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Asymmetric Fiscal Stabilization Policy and the Public Deficit: Theory and Evidence*

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Abstract

This paper studies the implications of asymmetric fiscal stabilization policy for the budget deficit. In our model, the government is more concerned about downturns than upturns in economic activity and therefore conducts fiscal stabilization policy in a precautionary way. We show that this type of behavior results in a deficit which on average exceeds its target level. We test our hypothesis empirically and find that asymmetric preferences for output stabilization are consistent with how fiscal policy was conducted in a sample of OECD countries during 1987-2005. According to our estimates, the upward bias due to precautionary behavior accounted for roughly 13 percent of the average deficit.

JEL Classification: H62, E60, E32

Keywords: Counter-cyclical fiscal policy, asymmetric loss function, deficit bias

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1 Introduction

The development of budget deficits and public debt has raised much concern among OECD policymakers. From the beginning of the 1970s, public debt has increased sharply in many OECD countries, reaching levels of more than 100 per cent of GDP for example in Belgium, Italy and Ireland by 1995. Along with the increase in debt, the role of fiscal policy as an instrument for improving macroeconomic performance has become the subject of renewed debate. On the one hand, advocates of discretionary fiscal policy point out that counter-cyclical policies can smooth fluctuations in economic activity and promote output growth. On the other hand, opponents highlight that discretionary fiscal policy can potentially exploit the public budget in ways which are not optimal from a social welfare point of view and thus call for rules to maintain fiscal sustainability.

Theoretically, the role of budget deficits is controversial. According to the classic theory of tax-smoothing, budget deficits can be optimal in the presence of temporary and unexpected spending shocks (Barro, 1979). However, according to political economy theory, deficits can also be non-optimal, as socio-economic groups with self-interest may adopt policies of overspending. These policies may be individually rational but collectively inefficient (Weingast et al., 1981; Roubini and Sachs, 1989a,b; Tornell and Lane, 1999; Velasco, 2000; Alesina and Drazen, 1991).[1]

In this paper, we develop a simple theory of deficits arising due to asymmetric fiscal policy preferences. In our model, a benevolent government seeks to minimize deviations of aggregate output and of the deficit from some target values. However, negative deviations of output are weighted more heavily in the loss function than positive deviations. In other words, recessions receive a higher weight than booms. This asymmetry in the loss function induces the government to run a relatively large deficit on average in order to avoid economic downturns. Put differently, the government pursues an output stabilization policy in a way that minimizes the probability of a recession. That is, the asymmetry in the loss function is consistent with a precautionary motive for stabilization policy. As a result, the deficit exceeds the target value on average. We label this upward bias in the deficit the precautionary bias.

From the model, we derive a reaction function for the fiscal authority that describes the choice of the deficit as a function of the output gap and the volatility of the output gap. In

[1]The theory of tax-smoothing calls for budget surpluses in times of low spending as a compensation for the budget deficits in times of high spending to keep the inter-temporal public budget balanced.

our empirical analysis we estimate the parameters of this reaction function empirically, which allows us to determine the cyclicality of fiscal policy and to quantify the precautionary bias in a sample of 20 OECD countries over the period 1987 - 2005.

Our results indicate that fiscal policy in the countries in our sample is conducted in a counter-cyclical and asymmetric way, placing more weight on avoiding economic downturns than on smoothing upturns. Based on our preferred specification we find that the resulting upward bias in the deficit accounts for approximately 13 percent of the average deficit as a fraction of GDP.

Since the literature argues that a deficit bias can be due to certain characteristics of the political system, it is possible that the precautionary bias identified in our analysis is also linked to, for example, the number of parties in government. To explore this potential link, we relate the precautionary bias to a number of variables frequently used in the empirical literature on the political economy of fiscal policy. Even though we find that the degree of federalism and government fragmentation can influence the precautionary bias, the evidence is rather week. We conclude that in contrast to this conventional deficit bias, the precautionary bias is largely independent of political economy issues.

Our paper is related to several strands of the literature. A number of papers estimate the degree to which fiscal policies in OECD countries follow a counter-cyclical pattern and analyze the determinants of such policies. Gali and Perotti (2003) and Aghion and Marinescu (2008), for example, find that budget deficits have become increasingly counter-cyclical in most OECD countries during the past twenty years, but that the trend was weaker in EMU (European Monetary Union) countries. Lane (2003) and Aghion and Marinescu (2008) analyze the determinants of counter-cyclical policies. They find that trade openness, output volatility, political power dispersion, the degree of financial development and inflation targeting can play a role.

Another related branch of the literature is concerned with the symmetry or asymmetry of fiscal policies over the business cycle. Gavin and Perotti (1997), for example, show for Latin America that government spending is moderately procyclical in expansions but strongly countercyclical in recessions. Sorensen and Yosha (2001) find that fiscal policy is asymmetric and procyclical in U.S. states and local governments. Our paper is particularly closely related to Hercowitz and Strawczynski (2004), Balassone and Zotteri (2008) and Leigh and Stehn (2009). Hercowitz and Strawczynski (2004) find that asymmetric spending contributed to an increase in the spending-output ratio in OECD countries during 1975-1998. More recently, Balassone and

Zotteri (2008) find similar evidence for fiscal policy in EU countries during 1970-2004, with fiscal balances deteriorating in recessions but not improving correspondingly in expansions. Leigh and Stehn (2009) analyze the asymmetry of monetary and fiscal policy in the G7 economies. Our contribution to this literature is to explicitly model asymmetric preferences of the government and to quantify the resulting bias in the deficit.

Finally, the paper is related to political economy theories of public finance, where a deficit bias in fiscal policy can arise due to a fragmentation of political power or an expected change in government. For example, political groups that share a common budget have an incentive to engage in pork barrel spending that favors their constituencies (Weingast et al., 1981; Tornell and Lane, 1999; Velasco, 2000). Also, governments can have an incentive to over-spend in order to constrain spending of future, ideologically different governments (Persson and Svensson, 1989; Roubini and Sachs, 1989a,b; Alesina and Tabellini, 1990). As a result, spending gives rise to deficits that are inefficiently high. We contribute to this strand of the literature by exploring the link between political economy issues and the precautionary bias.

The remainder of the paper is structured as follows: Section 2 presents the theoretical model. Section 3 describes the empirical implementation and our data set. Section 4 presents the results and Section 5 concludes the paper.

2 Model

In this section we develop a simple model to illustrate how a deficit bias may arise when the fiscal authority weighs negative deviations of output from some target level more heavily in the loss function than positive deviations.

We label the deviation of output from the target level the output gap and denote it by y_t. We assume that y_t is driven by a stochastic shock, u_t, which is *i.i.d.* over time. Fiscal policy can counteract the impact of the shock by adjusting the deficit, d_t, appropriately. More specifically, we assume that $y_t = \lambda d_t + u_t$, where λ is the fiscal multiplier. To model asymmetric stabilization policy we assume that the fiscal authority minimizes the following loss function:[2]

$$L_t = \alpha \left(\frac{\exp(\gamma y_t) - \gamma y_t - 1)}{\gamma^2} \right) + \frac{(d_t - d^*)^2}{2}, \tag{1}$$

[2]This loss functions is also used in Ruge-Murcia (2003) and Surico (2008) who study the consequences of asymmetric preferences for the inflation bias of monetary policy.

where d^* is the level of the deficit that is targeted by the government. The parameter $\alpha > 0$ is the weight associated with output stabilization and γ governs the asymmetry in the reaction to positive and negative output gaps. Note that if $\gamma < 0$, then the fiscal policymaker weighs negative output gaps more heavily than positive ones. In contrast, for $\gamma > 0$ positive output gaps receive a higher weight. In addition, it can be shown that for $\gamma \to 0$, equation (1) reduces to a loss function that is quadratic in y_t and in $d_t - d^*$ (see Ruge-Murcia, 2003).

We assume that the fiscal authority decides on the deficit before all the information in period t is revealed, in particular before u_t is realized. Therefore, the fiscal authority bases its decision on information available in $t-1$. Thus, the government minimizes $E_{t-1}(L_t)$ subject to $y_t = \lambda d_t + u_t$. The resulting optimality condition for the government is

$$E_{t-1}\left(\frac{\alpha\lambda}{\gamma}(\exp(\gamma y_t) - 1)\right) = -(d_t - d^*). \tag{2}$$

This expression will be the basis for our empirical analysis.

To illustrate the implications of (2) for the average deficit, we assume that u_t is normally distributed. It follows that the output gap is also normally distributed and $\exp(\gamma y_t)$ follows a distribution with mean $\exp(\gamma^2\sigma^2)/2$, where σ^2 is the variance of the output gap. Taking unconditional expectations of (2), rearranging and taking logs gives:

$$E(d_t) = d^* - \frac{\alpha\lambda\gamma}{2}\sigma^2. \tag{3}$$

Thus, we see that - on average - the actual deficit, d_t, differs from the targeted deficit, d^*, if $\gamma \neq 0$. More specifically, if $\gamma < 0$, the average actual deficit is above the target level. Intuitively, the deficit bias is the result of a precautionary motive. This precautionary motive arises since the government is more concerned about economic downturns than about upturns in economic activity. Consequently, the government acts in a way that minimizes the probability of a recession. Even if negative realizations of the shock do not occur frequently, the fiscal authority may still run a deficit on average, if this precautionary motive is strong enough. Therefore, we refer to the term $-(\alpha\lambda\gamma\sigma^2)/2$ as the precautionary bias. Note that the accumulated stock of government debt grows over time, if the precautionary bias is positive.

Although the deficit deviates on average from the targeted level, it is not clear whether the deficit bias is inefficient or not. Since the welfare losses associated with recessions may outweigh the welfare gains during booms, social preferences may also be asymmetric with respect to the business cycle. To the extent that the loss function of the fiscal authority postulated in (1)

captures these social preferences, the resulting deficit bias may be socially optimal despite its implications for the accumulation of debt.[3] In short, the deficit bias would be a by-product of a welfare maximizing fiscal stabilization policy.

However, it is also possible that the government's loss-function does not fully mirror social preferences. For instance, suppose the electorate is myopic. In this case, we could expect fiscal policy to be more precautionary in election years, when the government aims at increasing the probability of re-election and therefore tries to avoid a potential recession. In our empirical analysis, we will try to shed some light on this issue by exploring the link between the precautionary bias and political economy aspects of fiscal policy.

3 Empirical Specification and Data

To empirically estimate the degree of asymmetry of the loss function and to quantify the deficit bias, we re-write (2) as:

$$\alpha\lambda E_{t-1}(y_t) + \frac{\alpha\lambda\gamma}{2} E_{t-1}(y_t^2) = -(d_t - d_f), \tag{4}$$

where the exponential term is approximated by a Taylor series expansion. Rearranging terms gives

$$d_t = a + bE_{t-1}(y_t) + cE_{t-1}(y_t^2), \tag{5}$$

where $a = d_f$, $b = -\alpha\lambda$ and $c = -\alpha\lambda\gamma/2$. Note that asymmetric fiscal policy implies that $b < 0$. That is, a positive output gap results in a declining deficit and vice versa. Based on the reduced-form coefficients we can also find the structural coefficient governing the asymmetry in the loss function as $\gamma = 2c/b$. Recall that $\gamma < 0$ induces the government to conduct stabilization policy in a precautionary way. Hence, if fiscal policy is counter-cyclical, that is $b < 0$, then if $c > 0$ the reduced-form coefficients indicate that negative output gaps are weighted more heavily than positive output gaps in the loss function, which gives rise to a positive precautionary bias in the deficit. Note also that based on c we can infer the size of the precautionary bias.

Equation (5) is essentially a fiscal policy reaction function and nests several specifications estimated in the literature. For $c = 0$ we essentially obtain the specification used in Alesina and Tabellini (2008). Hercowitz and Strawczynski (2004) and also Balassone and Zotteri (2008)

[3] This argument ignores adverse consequences of high government debt in the future as this aspect is not covered in our model.

allow for an asymmetric response to positive and negative output gaps. This type of asymmetry is also nested in (5), since the marginal effect of the output gap on the deficit depends on the level of the output gap and therefore also on the sign of the output gap.

Note that (5) contains the conditional expectations $E_{t-1}(y_t)$ and $E_{t-1}(y_t^2)$, which are not directly observable. To deal with this issue, we use lagged observations of y_t and y_{t-1}^2 as proxies for the expectation terms. That is, we replace $E_{t-1}(y_t)$ with y_{t-1} and $E_{t-t}(y_t^2)$ with y_{t-1}^2.[4] Thus, we estimate the following modified equation (5) using a panel data set:

$$d_{it} = a_i + by_{it-1} + cy_{it-1}^2 + dX_{it} + \epsilon_{it}, \tag{6}$$

where we add X_{it}, which is a vector of additional control variables, and allow for country-fixed effects. The vector X_{it} includes a time trend and lagged total government debt as a percentage of GDP to capture a debt stabilization motive (see Bohn, 1998; Gali and Perotti, 2003; Alesina and Tabellini, 2008).

We also estimate specifications where we add political economy variables as a number of studies point out that political variables like the structure of government can be important determinants of fiscal policy. More specifically, we include several proxies for government fragmentation, election years and the degree of federalism.[5]

The degree of proportionality in the electoral system can have an important effect on the deficit, as greater representation of individual voters in the legislature potentially weakens fiscal discipline (Aghion et al., 2004). Persson and Tabellini (2003, 2004) confirm this hypothesis with empirical evidence for majoritarian systems to be associated with greater fiscal discipline than proportional systems. To control for this effect, we use an indicator variable for plurality (*pluralty*) in our estimations, which takes on the value unity if legislators are elected using a winner-take-all, that is, majoritarian rule and zero otherwise. In accordance with the literature, we expect the coefficient on *pluralty* to be negative: majoritarian systems are less representative and are thus expected to encourage fiscal discipline and decrease the budget deficit.

[4] Alternatively, we replace the expectation terms by the (squared) fitted values obtained from a regression of y_t on y_{t-1}, similar to the instrumental variable strategy in Gali and Perotti (2003) and Alesina and Tabellini (2008). Our results are robust with respect to this modification.

[5] For additional robustness analysis, we also include the lagged deficit in X_{it} to capture potential autocorrelation and find that although the effect and significance of the squared output gap becomes weaker, our main conclusions are robust. Further, we also test for cross-sectional stability and find that our results are not driven by single countries. Estimation details are available upon request.

Proportionality in elections can also lead to higher deficits because it may increase the number of parties in government (Persson et al., 2005) and, according to Weingast et al. (1981) and Velasco (2000), more fragmented governments run higher deficits as a greater number of constituencies compete for public funds while only taking part of the tax cost of these funds into account. Roubini and Sachs (1989a,b) provide early empirical evidence for more fragmented government coalitions to run larger budget deficits (see Alesina et al., 1999; Besley and Case, 2003, for cross-section evidence for Latin American countries and for the U.S. respectively). In our estimation, we use a variable for government fractionalization ($govfrac$), which is equal to the probability that two deputies picked at random from among the government parties will be of different parties. We also use the margin of government majority (maj), which is equal to the fraction of seats held by the government, divided by the number of total (government plus opposition plus non-aligned) seats and the vote share of all government parties ($numvote$). According to the theory, we would expect a positive coefficient for government fractionalization and negative coefficients for the vote share and the majority of government.

According to Franzese (2000), ethnic- and agrarian-party constituencies tend to be geographically concentrated, so multiple-constituency problems should be more evident when such parties share in government. We use a variable that indicates whether the largest government party represents rural interests ($govrural$) and expect a positive coefficient, if this increases government fractionalization and thus induces an incentive to overspend.

The electoral budget cycle literature (see Nordhaus, 1975; Tufte, 1978; Alesina, 1995) states that governments follow expansionary policies in election years in order to get re-elected. Consistent with this literature, Alesina et al. (1993) find evidence for electoral budget cycles in OECD countries. Following the literature, we use an indicator variable that equals 1, if there was a legislative election in that year and 0 otherwise. A positive coefficient of that variable would confirm the theory.

Finally, we use two variables that are related to federalism and, possibly, the number of constituencies. The first variable ($auton$) indicates whether or not there are contiguous autonomous regions (such as the Basque region in Spain and Montenegro in Yugoslavia). The second variable ($state$) indicates whether or not there are state or province governments that are locally elected. The sign of the coefficients of both variables, however, is not clear, because on the one hand the presence of autonomous regions or locally elected governments might increase the number

of constituencies and, therefore, fragmentation, but on the other hand it might lower general government debt, if local authorities are fiscally more prudent than central ones.

In addition to the political economy variables themselves, we also include interactions with y_{it-1} and y_{it-1}^2. Recall that according to (6) the size of the precautionary bias is closely related to the extent to which the deficit reacts to the squared output gap. Hence, interacting the squared output gap with political economy variables allows us to relate the size of the deficit bias to political economy issues. This extension will help us to shed some light on whether precautionary fiscal policy results in a deficit that is inefficient from a welfare point of view. As discussed in the previous section, although the precautionary bias may give rise to a deficit which - on average - lies above the target level, it is not necessarily inefficiently high, as it may simply mirror asymmetric social preferences. However, if the asymmetric preferences of the government deviate from the preferences of the population, the resulting bias may be socially inefficient. In particular, if the loss function of the government does not mirror the preferences of the population, this may be the consequence of political economy issues. For instance, it appears plausible that the effect of fragmentation on the deficit varies over the cycle. If asymmetries exist in the group-specific loss functions such that downturns are weighted more heavily than upturns, this would enhance the deficit-spending incentive inherent in existing theories of government fragmentation and the budget deficit. By interacting y_{it-1} and y_{it-1}^2 with political economy variables we are able to explore such issues empirically.

4 Results

To estimate the parameters of the fiscal policy reaction function, we use annual data from 1987 - 2005 for 20 OECD countries.[6] As our empirical reaction function describes discretionary fiscal policy, we use the primary deficit and the cyclically adjusted primary deficit as dependent variables. The primary deficit does not include interest payments on net debt and therefore reflects the discretionary response of fiscal policy. The cyclically adjusted (structural) primary deficit corresponds to discretionary fiscal policy even more closely, as it additionally separates out the effects of automatic cyclical fluctuations in revenues and expenditures. Both our measures of the deficit are obtained from the OECD.[7] The output gap, y_t, is calculated as the log deviation

[6] Our sample inlcudes Australia, Austria, Belgium, Canada, Denmark, Spain, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, New Zealand, Portugal, Sweden, the UK and the US.

[7] For a detailed description of data sources, see the Appendix.

of real GDP from the Hodrick-Prescott trend, for which we use a smoothness parameter of 6.25 (see Alesina and Tabellini, 2008; Ravn and Uhlig, 2002).[8] GDP data are obtained from the OECD Economic Outlook database. The political economy variables are taken from Beck et al. (2008). Throughout the paper, we report test statistics based on standard errors which are robust to heteroskedasticity of unknown form.

Table 1 displays the estimation results for our baseline specification of the fiscal policy reaction function (6). Columns (1a) and (1b) show the results for the primary deficit as dependent variable, and columns (2a) and (2b) show the results for the cyclically adjusted primary deficit. In columns (1a) and (2a) we present the results for a restricted version of (6), where we exclude y_{t-1}^2 from the estimating equation.

From column (1a) we see that the structural deficit falls with an expected improvement in the output gap, as y_{t-1} enters negatively and highly significantly. Thus, we find that fiscal policy is counter-cyclical, which is line with other papers on the cyclical response of fiscal policy such as Arreaza et al. (1998), Hercowitz and Strawczynski (2004) and Lane (2003). There is no apparent debt stabilization motive, whereas the time trend is significant and negative. Column (1b) displays the results when we include the squared output gap, which is the variable we are most interested in. We see that the estimated coefficient on y_{t-1}^2 is positive and highly significant, while the other coefficients remain roughly unchanged. That is, the volatility of the output gap partly explains the variation in discretionary deficits.

Note that since y_{t-1} enters with a negative sign and the coefficient on y_{t-1}^2 is positive, our estimation results are in line with the hypothesis that fiscal policy can be described by an asymmetric loss function where negative output gaps are weighted more heavily than positive ones. Consequently, the government pursues stabilization policy in a precautionary way generating an upward biased deficit.

Columns (2a) and (2b) largely confirm these results. However, with the primary deficit cyclically adjusted, the output gap and the squared output gap exert weaker influences. This result is as expected, as the automatic response of revenues to variations in the output gap is now excluded. Still, the squared output gap and, with the exception of specification (2a), the output gap remain significant.

[8] Our results are robust with respect to different smoothing parameters.

The coefficient estimates allow us to quantify the precautionary bias that results from the asymmetry in the loss function. According to specification (2b), which is our preferred specification, the deficit bias amounts to 0.11 percent of GDP.[9] Since we observe an average deficit of 0.86 percent of GDP in our sample, we conclude that 13 percent of the average deficit in our sample can the attributed to asymmetric stabilization policy.

Next, we augment our estimating equation with political economy variables to test for potential linkages between the deficit bias and our political economy variables as discussed above. Results are presented in Table 2. We test for the explanatory power of each political variable separately, without (columns a) and with (columns b) interaction terms between the political variable under consideration and y_{it-1} and y_{it-1}^2.

Columns (1) and (2) show that, while the signs are as expected, the degrees of government fragmentation and government majority do not affect the deficit, nor the deficit bias. The vote share of government parties (column 3) reduces the deficit, as expected, except when we include interaction terms. The interaction terms involving the fragmentation variables in columns (1)-(3) are insignificant, suggesting that fragmentation is not linked to the size of the precautionary bias. In particular, we cannot confirm that a fragmented government leads to a higher precautionary bias, as is the case with the conventional deficit bias from the political economy literature.

Interestingly, a rural interest of the largest government party (column 4) significantly increases the deficit once the interaction with the output gap and its square are included. Rural interest reduces both the degree of counter-cyclicality and the influence of output gap volatility. Thus, while rural lobbying results in higher deficits in general, it diminishes the precautionary motive to counteract downturns more strongly than upturns.

From column (5) we see that plurality in legislative elections reduces the deficit, which is consistent with a stronger fiscal accountability of majoritarian systems. Interestingly, we obtain a positive and significant coefficient on the interaction term between the squared output gap and plurality. Thus, plurality tends to increase the precautionary behavior of the government. This suggests that fragmentation would generate an asymmetry in fiscal policy, for example because

[9] Recall that the bias equals the average deviation of the deficit from the target level and is given by $c\sigma^2$, where σ^2 is the variance of the output gap. In our sample the variance of y_t is 1.20, which translates into a precautionary bias of $c\sigma^2 = 0.11$ percent of GDP.

interest groups discount total costs of government spending more heavily in upturns than in downturns.

Deficits are greater in election years according to column (6), but the effect turns out to be insignificant once the interaction terms are included. The interaction terms themselves are insignificant as well. A larger number of autonomous regions (column 7) increases the deficit, which again confirms the fragmentation hypothesis. Furthermore, the effect is stronger the larger the output gap, which renders fiscal policy pro-cyclical, while the interaction term involving the squared output gap is insignificant.

Local governments (8) reduce the deficit and they do so independently of the output gap, which might suggest that local fiscal authorities are more accountable for their policies than central ones. The interaction term of local governments with the squared output gap is also insignificant.

Overall, the parameter estimates remain remarkably robust across specifications when we control for political economy variables. In particular, we find that regardless of the political variable included, fiscal policy remains counter-cyclical, and y_{t-1}^2 enters positively and significantly at least at the ten percent level. We find only limited support for the hypothesis that the precautionary bias is related to political economy issues. Although our results indicate that plurality tends to increase the precautionary bias, while rural interests of the government have a dampening effect, most political economy variables do not appear to exert any influence on the precautionary bias. Thus, we conclude that the precautionary spending motive has significant explanatory power on its own, and is not due to some specific political incentive structures.

5 Conclusion

In this paper we explore how precautionary fiscal stabilization policy due to asymmetric fiscal preferences may give rise to a bias in the public deficit, that is a deficit that on average exceeds the target level. In our empirical analysis, we find that fiscal stabilization policy in the OECD is indeed consistent with an asymmetric loss function. Although our results for plurality suggest that the bias is systematically linked to the electoral system, overall we find only little evidence for the deficit bias to be linked to political economy issues. In other words, we find only limited evidence for a deviation of the government's loss function from the constituency's. Therefore, we cannot conclude that the bias is inefficient from a social welfare point of view.

According to the literature, starting with the run-up to the treaty of Maastricht in 1992 governments have opted more often to restrain fiscal policy via fiscal rules rather than use it as a potential instrument for stabilization. As our panel primarily covers the post-Maastricht period, it is perhaps not surprising that we find a general independence of fiscal policy from political institutions. Our results concerning the lack of a link between political economy aspects and the deficit bias may simply mirror the fact that fiscal policies have been required to pursue balanced budgets as a primary goal.

We would like to point out that while we link precautionary fiscal policy to political economy aspects in our empirical analysis, it would also be interesting to examine the potential relation between political economy and fiscal policy over the business cycle from a theoretical point of view. Such analysis might also allow to investigate welfare implications, and appears to be an interesting topic for future research.

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Table 1: Fiscal policy reaction function

	d_t =Primary deficit		d_t = Cyclically adjusted primary deficit	
	(1a)	(1b)	(2a)	(2b)
y_{t-1}	-0.50 (-3.17)	-0.59 (-3.94)	-0.17 (-1.49)	-0.21 (-1.82)
y_{t-1}^2		0.20 (3.21)		0.09 (2.13)
$debt_{t-1}$	-0.01 (-0.90)	-0.01 (-0.82)	-0.02 (-2.09)	-0.02 (-2.06)
$trend$	-0.10 (-3.26)	-0.08 (-2.58)	-0.04 (-1.79)	-0.03 (-1.38)
R^2	0.08	0.10	0.06	0.07
N	371	371	371	371

Table 2: Fiscal policy reaction function (cyclically adjusted primary deficit) with political controls

	Government fragmentation							
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
y_{t-1}	-0.19 (-1.64)	-0.19 (-1.67)	-0.20 (-1.79)	-0.19 (-1.67)	-0.19 (-1.70)	-0.19 (-1.69)	-0.19 (-1.61)	-0.21 (-1.75)
y_{t-1}^2	0.08 (2.12)	0.11 (2.00)	0.08 (2.07)	0.08 (2.03)	0.08 (1.90)	0.09 (1.99)	0.07 (1.79)	0.10 (1.95)
$debt_{t-1}$	-0.02 (-1.98)	-0.02 (-1.98)	-0.02 (-2.05)	-0.02 (-2.07)	-0.02 (-2.09)	-0.02 (-2.09)	-0.02 (-2.04)	-0.02 (-2.01)
$trend$	-0.03 (-1.43)	-0.03 (-1.30)	-0.03 (-1.47)	-0.03 (-1.45)	-0.04 (-1.62)	-0.03 (-1.54)	-0.03 (-1.45)	-0.03 (-1.43)
$govfrac$	1.19 (0.12)	1.29 (1.21)						
$govfrac * y_{t-1}$		-0.21 (-0.53)						
$govfrac * y_{t-1}^2$		-0.12 (-0.68)						
maj			-1.66 (-1.00)	-1.15 (-0.65)				
$maj * y_{t-1}$				0.20 (0.19)				
$maj * y_{t-1}^2$				-0.41 (-0.84)				
$numvote$					-0.05 (-1.87)	-0.04 (-1.48)		
$numvote * y_{t-1}$						-0.00 (-0.40)		
$numvote * y_{t-1}^2$						-0.00 (-0.74)		
$govrural$							0.97 (1.35)	2.00 (2.97)
$govrural * y_{t-1}$								0.42 (3.00)
$govrural * y_{t-1}^2$								-0.13 (-2.32)
R^2	0.07	0.08	0.07	0.07	0.09	0.09	0.07	0.08
N	371	371	371	371	371	371	371	371

Table 2: Fiscal policy reaction function (cyclically adjusted primary deficit) with political controls, continued

	Elections				Federalism			
	(5a)	(5b)	(6a)	(6b)	(7a)	(7b)	(8a)	(8b)
y_{t-1}	-0.22 (-1.95)	-0.20 (-1.63)	-0.20 (-1.77)	-0.19 (-1.71)	-0.21 (-1.91)	-0.21 (-1.87)	-0.20 (-1.77)	-0.22 (-1.79)
y_{t-1}^2	0.10 (2.48)	0.23 (2.93)	0.08 (2.07)	0.07 (2.01)	0.10 (2.44)	0.13 (2.91)	0.07 (1.72)	0.11 (1.78)
$debt_{t-1}$	-0.02 (-1.83)	-0.02 (-1.62)	-0.02 (-2.09)	-0.03 (-2.13)	-0.02 (-2.00)	-0.02 (-0.97)	-0.01 (-1.30)	-0.01 (-1.33)
$trend$	-0.02 (-0.80)	-0.01 (-0.49)	-0.03 (-1.36)	-0.03 (-1.35)	-0.04 (-1.62)	-0.04 (-1.57)	-0.01 (-0.57)	-0.01 (-0.46)
$pluralty$	-3.75 (-2.90)	-4.08 (-3.13)						
$pluralty * y_{t-1}$		0.16 (0.69)						
$pluralty * y_{t-1}^2$		0.29 (2.01)						
$legelec$			0.32 (1.64)	0.23 (1.05)				
$legelec * y_{t-1}$				-0.16 (-0.86)				
$legelec * y_{t-1}^2$				0.06 (0.97)				
$auton$					1.89 (2.91)	1.59 (2.26)		
$auton * y_{t-1}$						0.54 (2.04)		
$auton * y_{t-1}^2$						0.31 (1.40)		
$state$							-1.50 (-2.61)	-1.66 (-2.91)
$state * y_t$								-0.04 (-0.41)
$state * y_{t-1}^2$								0.05 (1.01)
R^2	0.10	0.12	0.07	0.08	0.08	0.09	0.05	0.05
N	371	371	371	371	371	371	352	352

A Appendix: Data Sources and Variable Description

Variable	Description	Source
y_t	Hodrick-Prescott filtered log of real GDP	OECD Economic Outlook 76, own calculations
$primdef$	general government primary deficit	OECD Economic Outlook 76, Annex Table 29
$cycprimdef$	cyclically adjusted general government primary deficit	OECD Economic Outlook 76, Annex Table 28
$debt$	general government gross financial liabilities	OECD Economic Outlook 76, Annex Table 32
$govfrac$	The probability that two deputies picked at random from among the government parties will be of different parties.	Beck et al. (2001)
maj	The number of government seats divided by total (government plus opposition plus non-aligned) seats.	Beck et al. (2001)
$numvote$	The total vote share of all government parties.	Beck et al. (2001)
$govrural$	1 if the largest government party represents rural interests, 0 if not.	Beck et al. (2001)
$pluralty$	1 if a plural system is used where legislators are elected using a winner-take-all rule, 0 if not.	Beck et al. (2001)
$legelec$	1 if there was a legislative election in this year, 0 if not.	Beck et al. (2001)
$auton$	The number of contiguous autonomous or self-governing regions.	Beck et al. (2001)
$state$	1 if state or province governments are locally elected, 0 if not.	Beck et al. (2001)

Note: Sample comprises 20 countries during 1987-2005 (371 observations).