0.021	$1.02^{0.25}$	0.80	0.65	0.31
τ^w	τ^k	τ^c	g^c/y	g^s/y	ρ_r	ρ_π	ρ_y	ϕ	
0.279	0.279	0.10	0.18	0.16	0.5	1.7	0.1	0.75	

respect to the RoT model. We assume logarithmic preferences both in consumption and leisure, and these also include money to derive a demand for real balances:

$$E_t U = E_t \sum_{z=0}^{\infty} \beta^z (\ln c^i_{t+z} + \chi \ln \frac{M^i_{t+z}}{P_{t+z}} + \varkappa \ln(1 - l^i_{t+s}) \tag{13}$$

This alters the dynamics of consumption since, under a positive probability of death ($\gamma < 1$), the Euler equation displays terms in household's financial wealth (b_t and m_t),

$$\begin{aligned}(1+\tau^c_{t+1})c_{t+1} &= \frac{1-\gamma\beta}{1+\chi(\gamma\beta)^{-1}} \left\{ \frac{(1+r_t)\beta(1+\chi(\gamma\beta)^{-1})(1+\tau^c_t)c_t}{(1-\gamma\beta)} + \right. \\ &\left. + \frac{(\gamma-1)(1+r_t)}{\gamma} \left[m_t + \frac{b_t}{1+i_t} \right] \right\} \end{aligned} \tag{14}$$

4. Fiscal rules and stabilization

Using the models discussed above we approach the assessment of the effects of fiscal rules on macroeconomic stabilization by first looking at the incidence of such rules on the effectiveness of discretionary fiscal policy, and then analyzing its incidence on the effectiveness of automatic stabilizers in the presence of technology shocks.

Fiscal rules can vary along several dimensions. We shall consider the following general form,

$$g^c_t = \left(g^c_{t-1}\right)^{\alpha_g} \left(\frac{b_{t-j}}{\overline{y}} - \frac{\overline{b}}{\overline{y}} \right)^{\alpha_b} (y_{t-1} - \overline{y})^{\alpha_y} + \varepsilon^g_t \tag{15}$$

in which g^c_t is public consumption, b_{t-j} represent real debt and y_{t-j} the level of output

in consumption that would be negative for lower values of σ. This makes the model slightly more realistic and hence more likely to generate higher output volatility under tight fiscal rules.

at $t-j$ and ε_t^g is an innovation with moderate persistence. α_b determines the intensity of debt consolidation and α_y tells us whether the government is pursuing an active countercyclical behavior on g_t^c, over and above the need to consolidate the level of debt. We set $j = 1$ and rules will be defined according to the value of the parameters α_b and α_y.

These features do not exhaust the forms that a fiscal rule may adopt and a general discussion about the properties of different alternatives is beyond the aim of this article (the interested reader may consider the study by Mitchell, Sault and Wallis, 2000). In particular, there are two types of rules we shall not analyze in this paper: those defined in terms of a deficit target instead of a debt target, and those in which consolidation is sought by means of income tax rather than government spending adjustments (for example, Pérez and Hiebert, 2004). Since the deficit target also includes the debt level, alternative definitions of the target should not be of much empirical relevance for the purpose at hand. Whether the rule is defined on taxes or public spending is of more importance. This issue has been discussed in Schmitt-Grohé and Uribe (1997), Canzoneri, Cumby and Diva (2004), and Railavo (2004), among others, who show that rules relying on income tax adjustment are bound to induce high output variability if the labor supply is sufficiently elastic. We view this as a related but separate matter, namely one on how the rule is designed, rather than on the influence of the rule as such. Since the design of the rule interacts with other features of the model, calling for a more detailed look into the labor market, we leave this for further research.

4.1 Discretionary fiscal policy

Discretionary fiscal stimuli are used to counteract the effect of shocks that affect output and consumption negatively. The fact that these fiscal changes are effective in affecting output is confirmed by the empirical evidence reviewed in Section 2, but it may be argued that a strict commitment to a debt target may diminish the effectiveness of these changes, since a rise in public spending or a tax cut must be compensated by a change of opposite sign in these variables sometime in the future.

Figure 9 compares the impulse responses (in percentage) of the three main components of aggregate demand to a 1 per cent impulse in public consumption under two alternative rules in the RoT model. In both cases $\alpha_y = 0$, so that public spending does not have a direct countercyclical function. The continuous line represents the economy with the minimum consolidation effort compatible with a monetary equilibrium ($\alpha_b = 0.2$), whereas the dotted line represents an economy under a more strict ('tight') rule ($\alpha_b = 2.0$). Not surprisingly, the dynamics of public debt are markedly different across economies. When the consolidation effort is weak ('loose' rule), public debt

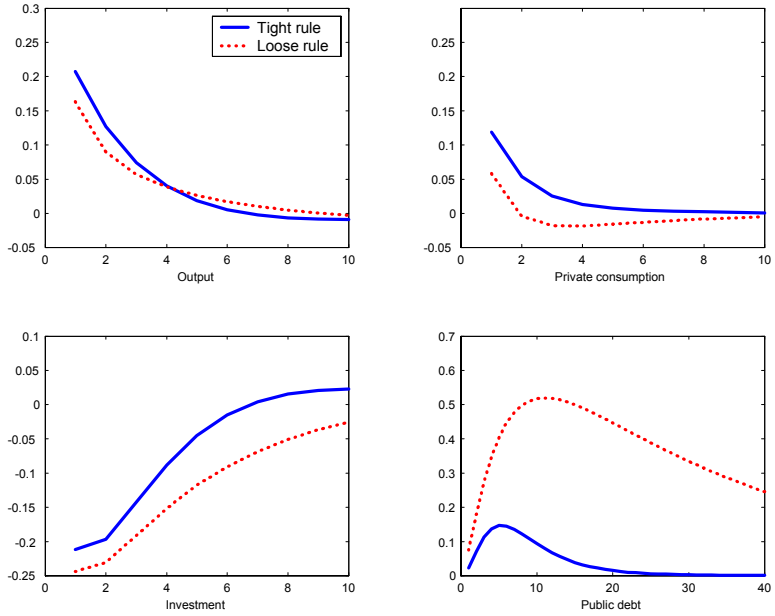

Figure 9: *Impulse-response functions (in %) after a public consumption shock (of 1%) in the RoT model. In the tight rule $\alpha_b^c = 2$ (solid line), whereas in the loose rule $\alpha_b^c = 0.2$ (dotted line).*

remains above its target for more than 40 quarters, whereas under the tight rule, this difference is much lower and it vanishes in about 15 quarters. It is striking that this sharp contrast does not translate into substantial differences in the dynamic responses of output, consumption and investment that look remarkably similar. If any, the accumulated response of output, consumption and employment are slightly higher under the rule with $\alpha_b = 2.0$.

The reason why consumption rises by more can be explained by the intensity of the fiscal shock under both rules and it is the combination of two effects. The shock generates a temporary deficit, thus requiring a downward adjustment on government spending with an intensity that depends on the nature of the fiscal rule (the size of α_b). Under a tight rule, the downward adjustment on public spending is stronger, thus reducing the overall persistence of the fiscal shock and the associated negative wealth effect (see Galí, López-Salido and Vallés, 2003). This moderates the fall of consumption of optimizing households as well as the increase in the labor supply of these agents. Given the increase in labor demand (needed to meet the additional demand) this leads to a greater increase in real wages under the tight rule, and hence to a greater increase in the consumption of non-optimizing households. The crowding-out in investment is

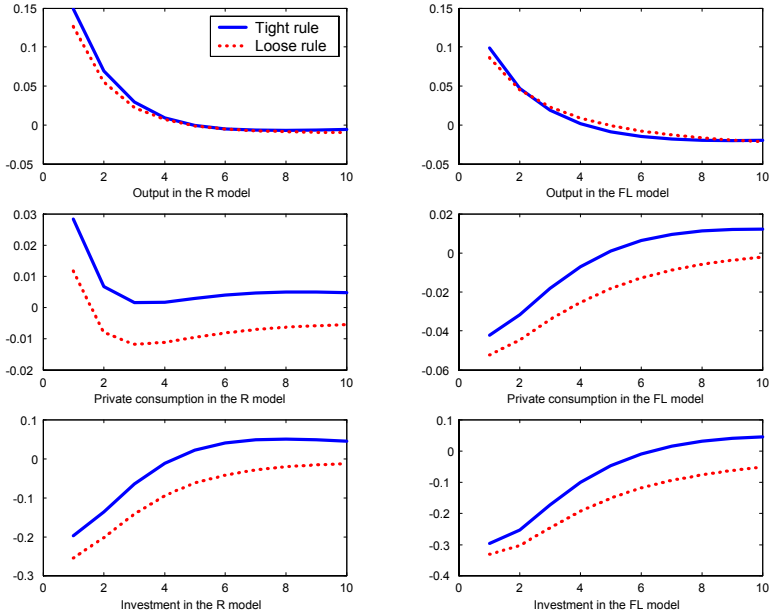

Figure 10: *Impulse-response functions (in %) after a public consumption shock (1%) in the R and FL models. In the tight rule (solid line)* $\alpha_b^c = 2.0$*, whereas in the loose rule (dotted line)* $\alpha_b^c = 0.2$.

also less intense for high values of α_b.

This result carries over alternative models of consumer behavior. In Figure 10 we report the impulse responses, again for the alternative fiscal rules in the models with $\lambda = 0$ and with finite lives (R and FL models respectively). The incidence of alternative rules goes in the same direction. Output multipliers are virtually unaffected by the response of public consumption, whereas private consumption tends to react more strongly to fiscal shocks in the case of a tougher fiscal rule. In both models, the fall in investment is more moderate under a more severe rule. The explanation given for the RoT model carries over the two other cases, although here only one of these effects is present. Tighter rules mean less persistence of the shock to government spending, and stronger consumption and investment responses. Therefore, the multipliers associated with private GDP (total output minus public spending) are significantly increased when the rule imposes a fast return to the steady state.

According to the empirical evidence reviewed in Section 2, efforts to render fiscal policy more disciplined seem to have been accompanied by some success on making it more purposely countercyclical too (European Commission, 2004, Galí and Perotti,

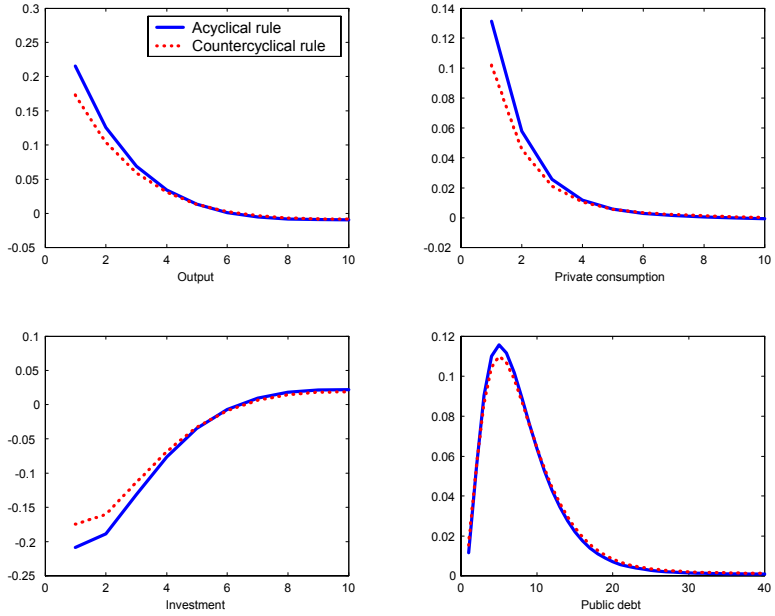

Figure 11: *Impulse-response functions (in %) after a public consumption shock (1%) in the RoT model. In the acyclical rule (solid line)* $\alpha_y^c = 0$*, whereas in the countercyclical rule (dotted line)* $\alpha_y^c = -1$.

2003). To assess the effect of this change we look at the implications of a stabilizing component in basic rule: $\alpha_y = -1$. Notice that all that is needed for a fiscal rule to ensure stationarity of the debt to output ratio is that it must contain a feedback component to the deviation of that ratio from its steady state. This does not impose any restriction on other parameters of the rule and, in particular, it does not prevent the rule from being active against cyclical movements in output.

The presence of such a component in the rule has very little effect in those models in which consumers have no limitations to intertemporal substitution, models R and FL. This is so because the cyclical response of g^c does not affect substantially the present value of the wealth effect associated with the fiscal shock. In the model with a significant proportion of restricted consumers, the differences are somewhat larger, since the countercyclical component of the rule diminishes the size of the fiscal shock that curtails the response of consumption. The impulse responses depicted in Figure 11 indicate that a countercyclical component in the rules reduces the responses of output, consumption and investment in absolute value, as expected.

4.2 Automatic stabilizers

Income and consumption taxes make public revenues dependent on economic activity. Income taxes are progressive inducing an elasticity of tax revenues to income greater than one, but aggregate revenues move roughly one-to-one with aggregate output in most developed countries (Van den Noord, 2000). Income and consumption taxes smooth away disposable income along the cycle, thus contributing to dampening macroeconomic fluctuations, but this effect might be endangered by procyclical fiscal responses induced by fiscal rules.

To assess the importance of this undermining effect of fiscal rules we perform a number of exercises measuring the strength of automatic stabilizers following technology shocks. Now we focus our attention mostly on the R model as the benchmark case, since the initial response to a technology shock in the model with a high proportion of non-maximizers (RoT) consumers is a fall in hours, output and consumption. This result may be well explained in a model with substantial frictions and has been discussed thoroughly in the literature (see Galí, 1999, Rotemberg, 2003, and Basu, Fernald and Kimball, 2004). However, this framework is somewhat less useful for the purpose at hand since the fall in activity leads to a rise in public debt, which implies a downward adjustment in public spending. Thus public spending tends to be negatively correlated with tax stabilizers, contrary to the widespread view that fiscal rules may induce positive comovements between public consumption and tax revenues.

Impulse responses

First we look at the impulse response functions when the economy is hit by a shock to total factor productivity. Given a technology shock, automatic stabilizers help to dampen the output, consumption and investment response. Then keeping the size of the shock constant we measure if the impulse response to the shock and the dynamic paths of debt and deficit are affected by the rule.

Figure 12 depicts the response of the three main components of aggregate demand and that of public debt to a temporary but quite persistent shock to the Solow residual in the R model. As expected, the positive shock induces a fall in public debt, which returns to its steady-state value at a pace that depends on the consolidation coefficient in the rule. With $\alpha_b = 2$ the deviation is low (reaching a maximum of 0.4 percent) and relatively short-lived, while it is larger and far more persistent under the benchmark rule.

The choice of a more demanding fiscal rule has a very small incidence on the dynamics of output. The rule with a strong consolidation bias lessens somewhat the responses of investment and consumption, especially the latter. This is consistent with the

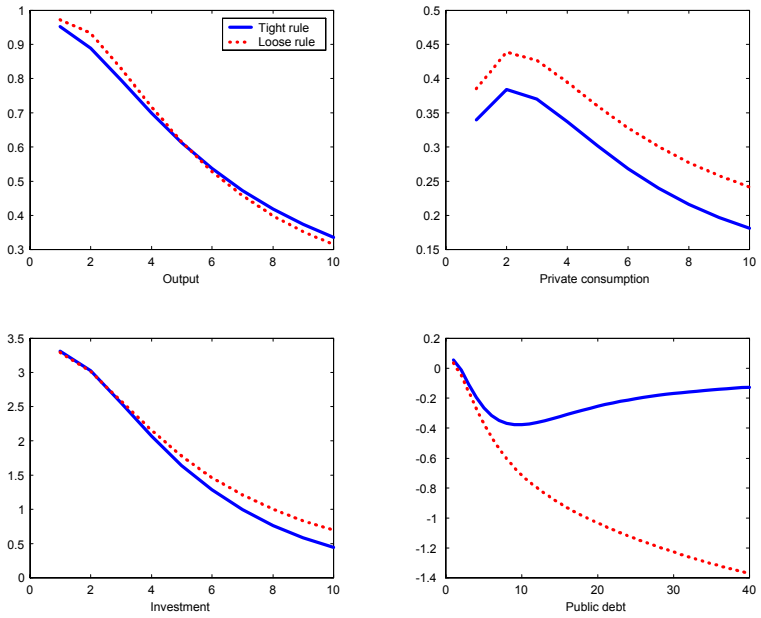

Figure 12: *Impulse-response functions after a technology shock in the R model. In the tight rule (solid line)* $\alpha_b^c = 2.0$*, whereas in the loose rule (dotted line)* $\alpha_b^c = 0.2$.

results of Canzoneri, Cumby and Diba (2004), who find that tight fiscal rules defined on government spending are welfare enhancing, even in framework in which the fiscal shock triggered by the rule does not crowd out consumption. The fall in public debt triggers an expected response in public consumption which is stronger and more persistent for higher values of $\alpha_b = 2$. Then the associated negative wealth effect is also stronger in the case of a tight rule, thus reducing the impact response of consumption (and investment) as compared with the loose rule, in which the increase in public spending is much smoother over time.

Figure 13 depicts similar results for the two alternative settings (RoT and FL). The impulse responses in the model with finitely lived agents (right-hand panel) resemble those in the model with rational infinitely lived consumers. The small quantitative differences among the two models can be explained by the slightly higher discount rate that agents with a positive probability of death face each period. In the RoT model the differences among the alternative rules are larger and qualitatively different. Take the case in which $\alpha_b = 0.2$ first. Here we obtain a standard result in the literature: an increase in total factor productivity in a model with high rigidities may lead to a

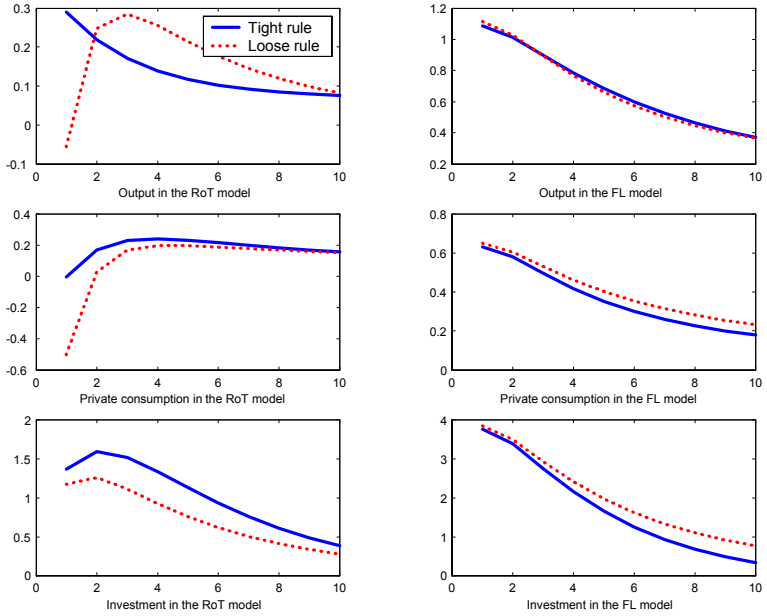

Figure 13: *Impulse-response functions (in %) after a technology shock (1%) in the RoT and FL models. In the tight rule (solid line)* $\alpha_b^c = 2$*, whereas in the loose rule (dotted line)* $\alpha_b^c = 0.2$.

fall in hours worked as well as in the real wage. Thus, consumption of rule-of-thumb households falls sharply, and so does total consumption and output. This is so despite the increase in consumption of optimizing households induced by the fall in public consumption, which generates a positive wealth effect (notice that the fall in hours and consumption generates a deficit on impact). These effects are almost reversed under the more consolidating rule: output rises and consumption does not fall on impact. The explanation lies in the size of the fiscal shock induced by the initial deficit that accompanies the productivity increase. The first rule is associated with a mild downward response of public spending, whereas the second one triggers a sharp fall in government consumption, which makes the increase in consumption and investment of optimizing consumers stronger. Thus, wages fall less and the consumption of RoT consumers is less affected.

The presence of an explicit stabilizing component in basic rule ($\alpha_y = -1$) does have a tiny effect in the shape of the response functions in all three models. Figure 14 depicts the results for the R model, and the others are largely similar, although this term makes a somewhat substantial difference (in the expected direction, i.e. making the

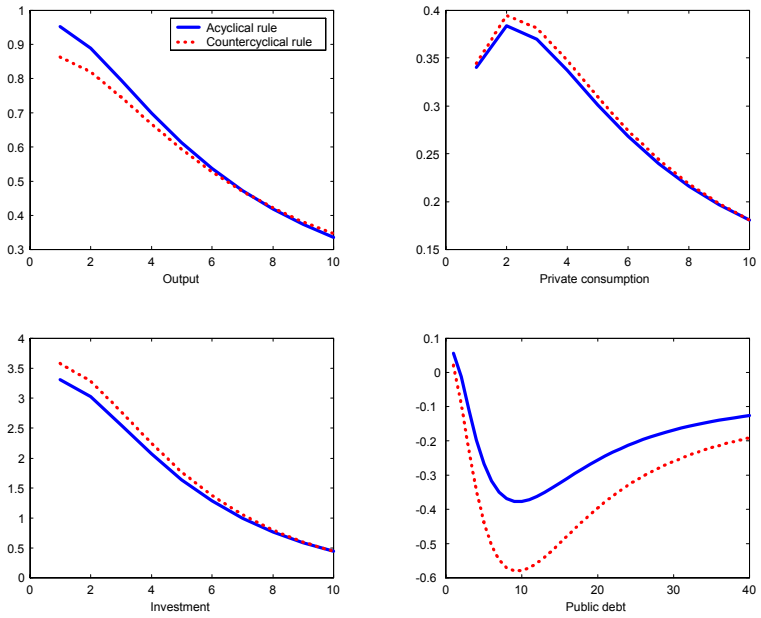

Figure 14: *Impulse-response functions (in %) after a technology shock (1%) in the R model when* $\alpha_b = 2$. *In the acyclical rule (solid line)* $\alpha_y^c = 0$, *whereas in the countercyclical rule (dotted line)* $\alpha_y^c = -1$.

economy more stable) in the economy in which some consumers follow rule-of-thumb behavior. This is so for the same reasons discussed in the case of the fiscal shock.

Output volatility

Impulse responses give us a hint of the dynamic shape of output and other macroeconomic variables in alternative fiscal scenarios. But the ultimate aim of stabilization policy is to reduce the volatility of output and consumption. Next we look in more detail at the incidence of fiscal rules on the standard deviation of these two variables. To do so we carry out a simulation exercise to obtain the standard deviation of output, consumption and investment in our three economies under different parameterizations of the fiscal rules. The model with transitory supply shocks has been simulated 100 times, producing 200 observations. We take the last 100 observations and compute the averages over the 100 simulations of the standard deviation of each variable of interest.

The results are summarized in Table 4, which compares tight ($\alpha_b = 2.0$) with loose ($\alpha_b = 0.2$) rules with ($\alpha_y = -1.0$) and without ($\alpha_y = 0.0$) the direct countercyclical response of public spending. Two general patterns emerge. First in models R and FL, output volatility increases as the tightness of fiscal policy increases, while it falls in

Table 4
Standard deviation caused by technology shocks

		R	RoT	FL
$\alpha^y = 0, \alpha^b = 0.2$	σ_y	1.0000	1.0000	1.0000[a]
	σ_c	0.6237	1.4261	0.7763
	σ_e	3.1333	4.4451	2.9544
$\alpha^y = 0, \alpha^b = 2.0$	σ_y	1.0444	0.8460	1.0214
	σ_c	0.5924	1.1018	0.7395
	σ_e	3.4455	6.0137	2.9597
$\alpha^y = -1, \alpha^b = 0.2$	σ_y	0.9592	0.9149	0.9688[b]
	σ_c	0.7080	1.3354	0.8360
	σ_e	3.5227	4.6805	3.3393
$\alpha^y = -1, \alpha^b = 2.0$	σ_y	1.0161	0.7669	0.9984
	σ_c	0.6086	1.1040	0.7734
	σ_e	3.7597	6.1410	3.2744

(a) $\alpha^b = 0.50, (b)\alpha^b = 0.60$

the RoT model. Secondly, as expected, output volatility is always smaller in models with active stabilization component. A closer look reveals that the attempts to avoid large deviations in debt from its steady state does not endanger output stabilization in a significant manner. Even in the cases in which output volatility increases with the tightness of the rule (R and FL), this increase is barely significant (below 3 per cent), whereas the standard deviation of output drops by 45 percent in the RoT model.

Turning our attention now towards the components of output, the results in Table 4 reinforce the conclusions we drew from the impulse response analysis. In all three cases the volatility of consumption is lower under the tight rule; this fall is substantial, ranging from 5 percent in the FL model to 29 per cent in the RoT case. Investment volatility is slightly affected by the rule chosen by the government, except in the model with RoT consumers, in which it rises along with α^b, although in this case, we must remember that only a small proportion of households are engaged in investment activities. In fact the reason why output volatility increases along with α^b in the models in which it does is simply that more active fiscal rules tend to generate a stronger reaction of public spending after a technology shock, whereas all the other components of GDP become more stable.

Table 5
Government size and output and consumption volatilities

	Output			Consumption		
	σ_y	σ_y	$\frac{\partial \ln \sigma_y}{\partial \ln(G/Y)}$	σ_c	σ_c	$\frac{\partial \ln \sigma_c}{\partial \ln(G/Y)}$
	$\frac{g}{y} = 0.17$	$\frac{g}{y} = 0.51$		$\frac{g}{y} = 0.17$	$\frac{g}{y} = 0.51$	
$\alpha_b^c = 0, \alpha_b^s = 0.20$	1.510	1.038	-0.434	2.332	0.951	-0.852
$\alpha_b^c = 0.2, \alpha_b^s = 0$	1.425	0.837	-0.484	2.307	1.305	-0.519
$\alpha_b^c = 1.0, \alpha_b^s = 0$	1.232	0.838	-0.351	1.946	1.598	-0.179

Output volatility and government size

Finally in Table 5 we have analyzed how the fiscal rule alters the effects of government size on output volatility. As in Andrés, Doménech and Fatás (2004) we focus on the elasticity of the standard deviation of output (σ_y) to government size as a share of GDP (g/y), for two different values of this variable: 0.17 and 0.51 such that the average (0.34) is the standard size of the government sector in advanced economies. As we have shown in Section 2, the empirical evidence indicates that economies with a larger government size exhibit a lower output and private consumption volatility. As shown by Galí (1994) this evidence cannot be explained by standard RBC models. Andrés, Doménech and Fatás (2004) have accounted for these facts when the economy exhibits important nominal and real rigidities and, in the case of private consumption, when the share of rule-of-thumb consumers is relevant. As we can see in Table 5, although the choice of the public expenditure variable in the fiscal rule (transfers, α_b^s, versus public consumption, α_b^c) and the intensity of the consolidation effort (different values of α_b^c) have some quantitative effects on $\partial \ln \sigma_y / \partial \ln(G/Y)$, these are relatively small and the main qualitative result remains unchanged.

Thus if the negative elasticity between government size and output and consumption volatility is to be considered as an indicator of the strength of automatic stabilizers in market economies, the fact that the use of fiscal instruments is constrained to avoid large deviations of the debt/GDP ratio does not undermine that strength either. Larger governments operating under tighter rules are still able to lessen the size of macroeconomic fluctuations caused by shocks to total factor productivity.

5. Concluding remarks

There is little disagreement about the success of the SGP, and other fiscal rules for that matter, in restoring discipline in public finances. They have done so for a while,

until most governments have abandoned them in a more or less explicit manner. The reasons for this fiscal fatigue are manifold, but one that has found some support among academics is the claim that these rules make it impossible for fiscal policy to perform its role as a stabilizing instrument. In this paper we have looked at this particular issue in detail and found that this fear is not warranted.

To do so we have first reviewed the available evidence on the effects of fiscal policy. As we read it, this evidence points towards an unequivocal short-run effect of fiscal impulses on output and consumption as well as non-negligible harming effects on the medium-term growth of excessive debt and deficits, operating mainly through higher real interest rates and lower private investment.

Turning to the main issue of the paper we have carried out simulations on alternative models representing different views of the mechanism of intertemporal substitution under alternative fiscal rules. The responses of output and consumption to discretionary fiscal stimuli are not significantly affected by the nature of the rule. Nor is the operation of automatic stabilizers drastically affected by the rule either. Again, impulse responses are roughly similar, or even more moderate, under a tight rule than under a loose one. Finally the volatility of output in an economy hit by technology shocks tends to be lower and that of consumption is substantially so the tighter the fiscal rule.

Although our results are model-dependent, and other modifications of the basic framework we have been working on in this paper might qualify our findings, the message we obtain from the analysis conducted here is that leaving aside the issue of deficit ceilings, there is nothing in the design of fiscal rules aimed at preventing huge and long-lasting deviations of debt from the steady-state level that makes them an impediment to fiscal policy carrying out its job as a significant stabilizing policy instrument.

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