GOVERNMENT SIZE AND AUTOMATIC STABILIZERS: INTERNATIONAL AND INTRANATIONAL EVIDENCE *

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Abstract This paper studies the role of automatic stabilizers using international and intranational data. We find that there is a strong and robust negative correlation between measures of government size and the volatility of output and the estimated effects are very similar in both samples. We find that transfers and personal taxes have the largest stabilizing role among all the components of fiscal policy. Although the stabilizing effects are also present in alternative measures of economic activity (disposable income, consumption), the relationship is weaker than when we use GDP or GSP as our measure of volatility.

* This paper is prepared for the conference on “Lessons from Intranational Economics for International Economics”, Gerzensee, June 11-12, 1999. We wish to thank Bent Sorensen, Oved Yosha, Stefano Athanasoulis and Eric van Wincoop for providing us with the data for the US states.

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. After controlling for endogeneity in the international data, we find that the effects are very similar in size across countries and across US states.

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

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).

the smoothing effect of the federal budget. A typical regression is:

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

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.⁶ 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

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).

⁶ It is probably worth reiterating that government spending may bring utility to consumers, even though we will refer to it as resource absorption. As long as it is an exogenous process for the consumers and it enters additively in the utility function, it does not affect households' choice of consumption and leisure and all its effects come from the fact that it absorbs resources. See Christiano and Eichenbaum (1992).

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 distortionary 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 empirical 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 extent 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

Table 1. Correlations

	G	TX	TR	CGW	CGNW	Open
GDP	-0.62	-0.59	-0.47	-0.45	-0.62	-0.29
DI	-0.34	-0.15	-0.19	-0.21	-0.49	0.30
C	-0.36	-0.30	-0.25	-0.12	-0.34	0.05
YDH	-0.33	-0.28	-0.21	-0.15	-0.47	0.18
PrivGDP	-0.44	-0.48	-0.57	-0.15	-0.28	-0.30

Sample: 1960-1997.

growth path.

At first glance the negative unconditional correlation between government size measured as the ratio of total government expenditures to GDP speaks forcefully in favor of a stabilizing role for government spending. Indeed, this finding, first documented by Gali (1994), is relatively robust to alternative measures of volatility and government size. Table 1 reports simple correlations between volatility of output (GDP), disposable income (DI), household disposable income (YDH), consumption (C), and private output (PrivGDP) on the one hand and government size as measured by a ratio (to GDP) of total expenditures (G), tax revenue (TX), transfers (TR), government wage spending (CGW), and government non-wage spending (CGNW), on the other. In all cases the correlation is negative.

There are at least three important results to emphasize in this table. First, different measures of government size show different strengths of negative correlation with volatility. As it has been argued forcefully by Alesina and Perrotti (1996), composition of spending cuts matter for the success of fiscal consolidation. Here we can see that the composition of spending matters also for the reduction in volatility with some types of spending being more stabilizing than others.

Second, Table 1 indicates that the correlation between size and volatility is strongest for output and less pronounced for any measure of disposable income or consumption, contrary to a common prior that taxes (and spending) should stabilize mainly disposable income and consumption. Third, we can also read from the table that government size is negatively correlated not only with output volatility, but also with volatility of private absorption. Therefore the negative correlation is not an artifact of a mechanical relationship between government size and volatility.⁷

⁷ One interpretation of the first row in Table 1 is that if the government sector is the safe and less volatile one, then it is quite obvious that countries with bigger governments will have less volatility exactly because the government plays a larger role in the economy. The correlations

The unconditional correlations 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 Table 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. So a *prima facie* evidence of adverse effects of openness on volatility does not exist, as indicated in the last column of Table 1. An extension of the Rodrik's argument can easily downplay this lack of evidence: If indeed more open economies are more volatile initially, then they would see their government size increasing over time to the point where the extra volatility coming from marginally higher openness is removed and no specific correlation is observed in the cross section. As a preview of some of the results to come, notice, however, that conditional on government size we should observe a positive correlation between openness and volatility for the Rodrik's story to come through.

Before proceeding with the main study of the paper we check whether the findings of Rodrik (1998) and Alesina and Wacziarg (1998) could be confirmed with our data set. Table 2 reports regressions of various measures of government size on openness and controls. The first column presents a Rodrik-type regression of government expenditures (G7097) 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 1970-1997.⁸ 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

between volatility of private output and different measures of government size indicate that there is more to the effects of government size on volatility.

⁸ Rodrik's baseline regression is G9092 on Open8089.

Table 2. Determinants of Government Size

	G7097 (1)	G7097 (2)	TR7097 (3)	CGW7097 (4)	CGNW7097 (5)
Open6069	0.180 (0.008)	0.254 (0.003)	0.412 (0.004)	0.148 (0.123)	0.019 (0.918)
Depend90	0.186 (0.635)	0.634 (0.178)	0.513 (0.510)	1.110 (0.075)	1.736 (0.136)
Urban90	0.064 (0.718)	-0.023 (0.897)	0.045 (0.879)	-0.102 (0.651)	0.090 (0.833)
GDPPC	0.188 (0.066)	0.297 (0.017)	0.287 (0.145)	0.264 (0.083)	0.543 (0.068)
GDP	–	0.035 (0.110)	0.058 (0.112)	0.019 (0.486)	-0.017 (0.743)
Adjusted R^2	0.426	0.491	0.352	0.225	0.343

Sample: 1960-1997.

p-values in parentheses

regression is in the spirit of Alesina and Wacziarg (1998) and it reiterates the robustness of Rodrik's results: openness enters again with a positive sign and it is statistically significant. As Alesina and Wacziarg (1998) have argued, however, if governments provide social insurance, then the most plausible channel would be transfers, while the variation in wage or non-wage government consumption should not be explained by openness. Columns (3), (4) and (5) provide support for this thesis. In relatively more open economies, transfers (TR7097) are higher than in closed economies, but the other components of spending do not have significant correlation with openness. The hypothesis that the effects of openness vary across components of government spending is also confirmed by the adjusted R^2 reported in the last row.

We turn now to the effects of government size on volatility in the OECD dataset. Table 3 reports a set of regressions designed to determine the stabilizing role of government spending. The first column presents results from a simple regression of volatility of GDP growth rates (VolY6097) on log government size for the whole sample.⁹ The strong negative correlation between total spending

⁹ 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,

Table 3. Government Size and Volatility. OLS

	Dependent Variable: VolY6097			
	(1)	(2)	(3)	(4)
GY6097	-1.929 (0.002)	-1.878 (0.000)	-1.282 (0.043)	-1.741 (0.006)
OPEN6097	–	-0.044 (0.836)	–	–
GDPPC6069	–	–	-0.484 (0.059)	–
GDP8085	–	–		0.044 (0.267)
Adjusted R^2	0.391	0.357	0.481	0.401

Sample: 1960-1997.

p-values in parentheses

and volatility of output has already been reported by Gali (1994) and Fatás and Mihov (1998). The next three columns document the robust nature of this correlation with respect to alternative controls. These results, however, do not permit any causal interpretation. Rodrik points out that the coefficient estimate is biased possibly because of the unaccounted effects of openness on government size and volatility. We have to emphasize here, that by omitting openness from the regression we bias the coefficient towards zero. Indeed, if government size is an endogenous variable, as shown in Table 2, the correct approach is to use instrumental variables which are not linked to volatility directly but are highly correlated with government size.

To deal with endogeneity, we first note that the regressors from Table 2 are potentially good candidates for instruments because of their high correlation with government size. One problem is that openness affects volatility directly. To take this into account, we restrict the sample range for the volatility variable to 1970-1997 and we include average openness for the same period in the regression. Using as instruments the regressors in the Alesina and Wacziarg (1998) regression (recall that both government size and openness are determined by country size and GDP per capita), we obtain results that are broadly consistent with

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.

Table 4. Government Size and Volatility. IV

	Dependent Variable: VolY7097		
	(1)	(2)	(3)
GY7097	-2.141 (0.040)	-2.078 (0.005)	-3.965 (0.000)
OPEN7097	0.308 (0.157)	0.315 (0.216)	0.668 (0.008)
GR7097	—	—	-0.307 (0.101)
P-value for the OID test	0.450	0.598	0.628

Sample: 1960-1997.
p-values in parentheses

the claim that larger governments manage to reduce the volatility of output.¹⁰ The first column of Table 4 presents our baseline IV regression. Notice that the coefficient on government size increases in absolute value from 1.88 to 2.14. This increase suggests that taking care of the bias related to openness improves our estimates. The regression results so far are consistent with the view that more open economies tend to have larger governments. The increase in the size of government as a response to openness does lead to a reduction in volatility in the cross section. Moreover, we obtain here a positive coefficient for openness, which is non existent in the unconditional correlations (see Table 1) or in the OLS regressions (Table 3).

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 formal test is the overidentification test reported in the last row of Table 4. In none of the cases we observe values below 5%, so we cannot reject the hypothesis that our instruments are exogenous. The second issue is the weakness of our 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 our first-

¹⁰ The instruments for Column (1) are: Open6069, Urban90, Depend90, GDP per capita and GDP; in Column (2) Open6069 is replaced with Area and Distance from main trading partners; and in Column (3) we add average growth rate of GDP to the list of instruments in Column (2). We use generalized method of moments as estimation technique with an optimal weighting matrix, which ensures that our estimates are heteroskedasticity-robust.

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.

It is not clear, however, whether we have accounted completely for the endogeneity of openness by including past openness. Since the cross sectional variation of openness does not exhibit differential time trends, it is clear that openness in 1960-1969 is as good a proxy for the whole sample openness as the one in 1970-1997. To ensure complete exogeneity of our instruments we decided to use area and distance from main trade partners instead of earlier period openness.¹¹ Column (2) reports the new results. The p-value from the OID test increases suggesting that indeed we have a better set of instruments now, while the coefficients on government size and openness change only marginally. Because the exogeneity of this set of instruments is more plausible we will use these variables in later regressions

Finally, one can think of an alternative determinant of volatility: the average growth rate of real GDP. Countries with high rates of economic growth might also experience higher volatility measured as the standard deviation of growth rates. At the same time because one of our instruments, GDP per capita in the initial period, could be highly correlated with the average growth rate of output according to the standard neoclassical growth model, we will have an instrument correlated with an omitted variable. Therefore we include the average growth rate of output in the 1970-1997 period in the regression without instrumenting for it. The last column in Table 4 reports the results. Both coefficients on openness and government size double in absolute value and again the exogeneity of our instruments improves. The average growth rate enters with the wrong sign, but it is insignificant. At the same time openness becomes significant and still has a positive effect on volatility.¹²

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 the effects of automatic stabilizers we have to explore which components of the

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

¹² We have included also GDP per capita in the regression, in addition to openness and government size. The coefficient on government size remains negative and significant at the 1% level, while openness is still positive but insignificant.

budget are the important determinants of this reduction in volatility and what type of volatility is most significantly affected. In particular, we are concerned by the fact that the correlation between government size and disposable income or consumption is weaker than the correlation with output, as documented in Table 1.

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 column (2) of Table 4. Each entry in Table 5 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 4. Looking at the first two columns, we can see that the effects of total spending and total taxes are very similar. 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 coefficient is when the dependent variable is the volatility of consumption and the regressor is total spending. However, we have to stress the significance of the results for disposable income and private output. These results are not trivial and in an OLS regression of volatility of disposable income on government size, the coefficients are never significant.

The second set of results concerns transfers. Column (3) suggests that transfers play an important stabilizing role for every measure of volatility, including consumption. Comparing the result for consumption to the result for private output, one could argue that the reason private absorption experiences a reduction in volatility with the increase in government size is exactly because of the reduction in the volatility of consumption. But notice, that while this kind of inference is justifiable in this case, in the case of total spending we see that private absorption is smoothed more by increased government spending than the mere reduction in consumption volatility. Finally, we note that the two other components, wage and non-wage spending, are rarely significant with non-wage spending having biggest effect on disposable income.

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 the most 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. The two components of government spending investigated above do not seem to play

Table 5. Government Size and Volatility. IV

	G7097	TX7097	TR7097	CGW7097	CGNW7097
GDP	-2.078 (0.005)	-1.770 (0.005)	-0.881 (0.000)	-0.763 (0.456)	-0.223 (0.569)
DI	-2.614 (0.023)	-2.667 (0.002)	0.057 (0.931)	-1.567 (0.066)	-0.513 (0.023)
C	-2.177 (0.054)	-2.071 (0.039)	-2.522 (0.000)	-1.431 (0.112)	-0.383 (0.234)
YDH	-3.066 (0.025)	-2.981 (0.016)	-1.587 (0.000)	-2.423 (0.055)	-0.863 (0.033)
PrivGDP	-2.574 (0.002)	-2.005 (0.006)	-1.604 (0.000)	-0.025 (0.981)	0.171 (0.704)

Sample: 1960-1997.

p-values in parentheses

a very important role.

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 Galí (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.

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 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 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 expendi-

tures 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 levels 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).

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.¹³

Table 6 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

¹³ 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.

Table 6. 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.

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.

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: initial GSP per capita (GSPPC63), area (Area), average growth (Growth6390) and urbanization 1980 (Urban90). These are variables that are behind differences such as in state GSP per capita, density or state income distribution.¹⁴

Table 7 presents the results. For both federal taxes and transfers, the fit is good (we can explain more than 50% of the variation in the ratio of federal taxes to GSP) 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 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.¹⁵ 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 density.

¹⁴ These differences produce, in the presence of non linearities in the tax system, differences in taxes-to-GSP ratios.

¹⁵ 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.

Table 7. Determinants of Government Size

	FTaxes (1)	FTransf (4)	Staxes (5)
POP63	5.466 (0.030)	-0.004 (0.979)	2.037 (0.573)
GSPPC63	0.044 (0.004)	-0.727 (0.000)	-0.002 (0.900)
Growth6390	5.944 (0.002)	-1.953 (0.379)	0.590 (0.836)
Area	-1.827 (0.000)	-0.467 (0.168)	-1.467 (0.097)
Urban80	0.031 (0.081)	0.0216 (0.164)	-0.006 (0.712)
Adjusted R^2	0.512	0.455	-0.042

Sample: 1963-1990.

p-values in parentheses

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. As we did in the cross-country sample we first report unconditional correlations of different measures of volatility and government size. Measures of government size based on taxes are negatively correlated with the volatility of macroeconomic aggregates and the size of the correlation is similar to the international correlations. The strongest correlations appear when GSP or investment (INV) are used to measure the volatility of the business cycle. Interestingly, measures of government size at the state level do not display a negative correlation with volatility and in the case of local and state government expenditures, the correlation is positive and large. The same is true when we look at federal grants.

Following our analysis of the international data, we run regressions of business cycle volatility on government size. Table 9 reports the results. We start with the most general measure of government size: total taxes as a percent of GSP. This includes federal, state and local taxes. Using the standard deviation of GSP growth rates as the measure of volatility we obtain a negative and significant

Table 8. Correlations

	Taxes	PTaxes	FTaxes	STaxes	FTransf	SGCons	FGrants
GSP	-0.38	-0.55	-0.47	-0.12	-0.32	0.21	0.27
SI	-0.24	-0.43	-0.36	0.01	-0.10	0.33	0.30
DSI	-0.27	-0.46	-0.42	0.01	-0.12	0.38	0.33
C	-0.14	-0.26	-0.22	0.01	-0.18	0.37	0.35
INV	-0.39	-0.58	-0.55	-0.06	-0.13	0.47	0.56

Sample: 1963-1990.

Table 9. Government Size and Volatility (GSP)

	Coefficient	Adjusted R^2
Taxes	-3.236 (0.046)	0.302
PTaxes	-3.970 (0.000)	0.426
FTaxes	-5.107 (0.003)	0.336
FPTaxes	-3.192 (0.002)	0.345
STaxes	-0.899 (0.026)	0.258
SPTaxes	-0.792 (0.000)	0.316
FGrants	-0.525 (0.574)	0.223
FTransf	-4.139 (0.002)	0.404
SGCons	0.133 (0.927)	0.025

Sample: 1963-1990. p-values in parentheses
All regressions include an intercept and controls.
Controls: GSP per capita 1963,
pop 1963 and avg. growth 1963-90.

coefficient and a good fit.¹⁶

In the same table we also report the slope of the regressions using alternative measures of government size. In all cases their sign is negative and, consistently, personal taxes (both federal and state) and federal transfers display the most significant coefficients. It is also interesting to notice that for those variables

¹⁶ All regressions control for GSP per capita, population or average GSP growth and an intercept. Their coefficients are not reported in the table. Government size is always in logs. Results in levels are practically identical to the results presented here.

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 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 than in the case of personal taxes or transfers and, as a result, they play less of a role as automatic stabilizers.

**Table 10. Change in Volatility (GSP)
as a result of a 1% increase in government size**

Taxes	-0.12	SPTaxes	-0.40
PTaxes	-0.40	FGrants	-0.18
FTaxes	-0.28	FTransf	-0.52
FPTaxes	-0.40	SGCons	0.01
STaxes	-0.30		
Expenditures (OECD dataset)			-0.11

What about the size of the coefficients? How do they compare across different measures of government size and how do they relate to the results for OECD countries? The coefficients of Table 9 are not directly comparable because the explanatory variable is in logs. In Table 10 we have calculated the effect, as implied by our regressions, of increasing each of the size of the government by 1% of GSP. The first thing that needs to be noticed is the striking similarity between the coefficient in the OECD data set and the coefficient in the regressions with US states. For example, in the OECD data, using instrumental variables (Column 3 of Table 4) the implied effect of increasing the size of the government by 1% of GDP is to reduce the volatility of GDP by -0.11. For the US States, this effect

is -0.12.

Across different fiscal variables we see that federal transfers have the largest effect followed by personal taxes. Interestingly, the effect of personal taxes at the federal and state level is practically identical. The smallest effects are with respect to federal grants and state and local government consumption.

Table 11. Government Size and Volatility

	SI	DSI	INV	C
Taxes	-1.088 (0.082)	-1.097 (0.090)	-21.540 (0.034)	-0.812 (0.507)
PTaxes	-1.802 (0.001)	-1.759 (0.002)	-26.100 (0.000)	-1.309 (0.236)
FTaxes	-1.658 (0.079)	-2.017 (0.029)	-44.280 (0.000)	-2.171 (0.278)
STaxes	-0.199 (0.190)	-0.226 (0.168)	-3.411 (0.071)	-0.121 (0.657)
SPTaxes	-0.487 (0.003)	-0.387 (0.023)	-4.536 (0.001)	-0.317 (0.196)
FGrants	-0.474 (0.484)	-0.599 (0.348)	18.790 (0.001)	1.185 (0.135)
FTransf	-1.885 (0.073)	-2.223 (0.028)	-5.618 (0.421)	0.075 (0.951)
SGCons	1.378 (0.210)	1.664 (0.106)	12.576 (0.082)	0.166 (0.845)

Sample: 1963-1990. p-values in parentheses
 All regressions include an intercept and controls.
 Controls: GSP per capita 1963,
 population 1963 and average growth 1963-90.

What about different measures of volatility? Table 11 reports the results of running similar regression using as dependent variable different measures of the volatility of economic fluctuations. The results are consistent with our previous estimates. First, we find that the best fit of the regression and the highest significance is 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 of transfers or taxes are smaller and, in some cases, insignificant. In the case of consumption, all the fiscal variables become non-significant. This surprising result was also present in the OECD countries.

Interestingly, there are two variables that appear as positive and significant in some 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.

In summary, the results presented in this section confirm that government size is negatively related to volatility of GSP growth rates. The estimated effects are very close to the sample of OECD countries and are the strongest for GSP and Investment. Among the different components of fiscal policy we find, once again, that taxes (personal) and transfers have the largest impact. When it comes to personal taxes, the level of taxation does not seem to matter as the effect of federal personal taxes is similar in size to that of state and local personal taxes.

4.4 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.¹⁷ For each state we have run regressions of the type

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

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

¹⁷ The analysis of Asdrubali, Sorensen and Yosha (1996) assumes that this elasticity is the same for all states.

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 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.¹⁸ 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 is practically identical to 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 federal transfers and 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. However, the relationship is weaker and in some cases insignificant.

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.

¹⁸ Rodrik (1998) suggests this argument as an explanation of why more open economies have bigger governments.

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7.- APPENDIX

DATA SOURCES.

All OECD 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
 $G = \text{EXPENDITURES} = \text{CGNW} + \text{CGW} + \text{IG} + \text{TSUB} + \text{SSPG} + \text{TRPG}$
 $\text{REVENUES} = \text{SSRG} + \text{TY} + \text{TIND} + \text{TRRG}$
 $\text{TRANSFERS} = \text{TSUB} + \text{SSPG} + \text{TRPG}$

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).