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ABSTRACT

Government Size and Automatic Stabilizers: International and Intranational Evidence*

This Paper studies the role of automatic stabilizers using a sample of OECD countries and US states. We find that there is a strong and robust negative correlation between measures of government size and the volatility of output. This correlation is robust to the inclusion of a large set of controls as well as to alternative methods of detrending and estimation. The economic significance of this relationship is larger for the US states.

JEL Classification: E60, F41
Keywords: fiscal policy, automatic stabilizers, business cycles, intranational economics

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NON-TECHNICAL SUMMARY

Both in the United States and in the European Union the role of fiscal policy has been at the centre of recent public debates. In the US the discussions on the Balanced Budget Amendment have questioned the role of fiscal policy as a tool to stabilize business cycle fluctuations. A recent US Treasury Department study concluded that in the absence of automatic stabilizers, at the peak of the last recession the US economy would have added 1.5 million people to the ranks of the unemployed and would have raised the unemployment rate to nearly 9%. As a result, the Balanced Budget Amendment 'could turn slowdowns into recessions and recessions into more severe recessions or even depressions' (Robert Rubin, 'White House Briefing on the Balanced Budget Amendment' Federal News Service Transcript, 24 February 1995).

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.

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, net taxes of transfers react more than proportionately so that disposable income is smoother than income. This has been the starting point of the analysis of a recent empirical literature around the issue of regional risk-sharing provided by the US federal budget.

Our point of departure, as suggested by the above quote, is different. Automatic stabilizers might have effects not only on the volatility of disposable income but also on the volatility of GDP itself. From a theoretical point of view, taxes or government expenditures have effects on consumption, investment, labour supply and therefore on GDP. The theoretical predictions are, however, ambiguous and the size of the effects can be, in some cases, very small. This Paper looks for empirical answers to this question. Our goal is to understand the relationship between government size and the properties of the business cycle in a cross-section of countries or regions. To the extent that the size of the government (e.g. the ratio taxes to GDP) can be a proxy for the amount of automatic stabilizers built into the fiscal system, we will also be able to provide evidence on the roles of automatic stabilizers.

In a sample of 20 OECD economies we find a very strong negative correlation between government size and volatility, i.e. larger governments stabilize output. This correlation is robust to the introduction of several control variables and different estimation techniques. Overall, we find that countries with larger governments (measured by the ratio of expenditures or taxes to GDP) display less volatile business cycles.

In the second part of the Paper we replicate our results using intranational data (data from US states). This sample allows us to establish stronger and more robust results because the endogeneity problems are much weaker than in the international data. Because US states share a common monetary policy or labour market regulations, it cannot be the case that the correlation we find between government size and volatility of output is caused by an omitted variable that is directly related to the fiscal variable in question. Also, fiscal variables related to the federal budget are determined at the federal level and are, therefore, not related to differences in political systems that, as it happens in the international sample, could lead to differences in government size.

Our results show strong support for the notion that larger governments have a stabilizing effect on output. The results for US states confirm our previous regressions and the economic significance is now larger. An increase in government size by one percentage point (of GDP) will reduce the volatility of output (standard deviation of GDP) by 0.07 in the OECD sample and by 0.21 in the US states sample. Among the different fiscal measures that we consider, personal taxes and transfers stand as the most effective stabilizing tools.

Overall, we find that our results suggest a stabilizing role for governments that is much larger than what standard models of the business cycles predict. We leave for future research the understanding of the theoretical mechanisms that can explain the size of our empirical results.

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 the analysis of Asdrubali, Sorensen and Yosha (1996), Athanasoulis and van Wincoop (1998) or Bayoumi and Masson (1996) on the stabilizing role of the federal budget. 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 depending on parameter values. The empirical evidence he presents is, however, indicative of a negative correlation between government size and volatility, i.e. larger governments stabilize output. This analysis has been criticized by Rodrik (1998) who argues that the coefficient in such

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

[2] Eichengreen and Wyplosz (1998).

a regression would be biased downwards because of reverse causality. For political economy reasons, fundamentally more volatile economies tend to have larger governments that reduce the inherent volatility by providing social insurance.

This paper is an empirical study of the relationship between government size and the volatility of the business cycle. We look at this relationship using both international and intranational data. The intranational data allow us to establish stronger and more robust results because the endogeneity problems are much weaker than in the international data. The reason is that fiscal variables related to the federal budget are determined at the federal level and are, therefore, not subject to the criticism of Rodrik (1998). Also, we are able to determine the stabilizing effects of fiscal variables at both the federal and state level. Our results show strong support for the notion that larger governments have a stabilizing effect on output.

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 and Section 5 concludes.

2 Previous Research

The popular view on automatic stabilizers relies on the textbook presentation of the Keynesian cross model in which taxes and some government expenditures respond automatically to output fluctuations and reduce the volatility of disposable income. Traditional demand multipliers are often calculated from reduced-form equations and tax elasticities are presented from a simple regression of changes in taxes on the growth rate of GDP.[3]

There is very little recent theoretical and empirical research on the effects of automatic stabilizers. Only the literature on fiscal federalism has carefully looked at this issue.[4] One approach taken by this literature is to measure the elasticities of different fiscal variables to changes in income in order to estimate the smoothing effect of the federal budget. A typical regression is:

$$\Delta log(si_t) - \Delta log(dsi_t) = \alpha + \beta\, \Delta log(gsp_t) + \epsilon_i$$

[3] See, for example, OECD (1984).

[4] See Sachs and Sala-i-Martin (1992), von Hagen (1992), Bayoumi and Masson (1996) or Asdrubali, Sorensen and Yosha (1996).

where si_t, dsi_t and gsp_t are state income, disposable state income and gross state product, and the coefficient β is interpreted as the percentage of volatility in GSP that is smoothed by the federal budget.

This view on automatic stabilizers considers only one channel of fiscal policy by taking the volatility of GSP as exogenous. In the regression above, it is assumed that built-in stabilizers have no effect on GSP. Stochastic models of the business cycle have predictions that go beyond this channel as taxes, transfers or government expenditures have effects on labor supply, consumption and investment decisions, all of which affect the volatility of GSP.[5]

One of the few theoretical papers to address some of these issues is Gali (1994). In the context of an RBC model, the paper directly addresses the effects of government size on macroeconomic stability. There are three basic channels operating in the model. First, assuming away the distortionary effect of taxation, government spending acts as pure resource absorption. When government spending increases in steady state, consumers feel poorer and they cut both consumption and leisure. This leads to an increase in work effort and higher steady state employment. In these models, 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, i.e. labor responds less vigorously to exogenous shocks when employment is high.

The second channel involves the distortionary effect of taxation. Since the after tax marginal product of capital is fixed by the real interest rate, an increase in distortionary taxes, requires an increase in the pre-tax marginal product of capital and therefore decline in output. In this setup larger governments amplify volatility. Finally, even if labor supply is inelastic, the increase in government spending takes away resources and affects macroeconomic stability. The output-capital ratio is fixed by the real interest rate in steady state, so to satisfy the resource constraint one needs to reduce consumption. In this situation an exogenous shock requires adjustment only on the intertemporal margin. The effects of government size on volatility depend on many parameters and are of ambiguous sign. Under standard parameterization, however, government spending is destabilizing.

Gali (1994) calibrates a model along these lines and finds that with distor-

[5] Also, some of the above papers do not stress the distinction between stabilization and insurance of the federal budget, an important point to understand the reaction of consumption. This point is made in Fatás (1998) and Bayoumi and Masson (1998).

tionary taxation and no transfers the stabilizing and destabilizing effects cancel out. If there are transfers, however, then government spending is destabilizing. This analysis sheds light on the mechanics of output stabilization, but clearly the forces operating are very different from the received wisdom of the textbook model. There is no role for aggregate demand management in this case and no role for progressivity of tax systems.

The emprical evidence provided in Gali (1994) suggests that, despite the ambiguity of the theoretical model, there seems to be a negative relationship between government size and GDP volatility. But this simple correlation is subject to a problem of reverse causality that will lead to a downward bias in a simple OLS regression. 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. Under the assumption that the government sector is the safe sector in the economy, Rodrik (1998) argues that more open economies will see their government size increase 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.

There is also a broader political economy literature that has looked at the determinants of government size. In a sequence of papers Alesina with several co-authors (Alesina and Wacziarg (1998) and Alesina and Spolaore (1997) and Alesina, Spolaore and Wacziarg (1997)) argues 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. Second, Alesina, Spolaore 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 is sufficient to ensure high-enough productivity. Based on these findings, Alesina and Wacziarg (1998) argue that there is a connection between country size, government size and openness and it is not clear whether the findings in Rodrik (1998) do not have an alternative interpretation, namely, openness serves as a proxy for country size. Below we will investigate the robustness of our results to the inclusion of a measure of country size. Also, we will

take explicit account of the argument that both government size and openness are determined by country size. In a related paper, Persson and Tabellini (1998) investigate the effect of political systems on government size. They argue that presidential democracies will have smaller governments and that countries with majoritarian systems will spend less on public goods.

The strategy of this paper is to determine to what extend fiscal policy stabilizes output fluctuations and which components of fiscal policy are responsible for this stabilization. From the review of the literature it is clear that government size, volatility, openness and country size are interconnected. To estimate correctly the stabilization role of governments we will deal with potential sources of reverse causality in two ways. In the next section we will explore this relationship using a cross section of OECD countries by employing instrumental variables. In Section 4 we take a different approach by using intranational data and exploiting the specifics of decentralized fiscal systems to overcome the endogeneity problems related to the joint determination of government size and volatility.

3 International Data

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 use first a data set for 20 OECD countries covering the years from 1960 to 1997. The choice of this set is dictated by two reasons. First, the study we report in the paper 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 scatterplot of government size and the volatility of GDP for the sample of 20 OECD economies.[6] There is a clear negative correlation

[6] Government size is measured as the log of total spending as % of GDP and volatility is

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.

Table 1. Government Size and Volatility. OLS

Dependent Variable: VolY6097			
	(1)	(2)	(3)
GY6097	-1.805	-	-2.261
	(-3.99)		(-3.80)
Open6097	-	-0.310	0.272
		(-1.33)	(1.17)
Adjusted R^2	0.439	0.039	0.450

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

This 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 correlation between government size and this third factor. Indeed, several recent papers analyze carefully the determination of the size of government from different viewpoints. As it is mentioned in Section 2, the size of government might be determined by social insurance motifs or by politico-economic arguments. In the case of Rodrik (1998) more open economies are subjected to external shocks and one way to reduce the adverse effects of this volatility on consumption and income is by increasing the size of government. It is worth reporting here that in the data the correlation between volatility and openness is actually negative in many cases, as shown in Column (2) of Table 1.

From the previous discussion, we have to distinguish between two potential problems with the regression of Column (1): Omitted variables and endogeneity.

measured as the standard deviation of the growth rate of real GDP. 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 does not alter our conclusions.

We first take the issue of omitted variables by including several controls in the basic regression. Column (3) of Table 1 shows that our result is robust to the introduction of openness (Open6097). The coefficient 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 coefficient with a downward bias. Part of Rodrik's argument, however, is about endogeneity of government size and we will deal with this issue later in the paper by using instrumental variables.

We take Column (3) 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. Table 2 introduces 3 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 (Wagner's Law) while, at the same time, one could argue that, for example, poorer economies, because of less developed financial systems, might have more volatile business cycles.

Table 2: Government Size and Volatility: Basic Controls. OLS

	Dependent Variable: VolY6097			
	(1)	(2)	(3)	(4)
GY6097	-1.561	-2.014	-2.170	-1.728
	(-2.25)	(-3.20)	(-2.69)	(-2.11)
Open6097	0.050	0.007	0.261	-0.026
	(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	0.508	0.459	0.417	0.455

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

The four columns of Table 2 confirm that, controlling for those three variables, does not substantially alter the size and significance of the coefficient on goverment size.

In Table 3 we further check the robustness of our results by introducing four additional controls. The first one (Spec91) is a measure of sectoral specialization based on Krugman (1991). It captures difference in sectoral shares across countries.[7] The second one is the standard deviation of the log-changes in terms of trade (ToT6097). The third one (PRSH90) is the share of primary products in total exports (in 1990). Both of these variables, used by Rodrik (1998), are measures of the volatility associated to open economies. These three controls, all of them designed to capture fundamental sources of risk, do not seem to affect the significance of the coefficient on government size.

Column (4) in Table 3 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.[8] 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 striking improvement in the fit of the regression suggests that the large in the Finnish economy in the early 90's cannot be properly dealt with by the Hodrick-Prescott filter. In both cases, Columns (5) and (6), the coefficient remains significant and close in size to our previous estimates.

An interesting question related to robustness is the stability of this coefficient over time. For that purpose we estimate a sequence of rolling regressions using the baseline specification of Column (3) in Table (1). Each regression uses volatility and government size calculated for a period of eighteen years, starting with the sample 1961-1978.[9] Figure 2 displays the coefficient estimate from each of the

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

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

[9] We chose eighteen years because the first and last regression are equivalent to splitting the

Table 3: 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.

19 regressions with 95% confidence intervals. The coefficient is remarkably stable over time and we cannot reject the null that the coefficients are equal across all subsamples.

[Insert Figure 2 here]

As mentioned before, beyond the problem of omitted variables, our basic regression might also be affected by problems of endogeneity. Indeed, 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 and volatility and therefore 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).

sample in half. Windows of fifteen or twenty years produce almost identical results.

Table 4 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). 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.[10] 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.

Table 4. 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.

The second column controls for country size by including real GDP. This regression is in the spirit of Alesina and Wacziarg (1998). n this case, the signifi-

[10] Rodrik's baseline regression is G9092 on Open8089.

cance of the coefficient on openness is much weaker and it confirms 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 4 includes two variables suggested by Persson and Tabellini (1998) that capture differences in political systems. They are dummies for presidential regimes and majoritarian electoral systems. The inclusion of these variables further weakens the coefficient on openness and increases the fit of he regression.

To deal with endogeneity, we can use the regressors from Column (3) in Table 5 as instruments for government size. In that list of potential instruments we replace past openness with area and distance because it allows us to maximize the sample size. Also past openness might not be an appropriate instrument if the cross-sectional variation in openness does not exhibit time variation.[11] The five columns of Table 5 present the results associated to different specifications of our IV estimation. Column (1) shows the basic regression while Columns (2) to (5) introduce some of the controls used in Table 2. 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 confidence in the documented results we look closely at the properties of our instruments along two dimensions. First, we check whether the instruments are uncorrelated with the errors in the second stage equation. A Hansens's test statistic for overidentification is reported in the last row of Table 5. This statistic is distributed as a χ^2 with the degrees of freedom given by the number of overidentifying restrictions. Clearly, in none of the cases we can reject the exogeneity of our instruments. The second issue is the weakness of the instruments. As argued recently by Staiger and Stock (1997) and Wang and Zivot (1998), weakness of instruments leads to a bias in the direction of OLS and makes inference completely unreliable. To check for this possibility we have estimated separately the first-stage regressions and in all cases the goodness of fit is extremely high with the F-statistic being significant at the 1% level or better.

3.2 Alternative Measures of Volatility and Government Size.

The results from the previous subsection strongly suggest that bigger governments successfully stabilize output fluctuations. To gain better understanding of

[11] These variables are often used as instruments for openness. See for example Rodrik (1998) or Frankel and Rose (1998).

Table 5. Government Size and Volatility. IV

	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

Sample: 1960-1997.
t-statistics in parentheses

the effects of automatic stabilizers we have to explore which components of the budget are the important determinants of this reduction in volatility and what type of volatility is most significantly affected.

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 5.[12] Results are presented in Table 6. Each entry in this table represents the estimate of the coefficient on government size. Thus the first entry corresponds exactly to the same regression as in column (2) of Table 5.

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. We have to stress the significance of the results for private output. These results indicate that the stabilizing effect on GDP of larger governments is not simply the mechanical result of having a larger and more stable government sector. It

[12] The instruments are area, distance, GDP per capita, dependency ratio and the urbanization rate for 1990, total GDP and the two dummies for political systems (presidential and majoritarian).

is also noteworthy that the stabilizing effects are as large for GDP than for disposable income or consumption. 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 6. Volatility and Government Size

	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
All regressions include an intercept and controls.
See text for details.

Does this set of results conform to the theoretical understanding of automatic stabilizers? Broadly speaking, it is consistent with the traditional view: transfers and taxes are important parts of the volatility reduction mechanism. To the extent that total government spending is cointegrated with taxes and therefore does not exhibit autonomous cross sectional variation in 30-year averages, we can interpret the results for total spending as results for a proxy of total taxes. It is, however, puzzling the size and significance of the effects of non-wage spending.

The importance of the findings reported above is at least two-fold: From a

theoretical point of view, they suggest that modeling government spending as pure resource absorption is not going to provide many realistic insights on the stabilizing role of government size. One has to enrich the models proposed by Baxter and King (1993) and by Gali (1994) to account for non-trivial effects of transfers and progressivity of taxation in order to capture the second-moments effects of government size. At the same time one should keep the results from this section in perspective: volatility reduction is unlikely to be the major goal of fiscal policy. Moreover, excessive involvement in fine tuning and stabilization policies might lead to an unsustainable increase in the government debt and needs for fiscal consolidation. When the time for balancing the budget arrives it is very likely that volatility would increase dramatically and the whole purpose of higher spending along this dimension would become self-defeating. This has been confirmed by the results in Table 3 where the sign of the coefficient on the interaction term between government debt and size, implied a reduced stabilizing role for governments with high debt.

Our results here also 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. Again both of these pieces of evidence are crucial building blocks for the hypotheses in Rodrik (1998).

4 Intranational Evidence

4.1 International vs. Intranational Data

In this section we look at the evidence on automatic stabilizers using intranational data from US states. The use of intranational data provides an interesting comparison with the results from the previous section. Not only there are several advantages of using intranational data to study the effects of automatic stabilizers, but there are also questions related to the design of a decentralized fiscal system that can only be answered with this type of dataset.

One of the big 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 with our controls. By changing the unit of observation 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.

A second advantage of using intranational data is that one can study the effects of different levels of government on volatility. As a result, we can establish differences in the stabilizing role of federal versus state and local government fiscal variables. More importantly, 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. For example, 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. For this reason, there is no need to use instruments in a regression of volatility of the business cycle on measures of government size as defined by federally-determined fiscal variables at the state level.

At the same time, the existence of different levels of governments creates difficulties when measuring the size of the government. While at the country level government expenditures are properly defined, the allocation of federal expenditures at the state level is not clear and, in some cases, it is not possible to find accurately disaggregated, by state, figures for all categories of government spending. For this reason, we rely more on measures of government size based on tax revenues.

There is an additional issue that distinguishes the international and intranational data, namely why government size differs across states. In the case of countries, there are differences in tax laws, progressivity of taxes and responsiveness of transfers or government expenditures that, to a large extent, are not present when we look at US states as federal tax schedules are equal across all states. This does not imply that there are no cross-section differences in the size of government or in the allocation of government expenditures. First, differences across states in GSP per capita or the dependency ratio results in different lev-

els of federal taxes or transfers. Second, local governments have the freedom of setting their taxes and therefore their size. In some sense, one can say that the intranational data might 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.

4.2 Description of the Data

The dataset includes different measures of economic activity at the state level: gross state product (GSP), state income (SI), disposable state income (DSI), retail sales (C) and manufacturing investment (INV).[13]

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.[14]

Table 7. Fiscal Variables

	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.

Table 7 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,

[13] 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.

[14] 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.

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.

To make this point clearer we have run basic regressions of the above measures of government size on different state-specific variables that can justify the differences in average tax rates across states: average GSP per capita (GSPPC) and population (POP), area (Area), average growth (Growth6390) and urbanization 1980 (Urban80). These are variables that are behind differences such as in state GSP per capita, density or state income distribution.[15]

Table 8. Determinants of Government Size

	FTaxes (1)	FTransf (2)	Staxes (3)
POP	0.028	0.011	-0.008
	(1.62)	(0.54)	(-0.43)
GSPPC	0.073	-1.206	0.072
	(0.37)	(-7.86)	(0.54)
Growth6390	0.023	0.001	-0.169
	(1.89)	(0.08)	(-0.99)
Area	-0.012	-0.005	-0.003
	(-4.39)	(-1.78)	(-0.77)
Urban80	0.302	0.264	0.119
	(2.05)	(1.32)	(0.76)
Adjusted R^2	0.364	0.654	-0.056

Sample: 1963-1990.
t-statistics in parentheses

Table 8 presents the results. For both federal taxes and transfers, the fit is good (we can explain around 50% of the variation in the dependent variable) and the sign of the coefficients is the expected one. Poorer states and states with lower density of population have lower taxes. GSP per capita is strongly

[15] These differences produce, in the presence of non linearities in the tax system, differences in taxes-to-GSP ratios.

negatively correlated with transfers. and higher transfers as a % of GSP. As expected, when it comes to state and local taxes, we are not able to explain much of the cross-state variation of state and local tax rates.[16] These results support our arguments that state and local fiscal variables are more influenced by political economy arguments, not captured in the economic indicators. On the other hand, federal fiscal variables at the state level can be explained quite well by a small set of indicators such as GSP per capita or population density.

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 a percent 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 negative correlation is evidence from the scatterplot.

[Insert Figure 3 here]

Table 9 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 the results when we introduce different controls. The first three controls are GSP (GSP), GSP per capita (GSPPC), and growth (Growth6390), all of them measured as the average over the full sample.[17] 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

[16] Only in the case of local government consumption we find that it is negatively correlated with the size of the state. This is consistent with Alesina and Wacziarg (1998) who finds for a large sample of countries, that the size of the government is negatively correlated with the size of the nation.

[17] Using initial values leads to almost identical results as the ones reported in Table 9.

Table 9. 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

(SPEC) based on Krugman (1991) and similar to the one used for the OECD countries.[18] The coefficient on government size is still significant although its size is now smaller (3.4) and closer to the results of the international dataset.

The last column of Table 9 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).[19] The coefficient on taxes is, once again, significant and broadly consistent, in size, with the other columns.

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

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

[19] These two variables are only available for 38 states and are measured as averages over 1981 to 1990. For details on the construction of these variables see Bayoumi, Goldstein and Woglom (1995). We would like to thank Xavier Debrun for giving us access to these variables.

the international data, there seems to be evidence that the size, in absolute value, has increased over time. We do not have an explanation for why the coefficient might have changed over time. One has to be careful interpreting this result because of the difficulties measuring the volatility of the business cycle over short periods of time.

[Insert Figure 4 here]

4.4 Alternative Measures of Volatility and Government Size.

Table 10 replicates the regressions of column (5) in Table 9 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, State Income (SI), Disposable State Income (DSI), Consumption (C) and Investment (I). As measures of government size we look at total (Taxes), Personal (PTaxes), Federal (FTaxes), Federa Personal (FPTaxes), State and Local (STaxes), Personal State and Local (SPTaxes) taxes as well as Federal Grants (FGrants) and Transfers (FTransf) and State and Local Government Consumption (SGCons). We only report the size and significance of the coefficient on government size (β_1).

If we first focus 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 report the same coefficient as in column (5) of Table 9 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

Table 10. Volatility (GSP) and Government Size

	GSP	SI	DSI	INV	CONS
	(1)	(2)	(3)	(4)	(5)
Taxes	-5.343	-1.706	-2.007	-29.338	-1.709
	(-5.91)	(-2.71)	(-2.90)	(-3.28)	(-1.06)
PTaxes	-4.197	-2.041	-2.045	-25.024	-1.223
	(-6.17)	(-3.17)	(-3.08)	(-4.14)	(-1.15)
FedTaxes	-4.827	-1.721	-2.035	-30.477	-1.631
	(-5.89)	(-2.83)	(-3.24)	(-3.773)	(-1.07)
STaxes	-3.165	-0.659	-0.753	-9.809	-0.926
	(-3.47)	(-1.23)	(-1.28)	(-1.56)	(-1.02)
SPTaxes	-0.753	-0.477	-0.375	-4.613	-0.304
	(-3.38)	(-2.79)	(-2.11)	(-3.13)	(-1.28)
FedGrants	0.400	0.089	0.028	18.694	1.213
	(0.45)	(0.17)	(0.06)	(3.15)	(1.35)
FedTransf	-3.185	-1.185	-1.524	-7.447	0.650
	(-2.19)	(-1.22)	(-1.62)	(-1.07)	(0.67)
SGCons	0.530	1.576	1.883	13.582	0.305
	(0.34)	(1.34)	(1.72)	(1.81)	(0.32)

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

of federal taxes or transfers, it is dificult 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 (5) report the results using as dependent variable different measures of the volatility of economic fluctuations. 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 state income or disposable state income, the effects are smaller although they are 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.

Table 11. 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		

Finally, we would like to look at the economic significance of our results and compare the implied stabilizing role of different components of fiscal policy. The coefficients of Tables 6 and 10 are not directly comparable because the explanatory variable is in logs. In Table 11 we have calculated the effect, as implied by our regressions, of increasing each of the measures of government size by 1% of GSP (or GDP). The first thing that needs to be noticed is that the coefficient for the intranational data is much larger than the coefficient for OECD

economies. This difference would be smaller had we used the coefficient of the regression where controls for sectoral specialization were introduced (Column (6) in Table 9). 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).

Across different fiscal variables we see that personal taxes an transfers have the largest effect in the intranational data. Interestingly, the effect of federal personal taxes is slightly higher than at the state level. The large estimate for state taxes might look 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. Also, in the international sample, although the effect of indirect taxes seems to be larger than that of direct taxes, this coefficient is insignificant in the regressions of Table 6.

4.5 Government size and Automatic Stabilizers

In both the intranational and international results we have found that government size is negatively correlated with a measure of business cycle volatility. Unlike previous papers that have looked at the stabilizing effects of federal budgets on state disposable income, our findings suggest that the stabilizing effects are more general than that and they appear not only on measures of after-tax income but also on output, investment or private output. How does our evidence compare with previous papers in the literature? Is government size related to more standard measures of automatic stabilizers?

The most common measure of automatic stabilizers is the elasticity of fiscal variables to income fluctuations. For the case of the stabilizers of the federal budget, the analysis of the literature has looked at the response of federal taxes and federal transfers to changes in income. Following Asdrubali, Sorensen and Yosha (1996) we have constructed a measure of the stabilizing effect of the federal budget by state.[20] For each state we have run regressions of the type

$$\Delta log(si_t) - \Delta log(dsi_t) = \alpha + \beta \Delta log(gsp_t) + \epsilon_i$$

where si_i, dsi_i and gsp_i are state income, disposable state income and gross state

[20] The analysis of Asdrubali, Sorenssen and Yosha (1996) assumes that this elasticity is the same for all states.

product, all of them measured as a ratio to the US aggregate. The coefficient β_i has the interpretation of the percentage of volatility in GSP that is smoothed by the federal budget. Is this coefficient related to our measures of government size? We have run a regression of the estimated β's on the size of the government (measured as total taxes). The coefficient is positive and significant at the 1%. Therefore, the size of the government, measured as the ratio of taxes to GSP is related to traditional measures of automatic stabilizers based on the elasticities of fiscal variables.

Despite this positive relationship, we need to emphasize that the evidence we have presented goes beyond the standard assumptions about the stabilizing effects of the federal budget. The analysis of Asdrubali, Sorensen and Yosha (1996) or Bayoumi and Masson (1996) is about the extent to which the federal budget stabilizes disposable income. Their main concern is the elasticity of taxes and transfers relative to changes in income, which are taken to be exogenous in their analysis. The estimates of β are an attempt to capture this type of stabilization. What our analysis of Sections 3 and 4 has shown is that government size seems to stabilize business cycles measured by output volatility and not only disposable income. In this sense, our results present stronger support for the notion of fiscal automatic stabilizers.

5 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 asociated to a less volatile GDP. The negative relationship is also present when we look at private output.

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.[21] When we account for possible endogeneity, we find that the stabilizing 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. The negative correlation between government size and volatility is also present when we use income, disposable income or consumption to characterize business cycles.

Overall, we conclude that there is a strong and robust negative relationship between government size and the volatility of the business cycle. This relationship goes beyond the role of taxes and transfers in smoothing disposable income. The estimated effects are hard to reconcile with existing business cycle models with government spending.

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

6 References

Alesina, Alberto and Roberto Perotti (1996). "Fiscal Adjustment". *Economic Policy*, **21**.

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.

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.*

Staiger, Douglas and James H.Stock (1997), "Instrumental Variables Regression with Weak Instruments", *Econometrica*, **65(3)** .

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.

Wang, Jiahui and Eric Zivot (1998), "Inference on Structural Parameters in Instrumental Variables Regression with Weak Instruments", *Econometrica*, **66(6)** .

7 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.

Figure 1. Volatility and Government Size

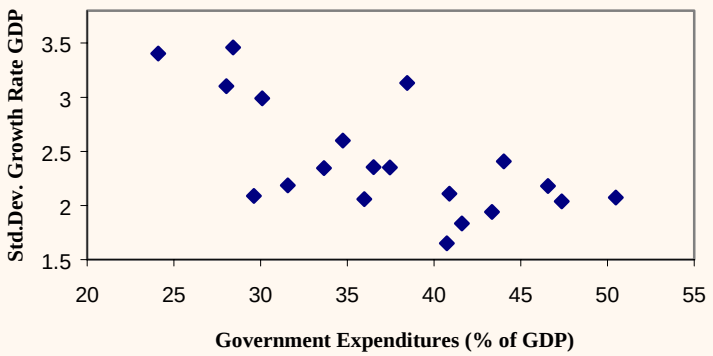

Figure 2. Coefficient on Government Size

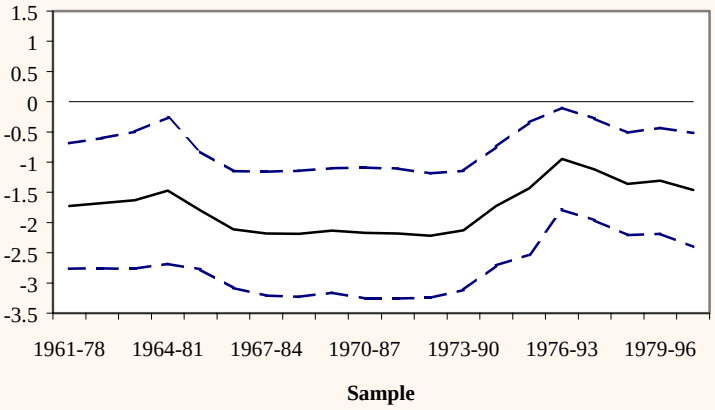

Figure 3. Volatility and Government Size

Figure 4. Coefficient on Government Size