Government Size and Automatic Stabilizers: International and Intranational Evidence [*]

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Abstract This paper documents a strong negative correlation between government size and output volatility both for the OECD countries and across US states. This correlation is robust to the inclusion of a large set of controls as well as to alternative methods of detrending and estimation. In the international sample, a one percentage point increase in government spending relative to GDP reduces output volatility by eight basis points. Whereas in the US states the reduction in volatility is significantly larger ranging from thirteen to forty basis points.

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1 INTRODUCTION

Both in the United States and in the European Union the role of fiscal policy has been at the center of recent public debates. In the U.S. the discussions on the Balanced Budget Amendment have questioned the role of fiscal policy as a tool to stabilize business cycle fluctuations. A recent U.S. Treasury Department study concluded that in the absence of automatic stabilizers, at the peak of the last recession the U.S. economy would have added 1.5 million people to the ranks of the unemployed and would have raised the unemployment rate to nearly 9 percent. As a result, the Balanced Budget Amendment "could turn slowdowns into recessions, and recessions into more severe recessions or even depressions".[1] In Europe, because of the creation of a single currency area and the disappearance of national monetary policies, the debate has focused on the role that national fiscal policies can play and the need for a fiscal federation. The permanent limits on budget deficits set by the Growth and Stability Pact have been criticized for not leaving enough room for fiscal policy to smooth output fluctuations.[2]

Both of these debates are based on the assumption that fiscal policy is important for smoothing business cycle fluctuations. The traditional view on automatic stabilizers has focused on the ability of taxes and transfers to stabilize disposable income. The assumption is that in the presence of a negative shock to income, taxes net of transfers react more than proportionately so that disposable income is smoother than income. This is, for example, the starting point of DeLong and Summers (1986) in their discussion of the effects of automatic stabilizers in the US economy during the post-war period. But the role of automatic stabilizers does not need to stop there. As suggested by the quote above, automatic stabilizers might have effects not only on disposable income but also on GDP itself. Gali (1994) studies the effects of government size on GDP volatility in a stochastic general equilibrium model to conclude that the theoretical relationship is ambiguous and its sign depends on a number of parameter values and a range of underlying assumptions. Despite the theoretical ambiguity, the empirical evidence he presents is indicative of a negative correlation between government size and volatility, i.e. larger governments stabilize output. Rodrik (1998) takes this stabilization role of the government sector as given and argues that exactly because

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[1] Robert Rubin, "White House Briefing on the Balanced Budget Amendment," Federal News Service Transcript, February 24, 1995.

[2] Eichengreen and Wyplosz (1998).

governments reduce the inherent volatility in the economy, one should expect that more open economies, which are by implication more volatile, will tend to have larger governments. The political economy argument in Rodrik (1998) suggests that there is endogeneity in the joint determination of overall economic volatility and the size of government spending.

Our paper explores the relationship between the average size of government as measured by the share of government spending or taxes in total output and the volatility of business cycles. The motivation for this focus is two-fold. First, there is evidence that across countries government size is strongly correlated with conventional measures of automatic stabilizers like elasticities of transfers and taxes or the progressivity of the tax system.[3] Second, going beyond the effect of tax elasticities, the size of government spending might in itself be a significant determinant of the characteristics of business cycles.[4] In particular, government consumption can be instrumental in propagating or dampening economic fluctuations, either by changing the structure of incentives to work or to invest in a market-clearing real business cycle model or by influencing the aggregate demand in a New Keynesian model with slow adjustment of wages and prices.

The finding that countries with larger governments experience less pronounced fluctuations in economic activity has important policy implications and can be used as a yardstick for evaluating the success of business cycle models in matching empirical facts. However, to employ this negative correlation between government size and volatility in a meaningful discussion of alternative theories one has to document first the robustness of the result to changes in the econometric specification and to explore its sensitivity to the inclusion of obvious determinants of volatility, like the growth rate of output, economic openness, and specialization, among other explanatory variables. This paper reports an extensive empirical investigation of the relationship between government size and macroeconomic volatility and frames the results in terms of plausible avenues for theoretical explanations of the key findings. We consider the sensitivity of the documented relationship to inclusion of justifiable controls and we analyze

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[3] Van den Noord (2000) documents a positive correlation between average primary expenditures and the cyclical sensitivity of the fiscal position for the OECD countries. We will come back to this correlation later in the paper and we will provide additional supporting evidence using our intranational data.

[4] For example, the debate on the need for a fiscal federation in Europe has focused on the minimum size of the budget necessary to ensure sufficient stabilization of output fluctuations rather than on the required response of taxes and transfers for a given budget size.

in detail possible sources of endogeneity. Furthermore we study the variation of the conditional correlation over time, as well as the importance of the detrending method. To strengthen our confidence in the reported facts we explore the relationship between government size and volatility using both international and intranational data. The use of two data sets is not simply a robustness check across different samples. Intranational data from the US states allow us to deal with the endogeneity of government size in a straightforward manner since fiscal variables related to the federal budget are determined at the federal level and are, therefore, not subject to the criticism of Rodrik (1998).

Our results show strong support for the notion that larger governments have a stabilizing effect on output. In both data sets and regardless of how we measure volatility or government size we find that an increase in the size of governments is always associated with a decline in output volatility. The robust nature of our results across different specifications, estimation techniques, sample periods, detrending methods, and data sets suggests that the negative statistical association between government spending and macroeconomic stability is not a spurious relationship and, therefore, it is a good candidate for testing the empirical strength of alternative business cycle theories.

The paper is structured as follows. The next section reviews previous research and provides the analytical background for our empirical framework. Section 3 presents the results from the international data. Section 4 extends the study to the US states. Section 5 interprets the results from both samples and Section 6 concludes.

2 PREVIOUS RESEARCH AND THEORETICAL FRAMEWORK

Automatic stabilizers are traditionally associated with the cyclical properties of taxes, transfers and government spending. The popular view on automatic stabilizers relies on the assumption that fluctuations in GDP or income are partially smoothed by changes in taxes and transfers over the business cycle so that disposable income is less volatile than income. Under the assumption that there are credit imperfections consumers cannot smooth completely consumption and therefore they benefit from the stabilizing effect of transfers and taxes on income. This logic is normally attributed to Keynesian models of the business cycle and the simplest representation is the traditional textbook version of the 'Keynesian cross'. In this setup, taxes stabilize disposable income and, therefore,

consumption.[5]

Empirically, this view of automatic stabilizers has led to the estimation of tax elasticities by regressing changes in fiscal variables on the growth rate of GDP.[6] The basic idea is to estimate the smoothing effect of the federal budget by running regressions of the type

$$\Delta log(y_t^d) = \alpha + \beta \, \Delta log(y_t) + \epsilon_t$$

where y_t, and y_t^d are GDP (or income) and disposable income. The estimated coefficient $1 - \hat{\beta}$ is interpreted as the percentage of volatility in GDP that is smoothed by taxes and transfers. These estimates are sometimes combined with measures of fiscal policy multipliers (e.g. the effect of changes in taxes on consumption and output) to calculate the stabilizing effects of automatic stabilizers. This empirical approach has also been recently used, although in a different context, by the literature on fiscal federalism.[7]

The above analysis of automatic stabilizers has several drawbacks. First, the theory is based on ad-hoc structures without explicit consideration of expectations, which of course are crucial in any consumption-smoothing model. Moreover, even though some of the New Keynesian literature has dealt with fiscal policy, there has not been a significant effort to understand the microfoundations of automatic stabilizers. Second, the analysis ignores the general effects that fiscal policy can have on the business cycle properties of macroeconomic aggregates. Tax schedules or unemployment benefits have general equilibrium implications beyond the reduced-form effects on disposable income and consumption. Therefore, in the empirical implementation of these models, the estimation of the cyclical elasticities of fiscal variables ignores the fact that output itself is endogenous and depends on the size and cyclicality of taxes, transfers and government spending.[8]

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[5] This is the benchmark used in DeLong and Summers (1986) in their discussion of the role of automatic stabilizers.

[6] See, for example, OECD (1984) and van den Noord (2000).

[7] See Sachs and Sala-i-Martin (1992), von Hagen (1992), Bayoumi and Masson (1996) or Asdrubali, Sorensen and Yosha (1996). Of course, this literature need not be directly associated with the prototypical Keynesian models because the insurance benefits provided by a fiscal federation do not rely on the existence of credit market imperfections. For a general discussion on the relevance of credit market imperfections for the theories of fiscal policy, see, for example, Woodford (1999).

[8] Also, those papers that have used regional data do not stress enough the distinction between stabilization and insurance of the federal budget, which is key to understand the impact of auto-

There are very few attempts in the literature to provide a theoretical analysis of automatic stabilizers in stochastic dynamic general equilibrium models. One of the theoretical papers that does consider the effects of steady-state government spending on output volatility is Gali (1994). In the context of a real business cycle model with flexible prices and continuous market clearing, he identifies differents effects of government size. These effects are, however, small in size and of ambiguous sign. Most of the effects are related to changes in the elasticities of capital and labor as a result of lower values of the steady state levels of employment and the capital output ratio.[9] The effects of government size on volatility depend on many parameters and are of ambiguous sign.[10] Despite the ambiguity of the theoretical model the empirical evidence provided in Gali (1994) suggests that there is a strong negative relationship between government size and output volatility.

There is a third strand of literature that relates to our work. When we look at the correlation between government size and volatility of output, this simple correlation is subject to a problem of reverse causality that might lead to a bias in a simple OLS regression (the coefficient will be biased towards zero). More volatile economies are expected to have bigger governments if indeed governments are capable of stabilizing output. This point is forcefully argued by Rodrik (1998) who studies how openness determines government size. The argument is that more open economies are subject to more volatility stemming from the fluctuations in world markets. Under the assumption that the government sector is the safe sector in the economy, Rodrik (1998) argues that households in more open economies will demand an increase in the share of the government sector as an insurance against external risks. His study documents a very robust positive correlation between government size and openness in a broad cross-section of countries, after controlling for socio-economic factors, income and many other variables. Thus, the size of government is endogenous and is determined, among other factors, by the volatility of the economy, and in particular by country's exposure to external

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matic stabilizers on consumption. This point is made in Fatás (1998) and Bayoumi and Masson (1998).

[9] For example, if government spending increases in steady state, consumers feel poorer and they cut both consumption and leisure, which leads to an increase in steady state employment. Because the elasticity of labor supply is inversely related to steady state employment, an increase in the work effort leads to a decline in this elasticity and therefore a decline in the volatility of output.

[10] Under standard parameterization, government spending is destabilizing.

risk.

In this paper we follow Gali (1994)'s approach and look at the correlation between measures of government size and volatility of macroeconomic aggregates across countries and regions. As mentioned in the introduction, studying the effects of government size is one of the possible ways of analyzing the stabilizing role of governments and it does not take into consideration other dimensions of fiscal policy such as the traditional elasticity measures of automatic stabilizers. There are, however, several reasons why we find that looking at government size provides a good starting point for analysis of the stabilizing role of governments. First, we can argue, following Rodrik (1998), that as long as the government sector is the safe sector in the economy, increasing its size will reduce the overall volatility of the economy. Second, the measurement of cyclical elasticities of fiscal variables is a difficult task and requires additional assumptions to uncover the structural relationship between those variables and the business cycle. Lastly, government size can be a proxy for the overall level of stabilization provided by fiscal policy. There is evidence that, across countries, government size and automatic stabilizers are strongly correlated. For example, van den Noord (2000) documents that, in a sample of OECD countries, larger governments are associated to larger cyclical elasticities of taxes and transfers. This is very much related to the observed positive correlation between marginal tax rates, progressivity and average taxes.[11] This connection between government size and traditional measures of automatic stabilizers is probably the reason why some of the literature on regional risk-sharing and the stabilizing role of a federal budget has stated its conclusions in terms of what the required size of the budget must be in order to provide an adequate level of transfers in response to asymmetric shocks.[12] Although, in theory, automatic stabilizers or regional insurance can be achieved through a budget that is zero on average, in practice, the responsiveness of transfers and taxes is associated to the size of the budget.

3 INTERNATIONAL DATA

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[11] In our empirical analysis we have used some available measures of the progressivity of the tax schedule for countries but the correlation with the size of the government is too high to distinguish the effects of both variables. We have also used some of the available estimates of the cyclical elasticities of taxes and obtained similar results. Finally, and for the intranational data, we have confirmed that there is a positive correlation between size of governments and the cyclical elasticity of fiscal variables. We report these results in Section 4.1.

[12] See, for example, the MacDougall Report, EC Commission (1977).

3.1 THE BASIC RELATIONSHIP BETWEEN GOVERNMENT SIZE AND VOLATILITY

To provide an empirical assessment of the effects of government size on the volatility of income we start with a data set for twenty OECD countries covering the years from 1960 to 1997.[13] The choice of this set is determined by the following reasons. First, our study requires an extensive list of macroeconomic variables, which are not available for a larger set of economies. Second, we try to evaluate how government spending affects the business cycle properties of key economic variables. Even if we could use proxy variables for less developed economies, it is not clear whether one can describe these economies as having a well-defined business cycle. Hence, we have focused on a set of industrialized economies, which presumably exhibit short-run fluctuations around a balanced growth path.

[Insert Figure 1 here]

Figure 1 reports a scatter plot of government size and the volatility of GDP for the sample of twenty OECD economies. Government size is measured as the average ratio of government spending to GDP and volatility is measured as the standard deviation of the growth rate of real GDP over the whole sample period.[14] There is a clear negative correlation between these two variables, first reported in Gali (1994). Column (1) of Table 1 presents the results of running a basic regression of volatility (VolY6097) on government size (GY6097). The coefficient is significant at better than 1% level and the adjusted R^2 is 0.44.

The results of this regression are certainly suggestive, but not completely reliable. It is clear that there might be a third factor affecting both volatility and government size, and what column (1) reports is simply a proxy for the correlation between volatility and this third factor. The existence of these factors can bias the above estimate in any direction. In general, the potential problems with the basic regression in column (1) are omitted variables bias and endogeneity.

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[13] The Appendix describes the data sources. We had to restrict ourselves to only those OECD countries, which have suffiently long time series for components of government spending

[14] In the regressions below we use the logarithm of government size. The use of logarithms is justified on grounds of having nonlinear relationship between size and volatility. It seems plausible to argue that an increase of government size from 5 to 10 % of GDP has a larger effect on volatility than the increase between, say, 40 and 45%. We do view, however, logarithmic transformation as somewhat extreme, but in all regressions reported in the paper, we do find that this transformation is not critical for our conclusions.

Table 1. Government Size and Volatility. OLS

| | Dependent Variable: VolY6097 | | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)
GY6097	-1.805	-2.261	-1.561	-2.014	-2.170	-1.728
	(3.99)	(3.80)	(2.25)	(3.20)	(2.69)	(2.11)
Open6097	-	0.272	0.050	0.007	0.261	-0.026
		(1.17)	(0.19)	(0.02)	(1.05)	(0.08)
GDPpc	-		-0.705	-	-	-0.713
			(1.73)			(1.38)
GDP	-		-	0.113	-	-0.046
				(1.12)		(0.41)
GR6097	-		-	-	0.030	-0.089
					(0.17)	(0.49)
Adjusted R^2	0.439	0.450	0.508	0.459	0.417	0.455

Sample: 1960-1990.
t-statistics in parentheses

First, there are clear candidates for explanatory variables for volatility, like GDP per capita, which are positively correlated with government spending. Second, as argued by Rodrik (1998), the size of government is endogenous to economic conditions, which casts doubts both on the unbiasedness and consistency properties of our estimator. To deal appropriately with the possible criticisms of the basic regressions we consider a large set of control variables and then we compare the results from the least squares regressions to the ones from regressions with instrumental variables.

Omitted variables bias

We first take the issue of omitted variables by including several controls in the basic regression. Column (2) of Table 1 shows that our result is robust to the introduction of openness (Open6097), which is measured as the average sum of exports and imports relative to GDP for the period 1960-1997. The coefficient of interest is still significant at the 1% level and has increased in absolute value. This increase is consistent with the arguments of Rodrik (1998) that a simple regression of volatility on government size would produce a coefficient biased towards zero. This regression, however, addresses only one part of the criticism, since the essence of Rodrik's argument is not so much the joint determination of

volatility and government size by openness, but about the endogeneity of government spending. We deal with this issue later in the paper by using instrumental variables.

We take column (2) in Table 1 as our baseline specification and we add different controls in order to deal with competing explanations for the negative coefficient on government size. Columns (3) to (6) introduce three basic controls: GDP per capita (GDPpc), GDP, and average growth over the sample period (GR6097). From a theoretical point of view these three variables can be correlated with both volatility and government size. GDP per capita is predicted to be positively correlated with government size because the demand for government services is income elastic (Wagner's Law). At the same time, one could argue that poorer economies, possibly because of less developed financial systems, might have more volatile business cycles.[15] Next, the inclusion of GDP is rationalized on the grounds that there are fixed costs in setting up governments, so a large economy will have a small government size. Simultaneously with this effect, we might observe that large economies are spared from the turbulence of world markets, because the size of the domestic market is large enough to preclude trading.[16] Finally, countries with smaller governments might grow faster because tax distortions are less pronounced when government spending absorbs a smaller part of output. At the same time, higher rates of economic growth are often associated to more volatile economies creating another source of possible bias from omitting a variable which is highly correlated with the size of the government sector. Keeping in mind all these considerations, we note that the last four columns of Table 1 confirm that, controlling for those three variables, does not substantially alter the size and significance of the coefficient on goverment size. Moreover, none of the controlling variables enters significantly in the regressions, impeding any attempt for evaluation of the importance of the considerations listed above.

In Table 2 we report the robustness of our results to further variations of the benchmark specification. First, we introduce four additional controls. The first variable (Spec91) is a measure of sectoral specialization based on Krugman (1991), which captures differences in sectoral shares across countries.[17] The second one is

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[15] Acemoglu and Zilibotti (1997) provide supportive evidence of this hypothesis.

[16] We discuss later the determinants of government size and elaborate further on these two controls.

[17] The data appendix describes the construction of this variable. It is calculated with 1991 data on sectoral production.

the standard deviation of the log-changes in terms of trade (ToT6097). The third control (PRSH90) is the share of primary products in total exports (in 1990). The latter two variables, used by Rodrik (1998), are measures of the volatility associated to open economies. Unlike the variables included in the regressions in Table 1, these three controls capture fundamental sources of risk, but it is not clear why they will be correlated with government size above and beyond their correlation with openness. We have included them to ensure that we can properly account for sources of economic volatility and thus we minimize the chance of having spurious estimate of the stabilizing role of government spending. Overall, the results of the first three columns in Table 2 indicate that these controls neither enter significantly in the benchmark regression, nor affect the coefficient on government size.

Column (4) in Table 2 addresses the issue of possible non-linearities in the effects of fiscal policy when governments are highly indebted. By including an interaction term between government size and the debt-to-GDP ratio (Debt*GY), we attempt to establish whether the stabilizing effect of government spending decreases as the debt-to-GDP ratio increases.[18] The results are mildly supportive of this conjecture as the coefficient is positive, although not significant at conventional levels.

Finally, columns (5) and (6) check the robustness of our result for alternative detrending methods. In this case we calculate volatility as the standard deviation of business cycle fluctuations as implied by GDP series detrended using a Hodrick-Prescott filter. Column (6) differs from column (5) by excluding the years 1991-1997 for Finland. The coefficient on government size is still in the vicinity of -2 for both specifications, but the striking improvement in the fit of the regression suggests that the large economic downturn in Finland associated with the collapse of the Soviet Union in the early 90's cannot be properly tackled by the Hodrick-Prescott filter. In both cases, columns (5) and (6), the coefficient remains significant and close in magnitude to our previous estimates.

Finally, another interesting dimension of checking the robustness of our results is the stability of the coefficient on government size over time. One might speculate that the rapid increase in the scope of government in the 1970s and then the decline of the welfare state in the 1990s will lead to time variation in the stabilizing effect of government spending. To evaluate this hypothesis we es-

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[18]   We have used the average debt-to-GDP ratio for the period 1990-97.

Table 2 Government Size and Volatility: Additional Controls. OLS

	Dependent Variable: VolY6097					
	(1)	(2)	(3)	(4)	(5)	(6)
GY6097	-2.586	-2.344	-2.184	-2.575	-1.912	-1.964
	(-4.02)	(-3.04)	(-3.69)	(-4.02)	(-2.97)	(-4.96)
Open6097	0.391	0.281	0.285	0.148	0.382	0.369
	(1.69)	(1.15)	(1.23)	(0.58)	(1.51)	(2.37)
Spec91	-0.328	-	-	-	-	-
	(-1.33)					
ToT6097	-	-0.027	-	-	-	-
		(-0.18)				
PRSH90	-	-	-0.135	-	-	-
			(-1.16)			
Debt*GY	-	-	-	0.112	-	-
				(1.45)		
Adjusted R^2	0.492	0.417	0.461	0.479	0.273	0.557

Sample: 1960-1997.
t-statistics in parentheses
All regressions include an intercept.

timate a sequence of rolling regressions using the baseline specification of column
(2) in Table 1. Each regression uses volatility and government size calculated for
a period of eighteen years, starting with the sample 1961-1978.[19] Figure 2 dis-
plays the coefficient estimate from each of the nineteen regressions together with
a 95% confidence interval. The coefficient is remarkably stable over time and,
obviously, we cannot reject the null that the parameter estimates are equal across
all sub-samples.[20]

[Insert Figure 2 here]

Endogeneity and government size

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[19] We chose eighteen years because the first and the last regression are equivalent to splitting
the sample in half. Windows of fifteen or twenty years produce almost identical results.

[20] We have checked also the robustness of our results by estimating a model with fixed effects,
since one might argue that large governments capture some uncontrolled country characteristic
that is strongly correlated with government size. There is no significant change in the estimated
coefficients. The results are available from the authors.

If governments stabilize business cycles, economies that are inherently more volatile might end up choosing larger governments. This is the main argument of Rodrik (1998) who emphasizes the link between openness, volatility and government size. To deal with these problems of endogeneity we need to find instruments for government size. Here, we use the political economy frameworks of Rodrik (1998), Alesina and Wacziarg (1998), and Persson and Tabellini (1998).

Table 3 reports regressions of government size on openness and several political and economic variables that can serve as instruments. The first column presents a Rodrik-type regression of government expenditures (GY7097) on openness (Open6069), real GDP per capita (GDPpc), dependency ratio in 1990 (Depend90), and urbanization in 1990 (Urban90). The justification for the initial set of explanatory variables is as follows. Openness affects the size of the government sector for reasons already discussed in Section 2. Namely, faced with higher volatility implied by greater openness, households will vote for an increase in the size of the government sector in order to minimize their exposure to risk. Turning now to the GDP per capita, according to the Wagner's Law richer countries can afford larger government sectors because some public goods are considered to be income elastic. Finally, the urbanization rate and the dependency ratio are standard determinants of government spending, as countries with larger non-urban population are expected to face bigger costs in providing public goods and also government spending increases with the rise in the ratio of retirees to working-age population. Relative to Rodrik's regression we have slightly changed the time frame with openness being measured as the average sum of exports and imports relative to GDP for the period 1960-1969 and government size is the average for 1970-1997.[21] The results are robust to alternative choices of average openness and average size. Openness enters with the expected positive sign and it is statistically significant at better than 1% level.

The second column controls for country size by including real GDP. This regression is in the spirit of the work of Alesina and different coauthors (Alesina and Wacziarg (1998), Alesina and Spolaore (1997) and Alesina, Spolaore and Wacziarg (1997)) who also argue that the size of government is endogenous and determined by politico-economic factors. In particular, Alesina and Spolaore (1997) argue that there are fixed costs in setting up governments. This suggests that smaller countries will have larger governments as percentage of GDP. Alesina, Spolaore

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[21] Rodrik's baseline regression is GY9092 on Open8089.

Table 3. Determinants of Government Size

Dependent Variable: GY7097			
	(1)	(2)	(3)
Open6069	0.200	0.167	0.101
	(3.50)	(1.63)	(0.98)
GDPpc	0.286	0.311	0.623
	(1.75)	(1.73)	(2.58)
Depend90	0.453	0.397	0.724
	(1.18)	(0.95)	(1.62)
Urban90	0.109	0.138	0.017
	(0.69)	(0.77)	(0.09)
GDP	-	-0.021	-0.011
		(-0.39)	(-0.22)
Presidential	-	-	-0.236
			(-1.58)
Majoritarian	-	-	-0.132
			(-1.36)
Adjusted R^2	0.446	0.413	0.476

Sample: 1960-1997.
t-statistics in parentheses
All regressions include an intercept.

and Wacziarg (1997) provide a theoretical justification for the well-documented negative correlation between country size and openness: Larger countries can afford not to trade with the rest of the world because their market size can ensure sufficiently high productivity. Hence country size is a joint determinant of both the size of government spending and of the degree of economic openness. Indeed, in a regression controlling for the size of the country the significance of the coefficient on openness is much smaller, thereby confirming the conjecture of Alesina and Wacziarg (1998) that country size might partially account for the correlation between openness and government size. Finally, the third column in Table 3 includes two dummy variables suggested by Persson and Tabellini (1998). The first one controls for the type of the political system – presidential or parliamentary – and takes a value of one for countries with presidential democracies. The second dummy controls for the type of the electoral system – majoritarian versus proportional – and it takes a value of one for countries that have majoritarian elections.

Persson and Tabellini (1998) argue that the direct accountability of politicians in presidential systems increases the competition both among politicians and voters and this implies less spending on every budget item and smaller governments. Furthermore, competition for voters in a majoritarian system targets the swing voter and creates incentives for more redistribution at the expense of the provision of public goods. Hence majoritarian systems should be associated with smaller spending on public goods. Both of these variables enter the regression with the expected sign, albeit both of them are insignificant. Yet, there is a significant improvement in the fit of the regression from 41.3% to 47.6%. The inclusion of these variables further reduces the magnitude and the significance of the coefficient on openness.[22]

To deal with endogeneity, we can use the regressors from column (3) in Table 4 as instruments for government size. In that list of potential instruments we replace past openness with area and distance because past openness might not be an appropriate instrument if the cross-sectional variation in openness does not exhibit time variation.[23] The five columns of Table 4 present the results associated to different specifications of our instrumental variables estimation. Column (1) shows the basic regression while Columns (2) to (5) introduce some of the controls used in Table 1. In all cases, the coefficient on government size is significant and, as expected, its size is always larger than in the OLS regressions. This increase suggests that taking care of the bias related to endogeneity improves our estimates.

To gain further confidence in the documented negative correlation between government size and volatility we check whether the instruments are uncorrelated with the errors in the second stage equation. A Hansen's test statistic for overidentification is reported in the last row of Table 4 together with its associated p-value. This statistic is distributed as a $\chi^2(k)$ random variable with k degrees of freedom, which are given by the number of overidentifying restrictions. Clearly, in none of the cases we can reject the exogeneity of our instruments.

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[22] Rodrik (1998) is aware of the fact that his results do not survive in the OECD sample once controls for country size are included. Our point here is not to judge the sensitivity of his results in different samples, but to find an appropriate set of instrumental variables for government size that is reasonably exogenous and does not suffer from problems associated with weak instruments. Clearly the regressors in column (3) provide one possible list of instrumental variables.

[23] Area and distance are often used as instruments for openness. Distance is defined as geographical Distance from 20 major world exporters. See for example Rodrik (1998) or Frankel and Rose (1998).

Table 4. Government Size and Volatility.
Estimation by Instrumental Variables

| | Dependent Variable: VolY6097 | | | | |
	(1)	(2)	(3)	(4)	(5)
GY6097	-1.817	-3.146	-2.676	-4.690	-3.202
	(-3.67)	(-3.75)	(-2.11)	(-2.05)	(-2.80)
Open6097	-	0.719	0.548	1.870	0.692
		(2.07)	(1.13)	(1.24)	(1.89)
GDPpc	-	-	-0.279	-	-
			(-0.48)		
GDP	-	-	-	0.280	-
				(0.82)	
GR6097	-	-	-	-	-0.069
					(-0.33)
OID test	1.458	0.656	0.618	0.352	0.731
p-value	(0.984)	(0.995)	(0.987)	(0.997)	(0.981)

Sample: 1960-1997.
Instruments: area, distance, GDP per capita,
dependency ratio, urbanization rate, total GDP,
and two dummies for political systems.
t-statistics in parentheses

Overall, these results extend the findings of Rodrik (1998): If indeed openness increases volatility and governments intervene to provide social insurance against external risk, then to what extent is this intervention successful? Do we indeed observe reduction in volatility? The answer is clearly yes. Moreover, we report that, in most specifications, the coefficient on openness is of the right sign: conditional on the size of government openness increases volatility of output, albeit the result is often statistically insignificant. Again both of these pieces of evidence are crucial building blocks for the hypotheses in Rodrik (1998).

3.2 ALTERNATIVE MEASURES OF VOLATILITY AND GOVERNMENT SIZE.

The results from the previous subsection strongly suggest that countries with larger governments experience smaller business cycle volatility. Moreover, this association does not arise spuriously as a result of omitted variables bias or endogenous determination of government size. Now we can probe deeper and focus on the details of this relationship by exploring which components of the budget

are the important determinants of the apparent reduction in volatility and what type of volatility is most significantly affected. The goal of this disaggregation is to understand further the mechanisms through which government size stabilizes output.

We would like also to study the impact on the volatility of different measures of economic activity in order to get a more accurate description of the stabilizing effects of fiscal policy. This is an important test for discriminating among different theories. For example, in the stylized model of Rodrik (1998) governments only stabilize GDP because as their share increases, the relative size of the 'safe' sector in GDP goes up. This mechanical explanation ignores any effects of fiscal policy and government size on the volatility of private output, that is the share of output not consumed by the government. Also, the more traditional view on automatic stabilizers emphasizes the smoothing role of fiscal policy on disposable income and consumption without making clear predictions about the effects on the volatility of total GDP.

We have run a battery of regressions of alternative measures of volatility on different measures of government size using openness as a control and as instruments the set used in Table 4. Results are presented in Table 5. Each entry in this table represents the estimate of the coefficient on government size from a regression of the volatility of the variable in the column on the measure of government size in the row. Again, each regression includes also a constant term and openness as a control, whose coefficient estimates are not reported to reduce clutter. Thus the first entry corresponds exactly to the same regression as in column (2) of Table 4.

The first thing to notice is that all coefficients are negative. In almost all cases these measures of size indicate statistically significant reduction in volatility in countries with larger governments. Interestingly, the only regression that produces slightly insignificant coefficients is when the explanatory variable is indirect taxes. This is not surprising as indirect taxes normally lack the standard attributes of automatic stabilizers like progressivity. Of the findings in the table, we have to stress the significance of the results for private output (PrivGDP). These results indicate that the stabilizing effect on GDP of larger governments is not simply the mechanical contribution of having a larger and more stable government sector to the overall macroeconomic stability. Clearly, we have to consider carefully the incentive effects of government size or potential demand linkages that can possibly explain the extension of the stability of the government sector to private output.

Furthermore, it is noteworthy that the stabilization of total GDP is as large as the stabilization of disposable income (DI) or consumption (CONS). As argued above, the traditional analysis of automatic stabilizers has focused on the ability of taxes and transfers to smooth disposable income, ignoring the effects on GDP. The table also suggests that non-wage spending plays an important stabilizing role for every measure of volatility, including consumption.

Table 5. Volatility and Government Size
Estimation by Instrumental Variables

	GDP (1)	DI (2)	PrivGDP (3)	CONS (4)
Total spending	-3.146	-3.153	-2.613	-3.590
	(-3.75)	(-2.86)	(-2.55)	(-2.76)
Non-wage spending	-1.234	-1.156	-0.830	-1.274
	(-4.24)	(-2.97)	(-2.07)	(-2.41)
Wage spending	-3.095	-2.725	-1.525	-2.836
	(-2.59)	(-1.92)	(-1.22)	(-1.70)
Transfers	-1.082	-1.382	-1.393	-1.703
	(-1.64)	(-1.73)	(-2.02)	(-1.88)
Taxes	-2.625	-2.653	-2.210	-2.875
	(-3.33)	(-2.54)	(-2.34)	(-2.34)
Direct taxes	-0.971	-1.026	-0.683	-1.312
	(-3.02)	(-2.68)	(-1.69)	(-2.61)
Indirect taxes	-1.295	-0.773	-0.306	-0.580
	(-1.97)	(-0.89)	(-0.40)	(-0.59)

Sample: 1960-1997. t-statistics in parentheses
Instruments: area, distance, GDP per capita, dependency ratio, urbanization rate, total GDP, and two dummies for political systems. All regressions include an intercept and controls. Each entry reports the coefficient in a regression of the volatility of the variable in the column on the measure of government size in the row.

Does this set of results conform to the theoretical understanding of automatic stabilizers? Broadly speaking, it is consistent with the traditional view where transfers and taxes are important parts of the volatility reduction mechanism. The fact that direct taxes and transfers perform better than indirect taxes

in the above regressions seem to support the view that fiscal variables that help smoothing disposable income (because of progressivity or because of responsiveness to economic conditions) are behind our results. Some of the other coefficients are more difficult to interpret. First of all, given that total government spending is highly correlated with taxes and therefore does not exhibit autonomous cross-sectional variation in thirty-year averages, it is difficult to tell whether the results for total spending are simply coming from the fact that spending is acting as a a proxy for total taxes. Similarly, the size and significance of the different components of spending (wage and non-wage spending) could fit well in models where the aggregate demand effects of government spending are responsible for stabilizing the economy but they can also act as proxies for some of the other variables. We will continue this discussion in Section 5, when we look at the extent to which these results can be generated by different models of the business cycle.

4 INTRANATIONAL EVIDENCE

4.1 INTERNATIONAL VS. INTRANATIONAL DATA

In this section we look at the evidence on the stabilizing effect of government size using intranational data from US states. This data set provides several specific advantages and allows us to address questions that could not be dealt with the international sample. First of all, we recognize that one of the difficulties in interpreting our findings from the cross-country analysis is the fact that there are many country differences that are difficult to control for and that might be partially responsible for some of the reported correlations. The negative correlation between government size and different measures of volatility of business cycles could be caused by institutional differences across countries that we are not able to capture even with an extensive list of explanatory variables. By changing the unit of observation from countries to regions that share national institutions, national federal tax laws, and have similar labor markets we can provide sharper conclusions on the importance of government size for macroeconomic stability.

A second advantage of using intranational data is that one can use the additional dimension of different levels of government to shed light on some of the issues that could not be properly addressed with the international dataset. For example, the fact that fiscal variables related to the federal budget are determined at the national level helps us deal with the reverse causality problems that we

faced in the previous section. Differences in the ratio of federal taxes to Gross State Product (GSP) across US states cannot be justified by political economy arguments based on the different degree of openness of different regional units. Instead, they are the result of differences in variables such as income per capita, degree of urbanization, dependency ratios that are exogenous to the volatility of GSP.[24] For this reason, there is no need to use instruments in a regression of volatility on government size, when the latter is measured by federally-determined fiscal variables.[25]

Measuring government size at the state level, however, raises several important questions. First, while at the country level government expenditures are properly defined, the allocation of federal expenditures across states is not well determined and, in general, it is impossible to construct accurately disaggregated state-level figures for government spending. Therefore, we rely in this section more on measures of government size based on tax revenues. The second issue is the origin of the observed variation across states of measures of government size based on federal taxes. In our cross-country study differences in tax laws and in the responsiveness of transfers or general government spending explain to a large extent the variation in government size across countries. The variation in the ratio of federal taxes to income across US states, however, cannot be explained by the same arguments, because US states are facing exactly the same tax schedule and federal budget laws. This does not imply that there are no relevant cross-sectional differences in the size of government or in the allocation of government expenditures. First, differences across states in GSP per capita, the dependency ratio or income distribution result in different levels of federal taxes or transfers. In some cases, this will be the case because of the progressivity of taxes. If this is the case, a state with high average federal taxes will also be a state with high marginal tax rates.[26] Second, state governments have the freedom of setting their

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[24] It could be argued that because of the convexity of the tax schedule, a state with more volatile income will have higher average taxes. If this was the case, the coefficient in our specification, a regression of volatility on taxes as a percentage of GDP, will be biased towards zero (i.e. against our hypothesis).

[25] Of course, even if these variables are exogenous to the volatility of GSP, we still need to control for any variable that can be correlated with the volatility of output and the size of the government to avoid omitted variables bias.

[26] Given that the federal tax schedule is the same for all US states, the degree of progressivity faced by all States is the same. However, as there are differences in income per capita or the distribution of income, different states will face different marginal rates. Given the progressivity of the schedule, states with higher average tax rates are likely to face higher marginal tax rates.

state and local taxes and therefore their size. In a sense, the intranational data provides a more stringent test of the propositions stated in previous sections. By having only limited sources of variation of the explanatory variables we might face more difficulties finding any correlation between government size and volatility of business cycles. At the same time, this data set offers us the possibility of narrowing the range of plausible explanations, since documenting a negative correlation will put the progressivity of tax schedules as the primary candidate for explaining the stabilizing role of government size.

To further address this issue, and to be able to better relate our results to previous literature, we have compared our measures of government size at the state level to common estimates of automatic stabilizers, namely the elasticity of fiscal variables to income fluctuations. The recent literature on intranational risk-sharing has looked at the response of federal taxes and federal transfers to changes in income. Following Sorensen, Wu and Yosha (2000) we have constructed, for each U.S. state, a measure of the cyclical elasticity of federal taxes. For each state we have run regressions of the type

$$\Delta FTaxes_{it} = \alpha_i + \beta_i \Delta gsp_{it} + \epsilon_{it}$$

where $FTaxes$ and gsp are federal taxes and gross state product.[27] The coefficient β_i has the interpretation of how cyclical federal taxes for different U.S. states. Is this coefficient related to our measures of government size? The answer is yes. Figure A1 in the appendix shows a scatterplot of both variables. There is a strong positive correlation, which indicates that, despite facing the same federal tax schedule, the cyclical sensitivity of taxes is different across states. More importantly, this elasticity is positively correlated with the ratio of federal taxes to GSP.[28] Therefore, we feel that our measures of size of the government are capturing relevant differences of fiscal variables at the state level, which are related to traditional measures of automatic stabilizers. This evidence is consistent with the results of van den Noord (2000) for OECD economies and it is supportive of the interpretation of government size as a proxy for automatic stabilizers.

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[27] For a more detailed analysis of the cyclical elasticity of different state fiscal variables, see Sorenssen, Wu and Yosha (2000). We recognize that the estimates from this regression will be consistent only as long as GSP is exogenous – something against which we have argued in Section 2. We report this regression here only for comparison of other measures of the sensitivity of fiscal variables to our measure of government size.

[28] A regression of the estimated β_i's on the ratio of federal taxes to GSP produces a positive coefficient significant at the 1% significance level.

4.2 DESCRIPTION OF THE DATA

The dataset includes different measures of economic activity at the state level: gross state product (GSP), disposable state income (DSI), retail sales (CONS) and manufacturing investment (INV).[29] There are two levels of fiscal variables. At the federal level we have federal taxes (FTaxes) (divided into personal (FPTaxes) and non-personal taxes), federal transfers (FTransf) and federal grants (FGrants). At the state level, we have state and local taxes (STaxes) and state and local government consumption (SGCons). We measure all this variables as a ratio to gross state product.[30]

In the appendix, Table A.1 presents the average and the standard deviation over the sample period for all the measures of government size. The variable that more closely resembles the overall government size used in the international data is total taxes (federal taxes plus state and local taxes). The average size of total taxes (27.4%) is smaller than in the international data (35%), as the US is one of the countries in the sample with the smallest government. Also, the standard deviation is small (3.5% for the US states versus 7.4% for the OECD countries). Therefore, as suggested above, the range of the explanatory variable that we will use in our regressions is significantly smaller than in the international data. The reason is that a large part of the taxes are set at the federal level where there are no considerations of state preferences for larger governments or for more insurance as in the case of countries.

4.3 GOVERNMENT SIZE AND BUSINESS CYCLE VOLATILITY

We now look at the relationship between different measures of government size and volatility of business cycles. Following our analysis of the international data, we run regressions of business cycle volatility on government size.

We start with the most general measure of government size: total taxes as percentage of GSP. This includes federal, state and local taxes. Figure 3 plots the volatility of GSP growth rates against this measure of government size. The

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[29] In all our regressions we include 48 states. Hawaii and Alaska are excluded from our sample. Consumption is not available at the state level. Following Asdrubali, Sorenssen and Yosha (1996) we approximate state consumption by retail sales. Retail sales are rescaled to that the aggregate of state consumption corresponds to US consumption.

[30] Using any other measure of economic activity in the denominator, such as state income, has no effect in any of the results. We use GSP to be as close as possible to the analysis of international data.

negative correlation is evident from the scatter plot.

[Insert Figure 3 here]

Table 6 presents the results of a regression of volatility on government size measured by taxes as % of GSP. We obtain a negative and significant coefficient and a good fit (column (1)). The size of the coefficient (6.08) is significantly larger than in the international data. The other columns display regression results when we introduce the controls, which were motivated in Section 3. The first three controls are GSP, GSP per capita (GSPpc), and growth (Growth6390), all of them measured as the average over the full sample.[31] In all cases, the coefficient on government size (taxes) is highly significant and its size is practically unchanged from the first regression.

In the regression of column (6) we introduce two controls that capture differences in the production structure of US states. The first one is the share of manufacturing in GSP (Manuf), the second one is an index of specialization (SPEC) based on Krugman (1991) and similar to the one used for the OECD countries.[32] The coefficient on government size is still significant although its magnitude is now smaller (3.4) and closer to the results of the international data set.[33]

The last column of Table 6 introduces two controls related to state fiscal variables. The first one is a measure of state debt (Debt), the second one is an index of fiscal restrictions at the state level (FRestrict).[34] The coefficient on taxes is, once again, significant and broadly consistent, in size, with the other columns.[35]

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[31] Using initial values leads to almost identical results as the ones reported in Table 6.

[32] The appendix describes the construcion of this index.

[33] Although not reported in the table, we have also controlled for differences in income distribution across US states. Although the relationship between income distribution and GSP volatility is not obvious, we have included a measure of the state poverty rate in a regression similar to the ones presented in Table 6. The coefficient in government size is unchanged and the poverty rate enters with a negative coefficient, although not significant.

[34] We have used these two variables for thirty-eight states as averages over the period between 1981 and 1990. The construction of these variables is reported in Bayoumi, Goldstein and Woglom (1995). We would like to thank Xavier Debrun for giving us access to these data.

[35] As the scatter plot in Figure 3 indicates, there are some outliers in our sample. To confirm that our results are not driven by these outliers, we perform two sets of estimation. First, we removed the 5 states with the highest volatility (the number 5 is arbitrary and comes simply from visual inspection of Figure 3). The second, and more rigorous approach, was to use a version of the least absolute deviation (LAD) estimator, which is known to be a robust estimator. We replicated

Table 6. Volatility (GSP) and Government Size

| | Dependent Variable: Std.Dev. Growth Rate of GSP | | | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Taxes	-6.084	-5.096	-6.708	-5.832	-5.343	-3.396	-4.650
	(-3.58)	(-3.66)	(-4.53)	(-3.50)	(-5.90)	(-3.06)	(-3.38)
GSP	–	-0.423	–	–	-0.576	-0.258	-0.650
		(-2.36)			(-3.36)	(-1.94)	(-2.38)
GSPpc	–	–	2.300	–	3.325	0.551	4.380
			(1.83)		(3.67)	(0.35)	(2.75)
Growth6390	–	–	–	-0.289	-0.338	-0.356	-0.248
				(-1.73)	(-1.76)	(-1.73)	(-1.26)
Spec	–	–	–	–	–	4.587	–
						(2.77)	
Manuf	–	–	–	–	–	-2.233	–
						(-0.77)	
Debt	–	–	–	–	–		-0.270
							(-1.67)
FRestrict	–	–	–	–	–		-0.063
							(-1.38)
Adjusted R^2	0.221	0.298	0.260	0.246	0.223	0.492	0.356

Sample: 1963-1990. t-statistics in parentheses

Figure 4 studies the time variation of the coefficient on government size by running a sequence of rolling regressions with an eighteen-year window. Unlike in the international data, there seems to be evidence that the size of the coefficient has increased in absolute value over time. While there is no clear explanation for this time variation, we may point out that one has to be careful in interpreting this result because of the difficulties associated with measuring output volatility over short periods of time.

[Insert Figure 4 here]

4.4 ALTERNATIVE MEASURES OF VOLATILITY AND GOVERNMENT SIZE

completely Table 6 using these two procedures and in all regressions the coefficient on government size was negative and statistically significant. The results are available from the authors.

Table 7 replicates the regressions of column (5) in Table 6 for different measures of government size and for different measures of volatility. The regression is

$$\text{Volatility}_i = \alpha + \beta_1 \text{Govt.Size}_i + \beta_2 GSP_i + \beta_3 GSPPC_i + \beta_4 Growth6390_i + \epsilon_i$$

As measures of volatility we look at the standard deviation of the growth rate of GSP, disposable state income (DSI), consumption (CONS), and investment (INS). As measures of government size we consider various taxes: total (Taxes), personal (PTaxes), federal (FTaxes), state and local (STaxes), personal state and local (SPTaxes); as well as federal grants (FGrants), federal transfers (FTransf), and state and local government consumption (SGCons). We only report the size and significance of the coefficient on government size (β_1).

Focusing on the first column, we can see the effects of different measures of government size on the volatility of GSP. The first row in that column reports the same coefficient as in column (5) of Table 6 where government size was measured as total taxes. In all other cases except for federal grants and local and state government consumption, the sign of the coefficient is negative. The most significant coefficient (and also the best fit in the regression) corresponds to the case where government size is measured as total personal taxes. It is interesting to notice that for those variables that are not part of the federal tax system and that can be considered more discretionary and state specific, we find insignificant coefficients (for example federal grants or state and local government consumption). A possible explanation for why federal grants or state and local government consumption do not display a significant correlation with measures of volatility could be related to the issue of reverse causality. While in the case of federal taxes or transfers, it is difficult to argue that their size is determined by the volatility of a state business cycle (given that they are determined by a common federal tax system), in the case of federal grants or state and local expenditures, there is certainly more discretion. As a result, their values are more dependent on state-specific economic conditions, among which volatility might be an important factor. One can also argue that because of this discretionary element, their response to cyclical changes are less pronounced that in the case of personal taxes or transfers and, as a result, they play less of a role as automatic stabilizers.

What about different measures of volatility? Columns (2) to (4) report the re-

Table 7. Volatility (GSP) and Government Size

	GSP (1)	DSI (2)	INV (3)	CONS (4)
Taxes	-5.343	-2.007	-29.338	-1.709
	(-5.91)	(-2.90)	(-3.28)	(-1.06)
PTaxes	-4.197	-2.045	-25.024	-1.223
	(-6.17)	(-3.08)	(-4.14)	(-1.15)
FTaxes	-4.827	-2.035	-30.477	-1.631
	(-5.89)	(-3.24)	(-3.773)	(-1.07)
FPTaxes	-3.854	-1.865	-23.257	-1.035
	(-4.86)	(-3.05)	(-3.72)	(-0.88)
STaxes	-3.165	-0.753	-9.809	-0.926
	(-3.47)	(-1.28)	(-1.56)	(-1.02)
SPTaxes	-0.753	-0.375	-4.613	-0.304
	(-3.38)	(-2.11)	(-3.13)	(-1.28)
FGrants	0.400	0.028	18.694	1.213
	(0.45)	(0.06)	(3.15)	(1.35)
FTransf	-3.185	-1.524	-7.447	0.650
	(-2.19)	(-1.62)	(-1.07)	(0.67)
SGCons	0.530	1.883	13.582	0.305
	(0.34)	(1.72)	(1.81)	(0.32)

Sample: 1963-1990. t-statistics in parentheses
All regressions include an intercept and controls.
See text for details.

sults using as dependent variable different measures of the volatility of economic fluctuations. While in the international data we could look at private output (measured as output minus government spending), at the state level we cannot construct that measure and we have to rely on partial measures of some components of private output. The results are consistent with our previous estimates. First, we find a very good fit and a highly significant coefficient when we use the standard deviation of manufacturing investment growth rates as a measure of volatility. This confirms, as with the international data, that the effect on volatility is not simply coming from the fact that the government is absorbing a larger share of production.

Second, using the volatility of disposable state income as a measure of

macroeconomic stability, we document that the stabilizing effects are smaller in magnitude although they are still consistently negative and significant. Once again, personal taxes stand out as the variable that produces the best result in terms of significance. In the case of consumption, none of the measures of government size are significant. This surprising result can be partially explained by the fact that we are using retail sales as an approximation to state consumption.

Interestingly, there are two variables that appear as positive and significant in most of the regressions, namely federal grants and state and local government consumption. One has to take these results with great care because they are not robust to the introduction of additional fiscal variables in these regressions. For example, if we introduce total taxes and federal transfers in the same regression as federal grants, the coefficient on federal grants becomes negative, although insignificant.

5 INTERPRETING THE RESULTS

In the previous two sections we have found that there is a strong and negative correlation between government size and the volatility of business cycles both across countries and across US states. How do we interpret these results? What do we learn about the stabilizing role of fiscal policy? First of all, we find that the robustness of our central result to different specifications, controls and samples suggests that this relationship is a fundamental one that needs to be taken into account when testing alternative theories of the effects of fiscal policy and, more generally, of the business cycle. Once this fact is accepted, the remaining question is what lies behind government size. Why is it that large governments are able to stabilize the economy? Here, our interpretation will be more tentative as we cannot possibly discriminate between some of the alternative explanations but the evidence is certainly suggestive of the possible mechanisms behind our estimates.

Table 8 provides a summary of the economic significance of our results and compares the implied stabilizing role of different components of fiscal policy. The coefficients of Tables 5 and 7 are not directly comparable because the explanatory variables are in logs. To make coefficients comparable, in Table 8 we calculate the effect on volatility of increasing each of the measures of government size by 1% of GSP (or GDP). Across different fiscal variables we see that personal taxes and transfers have the largest effect in the intranational data. Also, in the international sample, although the estimated effect of indirect taxes is larger than

Table 8. Change in Volatility (GSP or GDP)
as a result of a 1% increase in

Intranational		International	
Taxes	-0.21	Taxes	-0.07
PTaxes	-0.42	Direct Taxes	-0.08
FTaxes	-0.28	Indirect Taxes	-0.10
FPTaxes	-0.47	Transfers	-0.07
STaxes	-0.38	Spending	-0.08
SPTaxes	-0.39		
FTransf	-0.38		
FGrants	0.14		
SGCons	0.04		

that of direct taxes, this coefficient is insignificant in the regressions of Table 5.

These results lend support to the traditional Keynesian view of automatic stabilizers. Fiscal policy has a stabilizing role on output fulctuations. This role goes beyond the smoothing of disposable income and consumption as it also affects the volatility of GDP (or GSP) itself. Our results also indicate that the size of the budget is key to understanding the stabilizing effects of fiscal policy. Traditionally, the stabilizing role of fiscal policy has been associated to the size and volatility of the budget deficit and not the budget itself. Although, as we have argued before, there is evidence that overall size and responsiveness of fiscal variables are strongly correlated, our results raise the question whether the size of governments is important in itself. Finally, the results of Table 8, provide evidence in favor of the hypothesis that personal taxes and transfers are the most efficient tools to smooth disposable income.

Can these results be reconciled with a market-clearing model of the business cycle? As shown in Gali (1994), a standard RBC model cannot replicate the strong negative correlation between government size and volatility of output fluctuations. However, in Gali (1994) important aspects of fiscal policy, such as progressivity or countercyclical transfers, are ignored. Introducing progressive taxation will change both the distortionary effects of taxes as well as the intertemporal incentives to work and could provide avenues through which more progessive tax schedules reduce the response of labor supply to technology shocks.

An interesting fact is that the stabilizing effect in the intranational data is much larger than for the OECD economies.[36] This is consistent with the results

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[36] This difference would be smaller had we used the coefficient of the regression where controls

of Bayoumi and Masson (1998) where it is argued (and documented) that stabilization policies associated to a fiscal federation are more effective because they do provide true insurance across regional units and go beyond the stabilization of disposable income achieved through a countercyclical fiscal budget at the national level. This is further corroborated by the fact that the effect of federal personal taxes is higher than the effect of state personal taxes. According to this logic, the large estimate for state taxes might look somewhat surprising. However, this result might be due to the fact that state taxes acts as a proxy for total taxes. In fact, if we include both federal and state taxes in the same regression, the coefficient on state taxes becomes insignificant and three times smaller in size.

6 CONCLUSIONS

The role of fiscal automatic stabilizers has recently received much attention in the public debates around the issues of the Balanced Budget Amendment in the US and the need for a fiscal federation in the EMU area. Although recent research on the risk-sharing role of the federal budget has produced evidence on how federal taxes and transfers help smoothing fluctuations in income, the issue of the effects of automatic stabilizers on the overall volatility of the economy has not been dealt with.

In this paper we present evidence that there is a strong negative correlation between government size and the volatility of business cycles across OECD countries. This effect is not simply due to the fact that government expenditures are more stable than private expenditures and, as a result, large governments are associated to a less volatile GDP. The negative relationship is also present when we look at private output.

The simple estimate of the negative correlation between government size and volatility of GDP among OECD countries can be criticized because of reverse causality arguments. The reverse causality originates in the possibility that more volatile economies have larger governments in order to insure them against additional risk.[37] When we account for possible endogeneity, we find that the sta-

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for sectoral specialization were introduced (column (6) in Table 6). In that case, an increase in one percentage point of the taxes-to-GSP ratio in the intranational data would result in a reduction of 0.13 in the volatility of GSP, an estimate that is closer to the one of the OECD economies (0.07).

[37] Rodrik (1998) suggests this argument as an explanation of why more open economies have bigger governments.

bilizing effect of government size becomes more significant and larger in absolute value.

We then turn to the analysis of US states. The advantage of US states data is that some of the endogeneity problems of the international evidence are not present as federal fiscal variables are determined by the central government. Also, because US states share common institutions, labor markets and federal tax laws, we can better isolate the direct effect of government size on volatility. The results confirm the negative correlation reported for the OECD countries. States with larger taxes-to-GSP ratios display less volatile business cycles. The effects are significant and large. Interestingly, the size of the coefficient in the regressions for the US states are larger than the coefficient for the OECD countries. For the US states, we also study the role of the different components of fiscal policy at both the federal and local level. We find that personal taxes (federal or state and local) display the most negative and significant correlation with GSP volatility. This is consistent with the findings from the international sample where direct taxes had a more significant effect on volatility than indirect taxes.

7 References

Acemoglu, Daron and Fabrizio Zilibotti (1997). "Was Prometheus Unbound by Chance? Risk, Diversification, and Growth". Journal of Political Economy, 105(4).

Alesina, Alberto and Enrico Spolaore (1997). "On the Number and Size of Nations". Quarterly Journal of Economics, 21.

Alesina, Alberto, Enrico Spolaore and Romain Wacziarg (1997). "Economic Integration and Political Disintegration". NBER Working Paper, 6163.

Alesina, Alberto and Romain Wacziarg (1998). "Openness, Country Size and Government". Journal of Public Economics, 69.

Asdrubali, Pierfederico, Bent E. Sorensen and Oved Yosha (1996). "Channels of Interstate Risk Sharing: United States 1963-1990". Quarterly Journal of Economics, 111(4).

Athanasoulis, Stefano and Eric van Wincoop (1998). "Risksharing within the United States: What have Financial Markets and Fiscal Federalism Accomplished" Federal Reserve Bank of New York Research Papers, 9808.

Baxter, Marianne and Robert G. King (1993). "Fiscal Policy in General Equilibrium". American Economic Review, 83(3).

Bayoumi, Tamim, Morris Goldstein and Geoffrey Woglom (1995), "Do Credit Markets Discipline Sovereing Borrowers? ". Journal of Money, Credit and Banking.

Bayoumi, Tamim and Paul R.Masson (1996), "Fiscal Flows in the United States and Canada: Lessons for Monetary Union in Europe". European Economic Review, 39.

Bayoumi, Tamim and Paul R.Masson (1998), "Liability-Creating versus Non-liability-Creating Fiscal Stabilisation Policies: Ricardian Equivalence, Fiscal Stabilisation, and EMU ". Economic Journal, 108 (449).

Clark, Todd and Eric van Wincoop (1999). "Borders and Business Cycles" Federal Reserve Bank of New York Mimeo.

DeLong, Bradford and Lawrence H.Summers (1986), "Cyclical Variability of Economic Activity in the United States" in American Business Cycle, Edited by Robert J.Gordon, NBER and University Chicago Press.

EC Commission (1977), Report of the Study Group on the Role of Public Finance in European Integration (MacDougall Report), Brussels.

Eichengreen, Barry and Charles Wyplosz (1998). "The Stability Pact: More than a Minor Nuisance?" Economic Policy, 26.

Fatás, Antonio (1998). "Does EMU Need a Fiscal Federation?" Economic Policy, 26.

Frankel, Jeffrey and Andrew Rose (1998), "The Endogeneity of the OCA criteria". Economic Journal, 108 (449).

Galí, Jordi (1994), "Government Size and Macroeconomic Stability". European Economic Review, 38.

Krugman, Paul (1991), Geography and Trade. MIT Press, Cambridge.

OECD (1984), "Tax Elasticities of Central Government Personal Income Tax Systems". OECD Studies in Taxation, OECD, Paris.

Persson, Torsten and Guido Tabellini (1998), "The Size and Scope of Government with Rational Politicians", NBER Working Paper.

Rodrik, Dani (1998), "Why Do More Open Economies Have Bigger Governments", Journal of Political Economy, .

Sachs, Jeffrey and Xavier Sala-i-Martin (1992), "Fiscal Federalism and Optimum Currency Areas: Evidence from Europe and the United States". In Matthew Canzoneri, Vittorio Grilli, and Paul Masson, eds. Establishing a Central Bank: Issues in Europe and Lessons from the U.S.

Sorensen,Bent E. Lisa Wu and Oved Yosha (2000). "Output Fluctuations and Fiscal Policy: U.S. State and Local Governments 1978-1994". Manuscript, Tel Aviv University.

von Hagen, Jürgen (1992). "Fiscal Arrangements in a Monetary Union: Evidence from the US". In Don Fair and Christian de Boissieux, eds., Fiscal Policy, Taxes, and the Financial System in an Increasingly Integrated Europe. Kluwer Academic Publishers.

van den Noord, Paul (2000). "The Size and Role of Automatic Fiscal Stabilizers in the 1990s and Beyond". OECD Working Paper, ECO/WKP 2000 (3).

Woodford, Michael (1999). "Revolution and Evolution in Twentieth-Century Macroeconomics". Manuscript, Princeton University.

8 APPENDIX

DATA SOURCES.

Fiscal and National Account Variables, OECD. All data from the OECD economic outlook. Original codes and definition of constructed variables.

CGNW= Government Consumption (non-wages)
CGW = Government Consumption (wages)
IG = Government Gross Investment
TSUB = Subsidies
SSPG = Social Security Transfers Paid by the Government
TRPG = Other Transfers Paid by the Government
TY = Direct Taxes
TIND = Indirect Taxes
TRRG = Transfers Received by Government
KTRRG = Capital Transfers Received by Government
RESTG = Other capital Transfers
GNINTP = Net Interest Payments on Government Debt
YPEPG = Income Property Paid by Government
YPERG = Income Property Received by Government
CFKG = Consumption of Government Fixed Capital
NLG = Net Lending by Government
CPAA = Private Consumption
GDP = Gross Domestic Product
PGDP = Deflator of GDP
YDH = Household Disposable Income
G = EXPENDITURES = CGNW + CGW + IG + TSUB + SSPG + TRPG
REVENUES = SSRG + TY + TIND + TRRG
TRANSFERS = TSUB + SSPG + TRPG

Fiscal and National Account Variables, US states. Data from the US states has been kindly provided to us by Bent Sorensen and Oved Yosha and the original sources are described in detail in Asdrubali, Sorensen and Yosha (1996). Data on state manufacturing capital expenditures has been provided by Stefano Athanasoulis and Eric van Wincoop. The original sources are described in detail in Athanasoulis and van Wincoop (1998).

Debt and Fiscal Restrictions, US states. Both series are from Bayoumi, Goldstein and Woglom (1995) and they are only available for 39 states. They refer to the average over the period 1981 to 1990. We would like to thank Xavier Debrun for giving us access to these variables.

Specialization Index. The index of specialization is based on Krugman

(1991). Let s_{ij} the share of industry i in country j, we measures specialization as

$$\text{SPEC}_j = \sum_{i=1}^{I} |s_{ij} - s_{iA}|$$

Where s_{iA} represents the share of industry i in the US economy (in the case of US states) and the average share of industry i across OECD economies (in the international data). There are 10 comparable sectors in both datasets: Agriculture, forestry and fishing; Mining; Construction; Durable goods; Nondurable goods; Transportation and Communications; Electricity, gas, and sanitary; W & R trade, hotels, auto and misc. repair; FIRE and Bus. and Legal; Services Community, personal, other services and government. For the US states we use the average of the specialization index for the period 1984-1993. The data was kindly provided to us by Eric van Wincoop and it is described in detail in Clark and van Wincoop (1999).

Share of Manufacturing in GSP. Calculated as the ratio of state value added in manufacturing to GSP. Year: 1996. Source: Annual Survey of Manufacturers, 1996, Geographic Area Statistics, US Department of Commerce.

Table A1. State Fiscal Variables as % of GSP

	Taxes	FTaxes	FPTaxes	FTransf	FGrants	STaxes	SPTaxes	SGCons
Average	0.27	0.18	0.08	0.08	0.03	0.09	0.02	0.12
Std. Dev.	0.04	0.02	0.01	0.02	0.01	0.03	0.01	0.01

Sample: 1963-1990.

[Insert Figure A1 here]
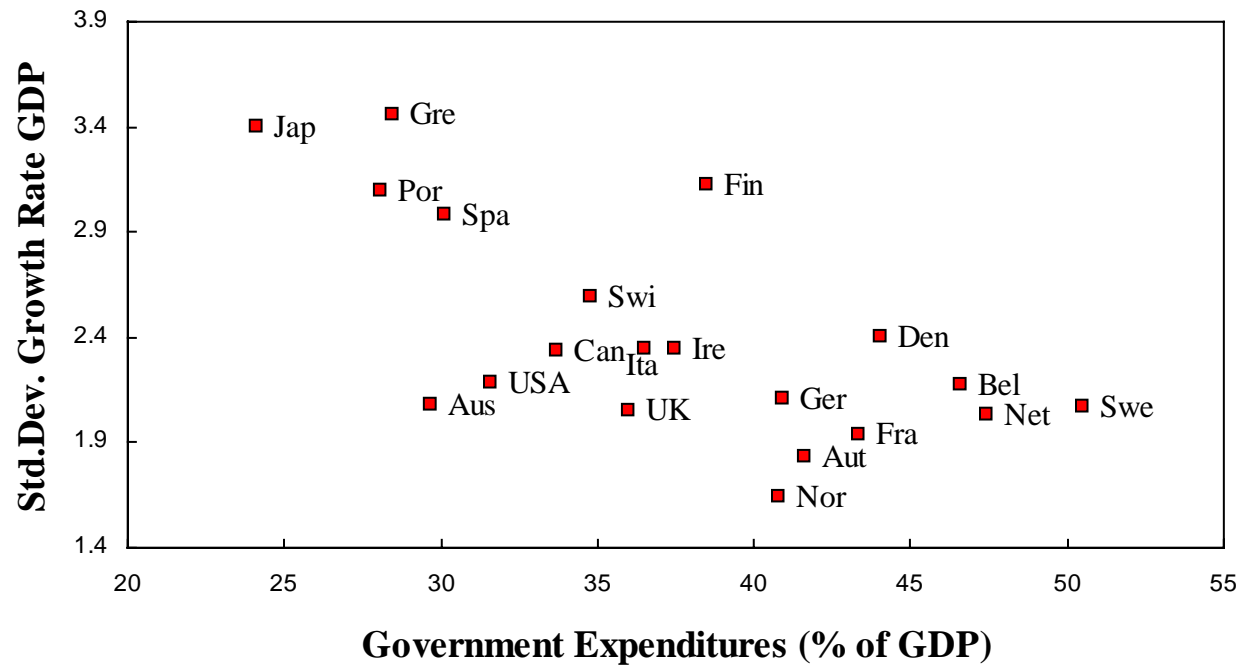
Figure 1. Volatility and Government Size

Figure 2. Coefficient on Government Size

Sample

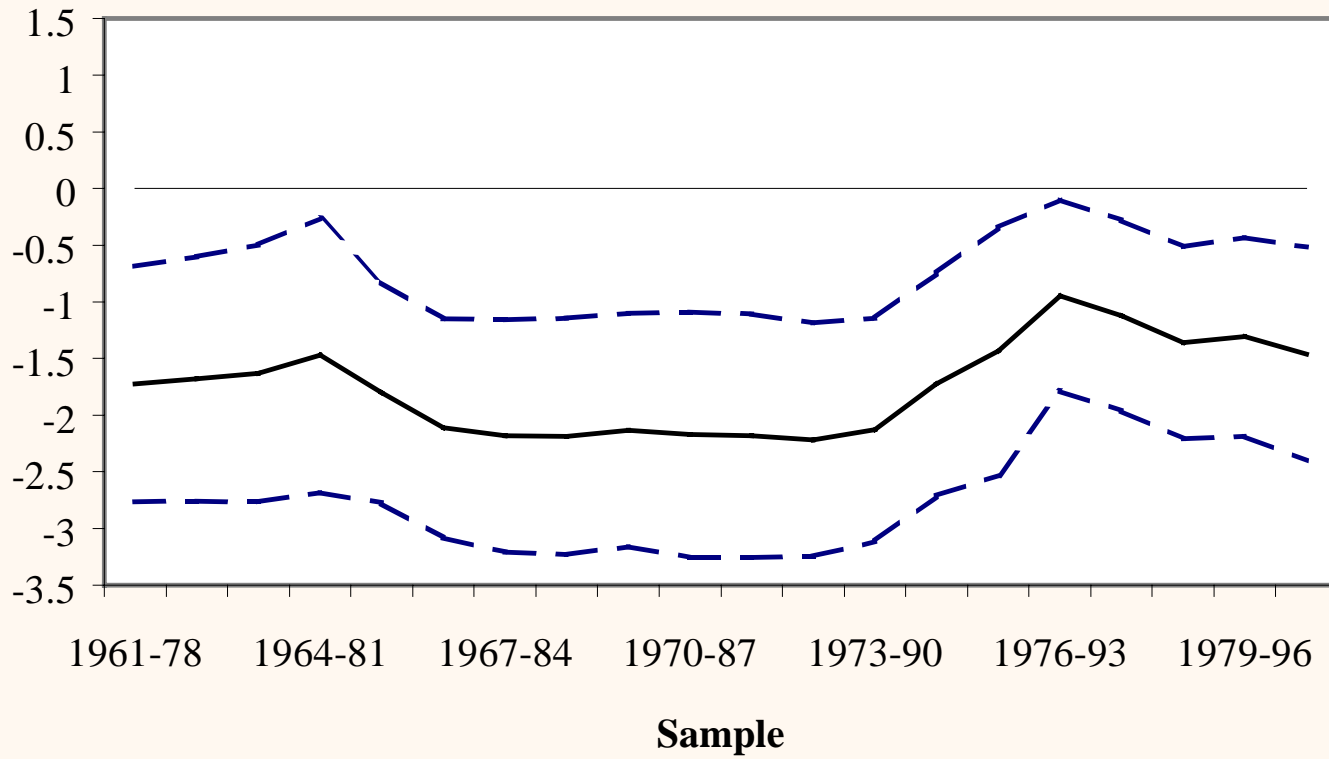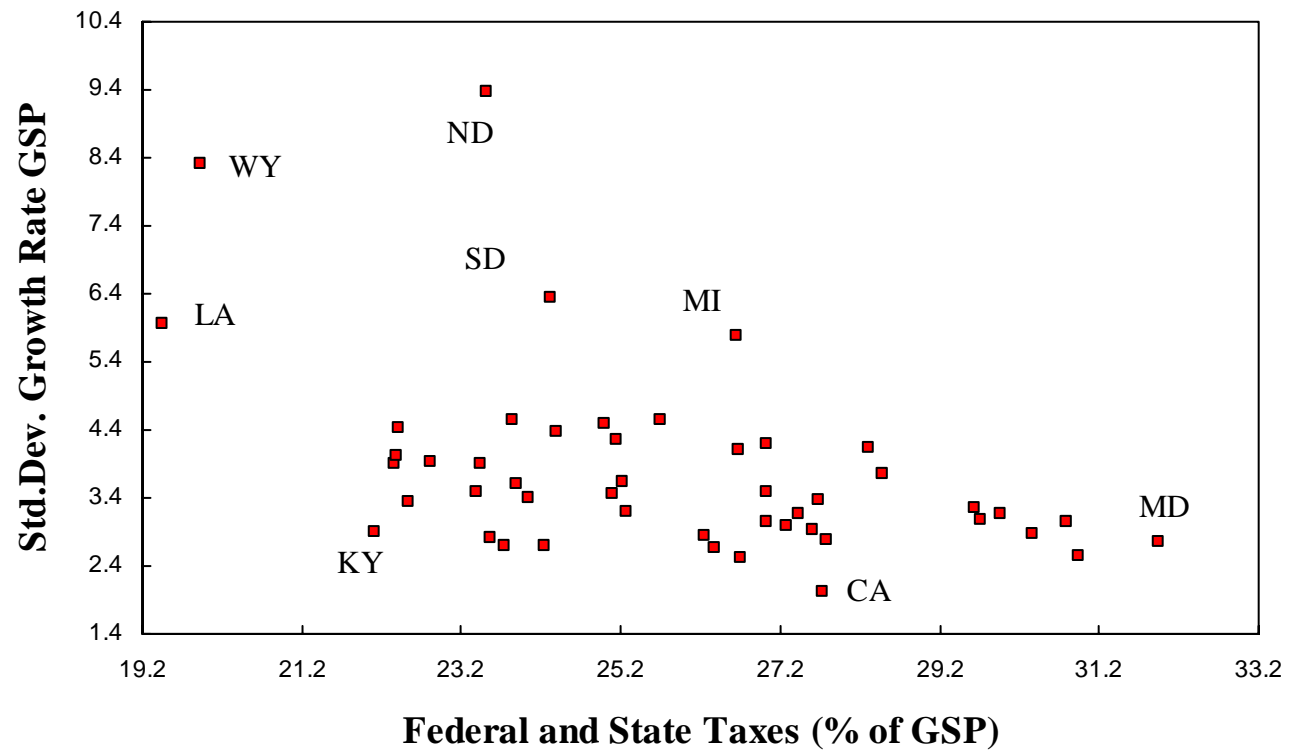**Figure 3. Volatility and Government Size**
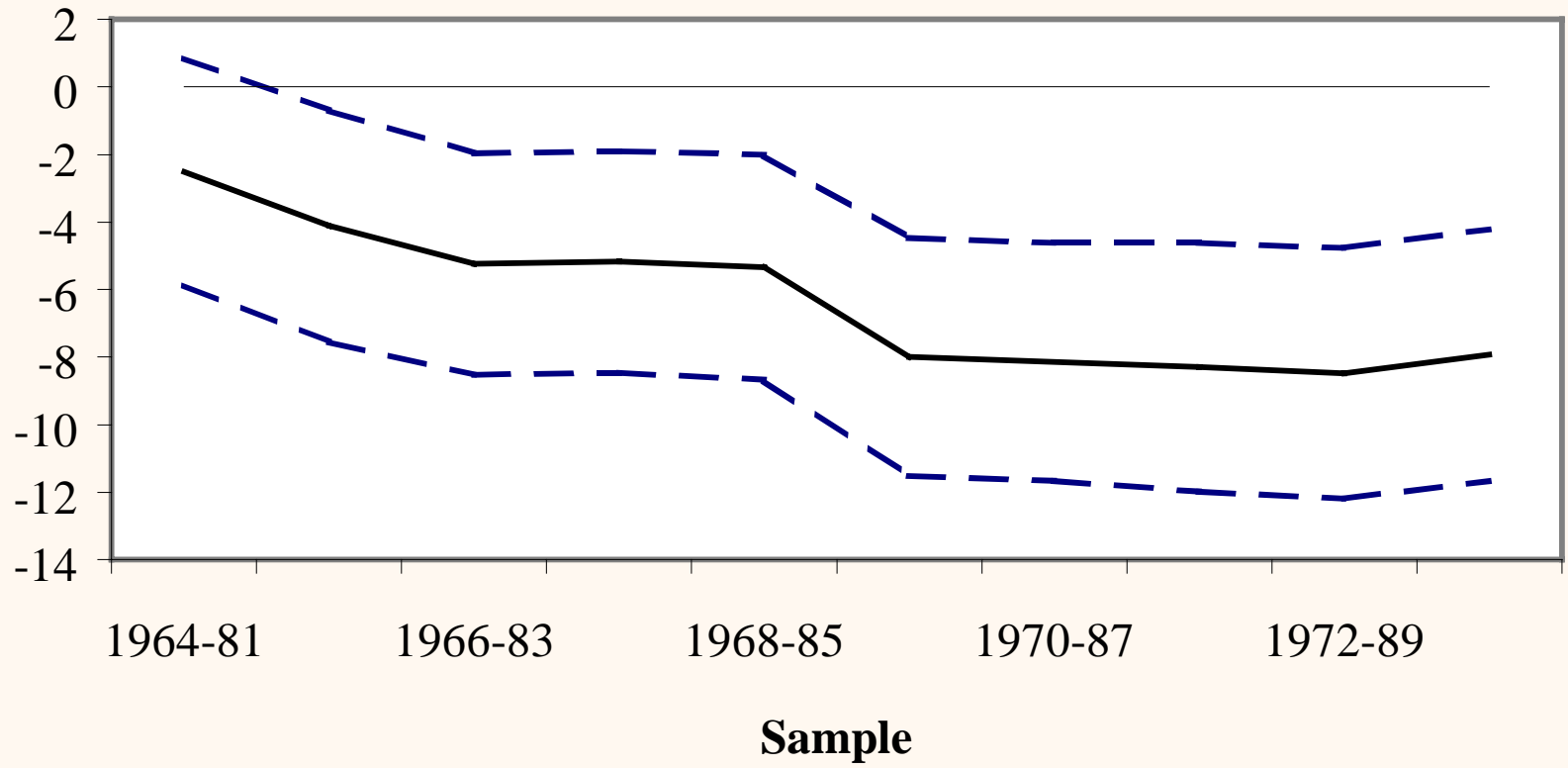
Figure 4. Coefficient on Government Size

Figure A1. Elasticity of Federal Taxes and Government Size