POLICY VOLATILITY, INSTITUTIONS, AND ECONOMIC GROWTH

Antonio Fatás and Ilian Mihov*

Abstract—In this paper, we present evidence that policy volatility exerts a strong and direct negative impact on growth. Using data for 93 countries, we construct measures of policy volatility based on the standard deviation of the residuals from country-specific regressions of government consumption on output. Undisciplined governments that implement frequent and large changes in government spending unrelated to the state of the business cycle generate lower economic growth. We employ both instrumental variables and panel estimation to address concerns of omitted variables and endogeneity. A 1 standard deviation increase in policy volatility reduces long-term economic growth by about 0.74% in the panel regressions and by more than 1 percentage point in the cross-section.

I. Introduction

THE current economic crisis has generated a renewed interest in the role of macroeconomic policy as a stabilizing tool. In particular, fiscal policy is back in fashion after years when it was considered too slow and ineffective. While fiscal and monetary policy can have beneficial short-term effects, there are also reasons to worry about potential adverse long-term effects of policies that are too aggressive. In this paper, we focus on fiscal policy and look at one potential long-term cost: if used too often and at the wrong time, it can generate unnecessary volatility and lower growth.[1]

The growth literature has already looked at the role of fiscal policy for long-term economic growth. However, it generally considered fiscal policy in levels by looking at government size, tax rates, and the level of debt. Interestingly, in most cases, the significance of these fiscal policy variables is very low, and it disappears once the growth regression includes additional controls like the quality of political institutions. We show that if one considers the volatility instead of the level of fiscal policy, there is a robust negative relationship between discretionary changes in government spending and economic growth. This relationship is robust to the introduction of many control variables, including measures of institutional quality.

Our results are related to two different strands of literature on economic growth: one that looks at the link between volatility and growth and one that studies the determinants of growth by running a horse race among a large set of macroeconomic variables, some of them related to economic policies.

The relationship between volatility and growth has been studied many times before, but the debate is still open. There is evidence of a negative relationship between volatility and growth (Kormendi & Meguire, 1985; Ramey & Ramey, 1995), but the evidence is weak. One of the reasons that this relationship might not be as strong as expected is that there could be reverse causality: countries that adopt riskier technologies are countries that grow faster (see Black, 1987, for a first reference to this idea and Imbs, 2007, for empirical validation of this hypothesis). One way to deal with the problem of reverse causality is to identify exogenous sources of volatility. By looking at the volatility induced by fiscal policy changes and using instrumental variables estimation, we avoid the problem, and our results show a much more robust relationship between volatility and growth than previous studies in this field. In fact, we show that in most of our specifications, volatility of output is not a significant explanatory variable, but policy-induced volatility is.

The view that policy volatility is key to long-term economic performance is certainly not new. In his Nobel laureate lecture, Friedman (1977) pointed out that while high inflation per se does not change the natural rate of unemployment, an increase in the variance of inflation can generate grave economic inefficiencies and affect the long-term performance of the country by raising its natural rate of unemployment. Thus, long-term monetary neutrality holds when we consider the level of policy but not when we look at its volatility.

In this paper, we construct a measure of policy volatility based on the variance of unforecastable changes in government consumption. We interpret this variance as the aggressiveness with which politicians use spending for reasons other than smoothing the business cycle. Since there are obviously many dimensions of macroeconomic policy, we need to justify our choice of policy volatility. We start with the idea that in order to estimate the variance of exogenous shifts in policy stance, we should be able to specify an equation that resembles a reaction function for every country in our sample. At first, it may seem easier to do this for monetary policy. Many recent studies have proposed reactions functions with the short-term interest rate as an instrument of monetary policy. This approach, however, leads to some fundamental difficulties: (1) short-term interest rates are not available for many countries in our sample, especially for the period before 1984; (2) when data are available, the series do not have consistent definitions across countries; and (3) the interest rate is properly labeled as a monetary policy instrument only in few countries and only since 1984 at best (with the United States being a notable exception). An alternative approach would

Received for publication December 17, 2009. Revision accepted for publication October 5, 2011.

* INSEAD and CEPR.

We thank the editor and two referees for their comments and suggestions. We are grateful for the financial support from INSEAD via research grant 2010-530R. Nicolas Depetris and Rashid Ansari provided excellent research assistance.

[1] Some of the effects of fiscal policy on the economy have been documented in a large body of literature. For example, a stream of papers starting with Blanchard and Perotti (2002) has analyzed the dynamic effects of fiscal policy on the economy and produced estimates of the so-called fiscal policy multipliers. Our approach here is different. We also study changes in fiscal policy that are unrelated to the state of the business cycle either not timed properly or motivated by factors other than the macroeconomic conditions in the country. However, the main goal of the paper is to show that the volatility of these policy changes exerts a strong negative effect on long-term macroeconomic performance.

The Review of Economics and Statistics, May 2013, 95(2): 362–376
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be to use monetary aggregates, but again we face problems with the consistency of definitions. A third possibility would be to use the inflation rate. We decided against this because even a well-specified equation for inflation will inevitably contain shocks that are due to other factors and not to monetary policy (for example, oil price shocks, terms-of-trade shocks). As a result we focus on fiscal policy, and by using government consumption we can construct an imperfect and yet consistent measure of fiscal policy stance. Comparable series for government consumption exist for many countries, and the time span is long enough to allow sensible time-series estimation of the reaction function.[2]

The second strand of literature that relates to this paper is the one that looks at the deep determinants of economic growth. This strand has recently questioned the role of macroeconomic policies in determining long-term growth rates. First, policy variables traditionally become insignificant in growth regressions when a large number of variables are tested as determinants of long-term performance. Second, while policies are very persistent over time, growth rates are not. And finally, there is evidence that some of the positive correlation that exists between good policies and growth is simply due to the fact that both are the result of good institutions, so once we control for the quality of institutions, the correlation disappears.[3] In our analysis, we extensively test the robustness of our results by running specifications similar to those of Acemoglu et al. (2003) or Sala-i-Martin, Doppelhofer, and Miller (2004). In these specifications, many other institutional and economic variables are included to test the robustness of the relationship between fiscal policy volatility and growth. The difference between our specification and those in the previous literature is that while most previous empirical studies use policy levels as regressors to predict growth performance, we claim that a key policy characteristic that matters for long-term country performance is the volatility of policy.[4] Thus, we argue that it is not enough to attain low inflation and low budget deficits on average; it is also necessary to have stable inflation and stable fiscal policy.

Using our measure of policy volatility, we find strong support for the view that volatility in policy has a significant negative effect on long-term growth rates. In other words, the way that macroeconomic policy is conducted matters for growth.

In our analysis, we acknowledge the role of institutions as we uncover a strong relationship between institutional settings (such as constraints on the executive) and fiscal policy outcomes. In this respect, political institutions that constrain the executive have a powerful effect on growth by shaping macroeconomic policy. Macroeconomic policy is then the mediating factor through which institutions affect growth. By understanding the specific channels through which low-quality institutions affect growth, we can provide better recipes for institutional reform as argued by Rodrik (2008b).

But our results also suggest that even within similar institutional settings, differences in policy volatility result in different growth rates. This finding is consistent with the view that policy volatility is determined by both the institutional environment and by shifts in political preferences or other idiosyncratic shocks.

The paper is organized in the following way. Section II describes our empirical strategy and the data set and presents the construction of our measure of policy volatility. Section III reports that in a large cross-section of countries, higher policy volatility affects economic growth negatively. In section IV we construct a panel of ten-year averaged data in order to address issues of reverse causality and omitted fixed effects. The link of our results to the empirical and theoretical literature on growth is discussed in section V. We conclude by summarizing our main findings and raising some questions for future research.

II. Empirical Strategy and Data Description

To test the hypothesis that policy volatility exerts a negative impact on long-term economic growth we have compiled annual data for 93 countries spanning the years 1960 to 2007. We posit that the link between policy volatility and economic growth can be identified with the following modification of a standard growth regression introduced by Barro (1991):

$$\overline{\Delta y_i} = \alpha + \lambda \log(\sigma_i^{\epsilon}) + \beta' X_i + \gamma' Z_i + u_i. \quad (1)$$

In this regression $\overline{\Delta y_i}$ is the average growth rate of output per capita (1970–2007) for country i. Our key regressor is the volatility of the exogenous shocks to government consumption (σ_i^{ϵ}). Throughout the paper, we refer to this variable as *policy volatility*, with the obvious caveat that our measure relates to only one instrument of macroeconomic policy. In equation (1), we also include a vector of variables (**X**) that have been identified as having significant explanatory power for the cross-country variation in growth. In order to verify that our key results are not due to omitted variables, we also include other controls captured by the vector **Z**. In this section, we discuss the definitions of the main regressors in equation (1) and the justification for their inclusion. We start with the measure of policy volatility.

A. *Policy Volatility*

Our goal is to isolate a measure of policy stance that captures the portion of discretionary fiscal policy that is not explained by the state of the business cycle. Shifts of this kind may occur because of changes in the political preferences of

[2] An alternative measure of policy volatility is to look at the volatility of exchange rates. This is the approach of Aghion et al. (2006); their results are very much consistent with the ones presented in our paper.

[3] One exception is Rodrik (2008a), where the level of the exchange rate is shown to be a significant determinant of growth.

[4] Woo (2009) also provides evidence that mismanagement in fiscal policy measured as procyclical and volatile fiscal policy can harm growth.

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the ruling party or because of the desire of the incumbents to generate a temporary boom before elections.[5]

In section I, we explained our focus on fiscal policy by referring to the difficulties with estimation of a monetary policy reaction function consistently across countries. In general, several variables can be used to characterize fiscal policy. We choose government consumption (as reported in the national income and product accounts) because this is the only series that is easily comparable across countries. Needless to say, this is not a perfect measure. It does not include important parts of government spending such as transfers, and it is not a comprehensive measure of fiscal policy because it omits the revenue side. However, the series for the more comprehensive measures like the budget balance, total expenditures, and total revenues are unreliable as there are frequent breaks and changes of definitions.[6]

Equipped with our preferred measure of policy, government consumption, our next goal is to isolate movements in government consumption that can be considered as policy decisions exogenous to the state of the economy. The literature on fiscal policy uses several approaches to measuring policy volatility. One approach is to calculate raw standard deviations of policy variables (before or after detrending). Another technique is to use GARCH models to construct smooth (time-varying) measures of volatility, which can also be used in panel estimation (as in Henisz, 2004). Finally, one can use, as we do, regression analysis to isolate changes in fiscal policy that are exogenous to changes in economic conditions. It is straightforward to show that the first two methods do not extract the exogenous component of policy changes (unless policy is itself exogenous). Therefore, we adopt the third approach, which requires that for each country in our sample, we run a regression of the following type:

$$\Delta \ln(G)_{i,t} = \alpha_i + \beta_{i,j}\, \Delta \ln(Y)_{i,t} + \epsilon_{i,t}. \quad (2)$$

In these regressions, we denote by G real government consumption spending, while Y is real GDP. One possible interpretation of this equation is that of a reaction function for the government. Following Alesina, Campante, and Tabellini (2008), Lane (2003), Woo (2009), and Aghion, Hemous, and Kharroubi (2009), who estimate similar policy reaction functions, we estimate equation (2) by OLS. Of course, we are aware of the possible reverse causality from government spending to output, and we have also estimated several versions of equation (2) using instrumental variables.[7]

We interpret the country-specific volatility of $\epsilon_{i,t}$ as an estimate of discretionary policy or a measure of fiscal activism.[8] In the calculation of policy volatility, we restrict the sample from 1970 to 2007 because we will use data from the 1960s as initial conditions in the growth regressions.[9]

B. *Policy Volatility and Institutions*

Before we proceed to the growth regressions, we investigate whether the newly constructed measure is related in any way to the institutional structure of the country. Our main institutional variable is constraints on the executive. We have chosen this variable because a version of this institutional characteristic is used in the previous literature (Acemoglu et al., 2003) and also because it shows how much freedom the executive has in changing policy stance. The particular variable that we use takes five values depending on how many checks on the executive exist. It is calculated as

$$\begin{aligned} \textit{Constraints} = {} & \textit{Legislature} + \textit{upper chamber} \\ & + \textit{judiciary} + \textit{federal}. \end{aligned}$$

Each of the variables on the right-hand side is a dummy variable that takes the value of 1 for countries that have the specific institutions: legislature is equal to 1 for countries where the parliament is freely elected and independent of the executive; upper chamber is 1 if the country has a bicameral legislature; judiciary equals 1 for countries where the judiciary is separated from the executive branch; federal equals 1 for countries with a federal structure whereby political power is shared between central and local governments. Thus, the variable constraints captures potential veto points on the decisions of the executive.[10] The data used to construct constraints on the executive come from Henisz (2000).

A variation of our measure of constraints is a variable constructed by Henisz (2000) called political constraints. This variable differs from our measure in two ways: the author

[5] The literature on the political economy of policymaking is enormous. Drazen (2000) and Persson and Tabellini (2000) discuss various models within the political business cycle literature, in which politicians have incentives to change spending levels for reasons other than macroeconomic stabilization.

[6] The source for the data on government consumption is the World Development Indicators database of the World Bank. Sources for all the other variables are listed in appendix 4 available from the online supplement.

[7] We have explored two sets of instruments. In a previous version of the paper, we estimated equation (2) in levels and instrumented output with a time trend, logarithm of oil prices, and a lag of the GDP deflator. We have also produced results where we use output in the rest of the world (current and lagged), as well as current and lagged oil prices as instruments. This is reminiscent of the instruments used by Gali and Perotti (2003), who use foreign output gaps to instrument for domestic output gap. Finally, we also estimated variations of equation (2) where inflation is included as a control variable. In all cases, the main results from these robustness checks are consistent with the OLS results presented in the paper and are available on request.

[8] Aghion and Marinescu (2006) used an alternative measure of budgetary activism based on the cyclicality of government debt. Their study is focused on understanding the growth effects of countercyclical fiscal policy.

[9] Koren and Tenreyro (2007) decompose output volatility in 45 countries into volatility due to specialization in volatile sectors, volatility due to macroeconomic country-specific shocks, and volatility due to the covariation between sector-specific and country-specific components. They interpret the macroeconomic component as resulting from volatile policies or political instability. In an earlier version of this paper, we used their data and found that their measure of country-specific volatility had a correlation of over 0.75 with our policy volatility measure. This result supports their interpretation and provides evidence that our measure is not capturing volatility due to the sectoral composition of country's output.

[10] The role of veto players in policymaking has been studied extensively in the political economy literature. See, for example, Tsebelis (2002) for an insightful discussion of the policy effects of veto players.

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adjusts for the ideological alignment across political institutions, and he argues that each additional constraint has a diminishing marginal effect on policy outcomes and therefore the link between the overall measure and the veto points should be nonlinear.[11] We prefer to use the simple sum of constraints because it deals in part with the possibility of endogenous response of electoral outcomes (and hence ideological alignment) to economic developments throughout the period.[12]

Two other measures of the role of constraints are used in the literature. Acemoglu et al. (2003) use constraints on the executive from the Polity IV data set. In contrast to our measure, which simply records the number of independent veto points, the Polity IV measure is based on interpretation of the effectiveness of the veto points. The Database of Political Institutions (DPI) provides a series for a variable called checks. This variable, as is the case for the political constraints variable in Henisz (2000), captures not only institutional characteristics in the country but also political outcomes as its value is adjusted when, for example, the president and the legislature are members of the same party.[13]

Table 1 documents the institutional determinants of policy volatility. In the first column, we report that our measure of constraints has a significant negative effect on policy volatility. Alone, this institutional characteristic explains 38% of the cross-country variation in policy instability. This is a strong result that has a straightforward interpretation: countries with more checks and balances do not allow the executive to change policy for reasons unrelated to the state of the economy. Therefore, in these countries, overall policy volatility is lower.

Column 2 adds as controls three other political and institutional variables used in the literature as determinants of policy volatility: political system (presidential versus parliamentary), electoral system (majoritarian versus proportional), and number of elections.[14] These variables improve the fit of the regression by raising the R^2 to 58%. Given that these variables (with the possible exception of the last one) are exogenous to the current state of the economy, we use them later in our analysis as instruments for policy volatility.

In the next two columns, we report similar regressions by restricting the sample to the set of the initially rich countries (column 3) and initially poor countries (column 4). The cutoff between rich and poor is set at $6,000 GDP per capita (average in 1967–1969), which is close to the mean income in that year.[15] With this cutoff, 29 countries are classified as rich and the remaining ones as poor. The coefficient on constraints is highly significant for poor countries and marginally significant for the rich ones.[16]

TABLE 1.—INSTITUTIONS AND POLICY VOLATILITY
Dependent Variable: Policy Volatility, 1970–2007

	(1) Univariate	(2) Baseline	(3) Rich	(4) Poor
Constraints on the executive	−0.365 (0.046)***	−0.234 (0.046)***	−0.143 (0.070)*	−0.191 (0.085)**
Presidential		0.759 (0.139)***	0.736 (0.194)***	0.294 (0.254)
Majoritarian		−0.122 (0.116)	0.081 (0.202)	−0.378 (0.155)**
Elections		−1.469 (0.439)***	−1.079 (0.635)	−1.182 (0.516)**
Constant	2.161 (0.084)***	2.036 (0.191)***	1.485 (0.246)***	2.471 (0.286)***
Observations	83	81	29	52
R^2	0.38	0.58	0.40	0.28

Robust standard errors in parentheses. Significant at *10%, **5%, ***1%.

C. *Growth Data and Summary of Controls*

In addition to constructing our measure of policy volatility for each country, we have also collected a set of controls that we will use in regression (1) to ensure that the link between policy volatility and growth is not due to an omitted variable. (A detailed description of the series is provided in appendix 4 available in the online supplement.) Here we offer only a brief overview of the data and the timing assumptions. In equation (1), the dependent variable ($\overline{\Delta y_i}$) is the average growth rate of output per capita (1970–2007) for country i. The period over which the growth rate is calculated corresponds to the period over which we construct our measure of policy volatility. As main controls in equation (1) (vector X), we include five variables that have been identified as having significant explanatory power for the cross-country variation in growth. Our choice of controls is based on Sala-i-Martin et al. (2004), who use Bayesian averaging of classical regression estimates for 67 determinants of growth to identify eighteen variables for which the posterior inclusion probability increases relative to the prior. Of these variables, we select four that have clear economic interpretation: (a) initial GDP per capita, (b) initial level of human capital, (c) initial investment price level, and (d) initial government consumption. In addition to these variables, we include in vector X average openness to control for the effect of trade on economic growth (see Frankel & Romer, 1999). All variables, except initial human capital, are calculated as the average over 1967 to 1969, the three years preceding the start of the growth sample. The initial level of

[11] We have run a nonlinear regression of policy volatility on our measure of constraints. The nonlinearity was expressed as an exponent of the constraints measure that was estimated by the model. Somewhat surprisingly, the exponent is estimated to be very close to 1; there is no strong evidence of nonlinearity in the effect of constraints on policy volatility.

[12] The ideological alignment across agents occupying various political institutions can be an outcome of strategic voting, as Chari, Jones, and Marimon (1997) argue.

[13] Although not reported in the tables below, we have replicated our results using the Polity IV index, the DPI measure of checks and balances, and the index that Henisz constructed. The results are available on request.

[14] Persson (2005) discusses in detail why the nature of the political and electoral arrangements might matter for policy outcomes. We refer readers to his analysis and also to our brief discussion of the related literature in section V.

[15] The income data are real GDP per capita (chained series) from the Penn World Tables v.6.3. The earlier version of the paper reports results based on PWT v.6.1.

[16] This result is consistent with Aghion et al. (2005).

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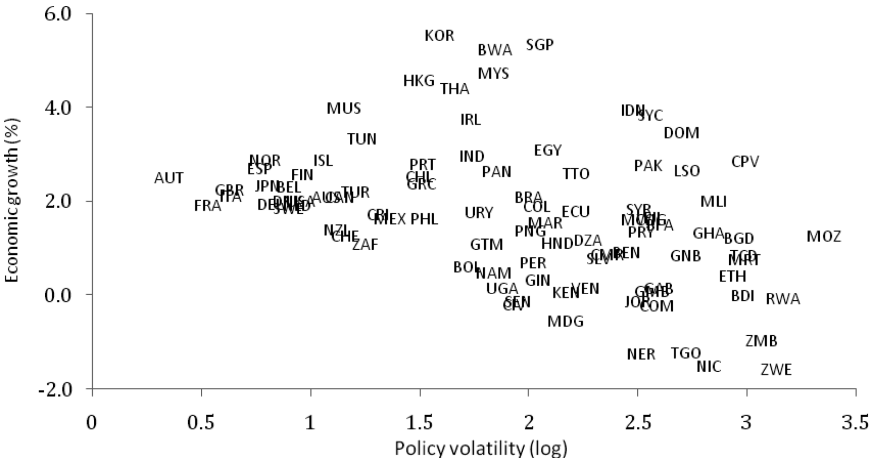
FIGURE 1.—POLICY VOLATILITY AND ECONOMIC GROWTH, 1970–2007



human capital is measured, as in Sala-i-Martin et al. (2004), as the percentage of the population of relevant age enrolled in primary school in 1960. The reason for the longer time lag is that those enrolled in primary school will contribute to growth as workers only after ten or more years.

We choose these five regressors as our main controls because behind each of them, there is a relatively well-accepted economic theory that explains why these variables should predict growth.[17] Thus, one can explain why initial GDP per capita predicts growth by referring to the neoclassical growth model, but it is very difficult to provide a theory explaining why, for example, a dummy variable taking a value of 1 for East Asian countries should predict growth. Furthermore, if the East Asian dummy is indeed so successful in predicting growth, then many theories would suggest that this predictive power is only temporary. Once the countries from the Asia-Pacific rim reach the technological frontier, their growth rate will slow down and the dummy variable will not be as successful as before. At the same time, GDP per capita will be a predictor (ceteris paribus) as long as there are countries away from the technological frontier.

While our baseline results include only five controls, we are sensitive to the criticism that the estimates might be driven by an omitted variable listed among the top predictors of growth in Sala-i-Martin et al. (2004). To investigate the sensitivity of our results to changes in the specification of equation (1), we include additional controls (vector **Z**). Within this set, we include sequentially all of the top 21 variables from Sala-i-Martin et al. (2004), as well as additional variables like output volatility, inflation volatility, and institutions.

III. Policy Volatility and Economic Growth

A. *Baseline Regression*

We start by documenting in figure 1 the correlation between policy volatility and long-term economic growth over the period 1970 to 2007. The most volatile fiscal policy is recorded in several African countries like Mozambique and Rwanda, and the most stable policies are those in the OECD economies. The unconditional raw correlation is negative, and a regression of growth on policy volatility, reported in column 1 of table 2, yields a negative coefficient of −0.813, which is significant at the 1% level of significance. Taken at face value, this coefficient suggests that a country like Venezuela, with volatility of fiscal policy close to the mean of the sample, could raise its growth rate by about 0.5% per year if its fiscal policy were stabilized to the same level as Mexico.

There are several reasons that we should interpret the scatter plot and the regression results with caution. First, it is possible that our measure of policy volatility is correlated with some other key determinant of economic growth, and therefore in column 1, the coefficient on policy volatility is biased and inconsistent. Second, the result reported in column 1 could be driven by outliers and hold only for this specific sample. Third, it is possible that policy volatility depends on recent growth performance and is therefore endogenous to long-term economic growth. The rest of table 2 addresses in part the first two possibilities, and the reverse causality issue is taken up in table 3.

To check for the possibility that a significant omitted variable is responsible for the documented link between policy and growth, we include in column 2 five key determinants of growth as we discussed in the previous section. We note that all of the variables enter with the expected sign: investment price 1960 and government size are not significant, while initial GDP per capita, primary enrollment, and openness are all significant at the 1% level. The coefficient on our key variable of interest, policy volatility, increases in absolute value and remains significant at the 1% level.

Next, we take up the possibility that the negative effect of policy instability on economic growth holds only for this sample. In columns 3 and 4, we split the sample into rich

[17] For a textbook presentation of the relevant theories see Barro and Sala-i-Martin (2003).

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TABLE 2.—AVERAGE GROWTH AND POLICY VOLATILITY
Dependent Variable: Growth Rate of Output per Capita, 1970–2007

	(1) Univariate	(2) Baseline	(3) Rich	(4) Poor	(5) Additional Controls
Policy volatility	−0.813	−1.358	−0.585	−1.558	−1.011
	(0.153)***	(0.356)***	(0.274)**	(0.459)***	(0.362)***
Government size		−0.001	−0.066	0.007	−0.000
		(0.013)	(0.019)***	(0.014)	(0.013)
Investment price		−0.003	−0.006	−0.003	−0.003
		(0.003)	(−0.004)	(0.005)	(0.003)
Initial GDPpc		−1.195	−0.719	−1.381	−1.232
		(0.277)***	(0.475)	(0.370)***	(0.269)***
Primary enrollment		2.806	−0.526	2.896	3.153
		(0.732)***	(4.268)	(0.800)***	(0.691)***
Openness		0.011	0.006	0.01	0.01
		(0.004)***	(0.005)	(0.006)*	(0.004)**
Output volatility					−0.427
					(0.412)
Inflation					−0.02
					(0.017)
Variance of inflation					0.000
					(0.000)
Constant	3.169	11.599	11.065	13.233	11.923
	(0.268)***	(2.514)***	(6.426)*	(3.297)***	(2.512)***
Observations	93	87	30	57	87
R^2	0.16	0.45	0.57	0.45	0.49

Robust standard errors in parentheses. Significant at *10%, **5%, ***1%. All controls are calculated for the period 1967–1969 except primary enrollment, calculated for 1960–1964. Policy volatility is calculated as the log of the standard deviations of the policy residuals from 1970 to 2007.

TABLE 3.—AVERAGE GROWTH AND POLICY VOLATILITY: INSTRUMENTAL VARIABLES ESTIMATION
Dependent Variable: Growth Rate of Output per Capita, 1970–2007

	(1) Univariate	(2) Baseline	(3) Rich	(4) Poor	(5) Additional Controls
Policy volatility	−1.094	−2.902	−1.791	−2.871	−3.378
	(0.234)***	(0.643)***	(0.838)**	(0.966)***	(1.211)***
Government size		0.005	−0.054	0.015	0.002
		(0.014)	(0.038)	(0.015)	(0.015)
Investment price		−0.002	−0.002	−0.006	−0.003
		(0.003)	(0.003)	(0.006)	(0.003)
Initial GDPpc		−2.066	−1.516	−2.036	−1.965
		(0.393)***	(0.708)**	(0.455)***	(0.418)***
Primary enrollment		2.597	1.351	2.606	2.304
		(0.885)***	(7.955)	(0.937)***	(1.217)*
Openness		0.016	0.009	0.015	0.014
		(0.005)***	(0.009)	(0.005)***	(0.005)**
Output volatility					1.079
					(0.992)
Inflation					−0.012
					(0.024)
Variance of inflation					0.000
					(0.000)
Constant	3.603	21.159	17.261	21.028	20.141
	(0.426)***	(4.035)***	(9.954)*	(4.772)***	(4.365)***
Observations	81	79	29	50	79
OID test	0.01	0.81	0.85	0.73	0.86

Robust standard errors in parentheses. Significant at *10%, **5%, ***1%. All controls are calculated for the period 1967–1969 except primary enrollment, which is for 1960. Policy volatility is calculated as the log of the standard deviation of the policy residuals from 1970 to 2007. Instruments for policy volatility: constraints in 1969, presidential, majoritarian, and elections. The last row reports the *p*-value from a test of overidentification.

and poor countries.[18] In the poor countries' policy, volatility has a bigger impact on long-term growth than in the rich subsample. If we test in a nested model for the equality of the two coefficients, however, we find that the difference is not statistically significant.

A slightly different concern is that we might have misspecified our first-stage regression, equation (2), when generating exogenous shocks by running a regression of government spending on output. It is conceivable that if we do not

[18] As mentioned in the previous section, rich countries are defined as average GDP per capita in 1967–1969 of at least $6,000.

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capture sufficiently well the reaction of fiscal policy to output growth, then a component of output fluctuations will enter the residuals. Hence, instead of measuring the effects of policy volatility, we might be documenting the effect of output volatility on economic growth. A straightforward way to test this claim is to include output volatility as a regressor. We report the results in column 5, where we also include the average inflation and its volatility as controls.[19] This modification has no effect on the coefficient or significance of the policy volatility variable. This suggests that our measure of policy volatility is not simply a proxy for the volatility of output. The fact that the volatility of output is not in itself significant confirms previous results in the literature.[20]

In summary, our measure of fiscal policy volatility enters a standard growth regression with a negative and statistically significant sign. The effects are not negligible: a reduction in policy volatility corresponding to 1 standard deviation in our sample raises long-term economic growth by about 0.92 percentage points.

B. Treating Policy Volatility as Endogenous: An IV Approach

There are still two potential problems with the results reported in table 2: omitted variables and endogeneity of policy volatility. It is indeed plausible to argue that an omitted variable may affect both growth and policy volatility or that countries with low rates of growth resort more often to aggressive policy in order to boost demand in the economy (reverse causality). Indeed, this version of the reverse causality argument generates a negative (conditional) correlation between output growth and policy volatility. In this section, we address these concerns by using instrumental variables. Incidentally, instrumental variables will also help us deal with standard measurement error problems that might be present because of the imprecision with which we have constructed the measure of policy volatility. The presence of measurement error creates an attenuation bias: it works against finding a significant relationship between policy and growth. If the instruments help us deal with the measurement error, we should see an increase in the absolute value of the coefficient. If, on the other hand, endogeneity has an important impact on our OLS estimates, then we should see a decrease in the absolute value of the coefficient on policy volatility.[21]

From the analysis of the link between institutions and policy volatility in table 1, we know that the constraints on the executive that were in place in 1969, the year before the start of our sample period, are very good predictors of policy volatility. In the next battery of tests, we use the institutional characteristics of the countries in our sample as instruments for policy volatility.

The univariate regression reported in column 1 of table 2 reveals again the strong negative impact of policy volatility on growth. In the next column, we add our standard controls, and the nature of our results does not change. Interestingly, the coefficient estimates for policy volatility in both cases jump relative to the OLS results reported in table 2, which is consistent with the presence of measurement error in our policy variable. In columns 3 and 4, we split the sample again into rich and poor countries, and still the coefficient for poor countries remains larger in absolute size.

Column 5 reports results from a perturbation of the baseline IV regression that also includes output volatility, inflation, and its volatility as regressors. As before, the standard deviation of output growth is insignificant, and the inclusion of monetary variables has no impact on the significance of policy volatility. This result shows again that one cannot attribute our key result to the role of general macroeconomic volatility for output growth. In both cases, the results are consistent with those documented by Sala-i-Martin et al. (2004). Importantly, the coefficient on fiscal policy volatility is unaffected in terms of magnitude or statistical significance.[22]

C. Robustness

We return now to our selection of controls in the growth regression. The study by Sala-i-Martin et al. (2004) shows that many geographical fixed effects, like a dummy for the East Asian countries or the percentage of the country area with tropical climate, predict growth quite well. Although it is difficult to see why East Asian countries would have different policy volatility (why the omitted variable is correlated with our measure of policy), we explore later in this section how the most significant regressors from the Sala-i-Martin et al. (2004) study affect our findings.

Because our sample period and some of our data sources differ from those used by Sala-i-Martin et al. (2004), we start our robustness study by using exclusively data from their paper. In table 4, the first column the dependent variable is growth from 1960 to 1996; in addition to our measure of policy volatility, we include the controls as they are defined in their study. The fundamental difference is only that the initial period is 1960 for the controls and dependent variable is calculated over a different range. The estimation by OLS yields coefficients for the controls that are very close to the posterior means reported by Sala-i-Martin et al. (2004), while the

[19] Monetary variables are included because they can potentially affect both long-term growth and fiscal policy, and therefore our main estimates may suffer from omitted variables bias.

[20] As Imbs (2007) and others pointed out, it is conceivable that there is a positive correlation between output volatility and growth. Countries that are willing to take more risks might grow faster and, as a result of investing in more innovative and risky technologies, display higher output volatility. Similar discussion can be found in Ramey and Ramey (1995).

[21] Of course, the magnitude of the coefficient could increase in the IV estimation if in the original regression there is an omitted variable that has positive (negative) correlation with policy volatility and affects growth in a positive (negative) way. The measurement error is an example of such influence.

[22] There are always concerns about the validity of instruments in growth regressions. One particular problem occurs when the same instrument has been used in different papers to instrument for different growth determinants. In appendix 3 of the online supplement, we discuss this problem and use a method developed by Conley, Hansen, and Rossi (2012) to provide a sensitivity analysis by relaxing instruments' exogeneity assumption.

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TABLE 4.—ROBUSTNESS: SALA-I-MARTIN ET AL. (2004) VARIABLES
Dependent Variable: Growth Rate of Output per Capita, 1970–2007

	(1) Using Sala-i-Martin et al. Data	(2) Top 6 (OLS)	(3) Top 6 (IV)
Policy volatility	−1.373	−0.835	−2.309
	(0.279)***	(0.365)**	(0.873)**
Investment price	−0.004		
	−0.004		
Government size	−5.88		
	(2.020)***		
Initial GDPpc	−1.294		
	(0.288)***		
Primary enrollment	2.816		
	(0.651)***		
Openness	1.326		
	(0.443)***		
Investment price		−0.002	0.000
		(0.002)	(0.003)
Initial GDPpc		−1.042	−1.705
		(0.249)***	(0.463)***
Primary enrollment		2.426	2.324
		(0.656)***	(0.766)***
East asian		1.103	0.627
		(0.554)**	(0.810)
Tropical area		−0.917	−0.192
		(0.301)***	(0.591)
Population coastal area		0.001	0.001
		(0.000)***	(0.000)***
Constant	12.16	10.449	18.009
	(2.377)***	(2.407)***	(4.812)***
Observations	85	85	78
R^2	0.6	0.57	
OID test			0.93

Robust standard errors in parentheses. Significant at *10%, **5%, ***1%. In the first column, we use data from Sala-i-Martin et al. (2004). The dependent variable in this column is for the period 1960–1969. In columns 2 and 3, we use the same data as in tables 2 and 3. Initial GDPpc and investment price are calculated for the period 1967–1969. Primary enrollment is for 1960. The remaining controls are as defined by Sala-i-Martin et al. (2004). See also the data appendix in the online supplement. Policy volatility is claculated as the standard deviations of the policy residuals from 1970 to 2007. Instruments for policy volatility: Constraints in 1969, presidential, majoritarian, and elections. The last row reports the *p*-value from a test of overidentification.

coefficient on policy volatility remains close to the estimates from table 2. Thus, the change of the time period and in the exact definition of the controls has no effect on our results.

We now proceed by using the top six variables from Sala-i-Martin et al. (2004). We change the range for the dependent variable back to 1970 to 2007 as in our baseline regression. The top six variables from Sala-i-Martin et al. (2004) are (a) East Asian dummy, (b) primary enrollment 1960, (c) investment price in the initial period, (d) initial GDP per capita, (e) fraction of tropical area, and (f) coastal population density in the 1960s. Relative to our baseline regression from table 2, we now drop government consumption and openness and include three geographic and demographic characteristics. The OLS regression in column 2 shows that the effect of policy volatility on growth is slightly moderated, but it remains significant at the 5% level. The other variables are all significant with the exception of investment prices.

In the last column of table 4, we replicate our baseline IV regression by instrumenting policy volatility with the same instruments as in the previous section while using the top six controls from Sala-i-Martin et al. (2004). The results remain largely unaffected, with policy volatility still significant at 5%. An alternative approach to verify robustness of our results is to add sequentially all of the top eighteen variables from Sala-i-Martin et al. (2004) for which the posterior probability of inclusion is higher than the prior.[23]

In summary, we have searched over the space of a large number of variables that have been found to determine long-term growth. Our conclusion is that policy volatility is robustly and significantly correlated with growth. We have not found a single cross-sectional growth regression that challenges this conclusion. Of course, there might be some suspicion that the instruments are themselves determinants of growth and thus belong to the growth regression as regressors or that endogeneity cannot be addressed in a satisfactory manner by using cross-sectional regressions. To address some of these concerns, we report later in this paper estimates from panel regressions designed to deal with the issue of reverse causality. In the next section, we turn to the marginal explanatory power of our key institutional variable: constraints on the executive.

D. *The Marginal Effects of Policy Volatility and Institutions on Growth*

The fact that constraints on the executive affect policy outcomes and thus policy volatility is both theoretically justifiable and intuitive. In his book on the role of veto players, Tsebelis (2002) discusses the role of veto points for policy stability and summarizes the evidence from a number of studies. The gist of the main argument is that countries with many veto players will have more stable and predictable policy because the process of negotiating new policy initiatives is more difficult and more costly. So far, our results confirm this logic. It is, however, possible that in addition to shaping policy outcomes, constraints on the executive also exert a direct effect on growth. In this section, we ask two related questions: (a) Do political constraints have any additional explanatory power for economic growth above the effect they have through policy volatility? (b) Within the same institutional setup, do we observe any effect of policy volatility on growth? In other words, is the link between volatility and growth fully explained by the way that policies are shaped by institutions?

Table 5 is devoted to answering the first question. The univariate regression of output growth rates from 1970 to 2007 on constraints on the executive in 1969 shows significant positive correlation. A causal interpretation of this result suggests that countries with more constraints on the executive achieve faster economic growth. But what is the channel? As we have shown in our main tables, one explanation is that political constraints lead to more stable policy, which creates a more favorable environment for growth. In

[23] These results are reported in appendix 1 of the online supplement. In all regressions, policy volatility remains significant at better than the 5% level.

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TABLE 5.—AVERAGE GROWTH, POLICY VOLATILITY, AND POLITICAL CONSTRAINTS
Dependent Variable: Growth Rate of Output per Capita, 1970–2007

	(1) Univariate (OLS)	(2) Both Variables (OLS)	(3) Baseline (OLS)	(4) Volatility Instrumented	(5) Constraints Instrumented	(6) Both Instrumented
Constraints	0.217	−0.190	−0.014	−0.107	0.478	0.027
	(0.105)**	(0.156)	(0.149)	(0.176)	(0.676)	(1.131)
Policy volatility		−1.116	−1.502	−3.031	−1.163	−3.331
		(0.262)***	(0.373)***	(0.674)***	(0.483)**	(1.309)**
Government size			0.004	0.007	−0.029	−0.016
			(0.013)	(0.016)	(0.025)	(0.041)
Investment price			−0.006	−0.002	−0.005	−0.002
			(0.003)*	(0.003)	(0.003)	(0.004)
Intiial GDPpc			−1.275	−2.041	−1.721	−2.133
			(0.313)***	(0.415)***	(0.873)*	(1.158)*
Primary enrollment			2.859	2.578	3.288	2.677
			(0.752)***	(0.912)***	(0.834)***	(1.241)**
Openness			0.012	0.016	0.012	0.014
			(0.004)***	(0.005)***	(0.006)*	(0.008)
Constant	1.475	3.881	12.545	21.259	15.059	22.943
	(0.250)***	(0.621)***	(2.725)***	(4.125)***	(6.231)**	(8.619)**
Observations	84	84	82	79	50	50
R^2	0.03	0.21	0.49			
OID Test				0.23	0.02	0.58

Robust standard errors in parentheses. Significant at *10%, **5%, ***1%. All controls are calculated for the period 1967–1969 except primary enrollment, which is for 1960. Policy volatility is calculated as the log of the standard deviation of the policy residuals from 1970 to 2000. Constraints are the constraints on the executive in 1969. Instruments for column 3: Presidential, majoritarian and elections. In columns 4 and 5, we also use the logarithm of settlers' mortality as calculated by Acemoglu, et al. (2001). The last row reports the *p*-value from a test of overidentification.

column 2, we discover that these constraints have no marginal power in explaining growth above and beyond their effect on policy stability. Importantly, the coefficient on policy volatility is close to the estimates from table 2, where political constraints are excluded. If the institutional variable was a significant predictor of growth, then not only would we expect the coefficient on constraints to be significant, but we should also expect a significant change in the estimated effect of policy volatility on growth. Thus, we can conclude that institutions do not affect growth directly, and therefore they are good instruments for policy volatility. This conclusion is confirmed also by the results in column 3, where we include our standard controls.

Next, we want to establish whether institutions have any marginal explanatory power for growth within the IV framework. In column 4, we include political constraints as a regressor in our baseline IV estimation. Policy is instrumented only with the political regime, electoral regime, and number of elections. Constraints remain insignificant, while the coefficient on volatility changes in magnitude but remains significant at the 1% level.

One potential criticism of this regression is that constraints themselves are endogenous. Indeed, this is the argument that prompted Acemoglu et al. (2003) to use settlers' mortality rates as an instrument for institutional quality. Their main dependent variable is the level of GDP per capita; therefore, in their case, one can plausibly argue that the endogeneity of institutions to past levels of income per capita may create bias in the estimation if both institutions and income per capita are persistent processes. It is less clear how one can make the same argument when the dependent variable is the subsequent growth rate and initial income per capita is used as a control. Nevertheless, in column 5, we use as an instrument the logarithm of settlers' mortality and instrument only political constraints. This estimation does not record a significant coefficient for constraints. In the last column, for completeness, we instrument both policy volatility and political constraints.

In all variations reported in table 5, we find a statistically significant negative effect of policy instability on output growth. At the same time, constraints on the executive have little additional explanatory power. It is important to interpret this result correctly. It does not say that institutions do not matter. They do. However, their effect, as one might reasonably expect, is manifested through policy, and there is very little (if any) additional impact of political constraints on growth.

Now we turn to the second question: whether within the same institutional setup, policy volatility can make a difference. In the first two columns of table 6, we report OLS regressions for countries where the number of veto points is less than 2 (column 1) or more than 2 (column 2). Columns 3 and 4 replicate the same regressions by using our main instruments to instrument for policy volatility. In all cases except for column 2, the results are significant at 5% and indicate that even within similar institutional frameworks in terms of veto points, policy volatility matters.[24] In the last column, we look at the effect of policy volatility within each institutional cell. First, we generate five dummy variables for each one of the institutional categories (from 0 to 4 constraints) and then interact these dummies with our policy volatility measure. The coefficients show that within each institutional structure,

[24] We have also estimated regressions for countries with no constraints at all. We find that the coefficient on policy volatility remains highly significant and negative. This result not only confirms the importance of policy stability but also indicates once again that our findings cannot be driven by the omission of constraints from the main regression.

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TABLE 6.—THE EFFECT OF POLICY VOLATILITY WITHIN INSTITUTIONAL STRUCTURE
Dependent Variable: Growth Rate of Output per Capita, 1970–2007

	(1) Constraints < 2 (OLS)	(2) Constraints >= 2 (OLS)	(3) Constraints < 2 (IV)	(4) Constraints >= 2 (IV)	(5) with dummies (OLS)
Policy volatility	−1.835	−0.387	−2.559	−1.713	
	(0.428)***	(0.318)	(1.087)**	(0.618)**	
Government size	0.022	−0.054	0.019	−0.03	−0.004
	(0.014)	(0.012)***	(0.031)	(0.014)**	(0.016)
Investment price	−0.009	0	−0.005	0.002	−0.009
	(0.004)**	(0.002)	(0.005)	(0.003)	(0.004)**
Initial GDPpc	−1.452	−0.574	−1.735	−1.475	−1.452
	(0.317)***	(0.469)	(0.507)***	(0.778)*	(0.322)***
Primary enrollment	2.986	−1.558	2.716	−0.191	3.015
	(0.805)***	(2.228)	(0.935)***	(2.944)	(0.765)***
Openness	0.011	0.016	0.013	0.021	0.013
	(0.006)*	(0.007)**	(0.006)**	(0.010)**	(0.005)***
d0					14.194
					(2.990)***
d1					15.322
					(2.603)***
d2					13.504
					(3.021)***
d3					13.344
					(2.843)***
d4					13.517
					(4.184)***
d0 × Policy Volatility					−1.48
					(0.510)***
d1 × Policy Volatility					−2.466
					(0.361)***
d2 × Policy Volatility					−0.816
					(0.401)**
d3 × Policy Volatility					−0.736
					(0.366)**
d4 × Policy Volatility					−0.309
					(3.519)
Constant	14.428	9.363	17.977	17.032	
	(2.764)***	(3.437)**	(5.859)***	(5.047)***	
Observations	50	31	48	31	81
R^2	0.56	0.59			0.82
OID test			0.05	0.71	

Robust standard errors in parentheses. All regressions include an intercept. Significant at *10%, **5%, ***1%. All controls are calculated for the period 1967–1969 except primary enrollment, which is for 1960. Policy volatility is calculated as the log of the standard deviation of the policy residuals from 1970 to 2007. Instruments for policy volatility: constraints in 1969, presidential, majoritarian and elections. The dummies d0–d4 in the last column are defined as d0 is equal to 1 for countries with no constraints, d1 is equal to 1 for countries with 1 constraint, and so on. The last row reports the *p*-value from a test of overidentification.

the volatility of fiscal policy has a negative impact on growth. In all cases, except for the case with four constraints, the effect is statistically significant. It appears, however, that the impact of policy stability on growth is much more pronounced within the low levels of constraints (either dictatorships or one veto player systems) than for countries with more developed checks and balances.[25]

The results so far lead to a potentially important policy recommendation: there is room for both institutional reform and good macroeconomic policies as recipes for growth. A simple way to illustrate this point is to look at table 6. For both the group of countries with low-quality institutions and those with high-quality ones, the effect of policy volatility on economic growth is negative and significant. Thus, table 6 provides some evidence that even when it is difficult to change institutions, growth performance can be improved by following stable macroeconomic policies.

[25] In the last cell, where we have countries with four constraints on the executive, we have only five observations. Thus, the large standard errors might be due to the insufficient number of observations.

IV. Panel Estimation

Possibly the most interesting direction for further investigation is the study of the effects of policy changes on economic growth over time. Ideally, one would like to see how shifts in policy volatility affect growth within a country. One might want to use estimation of average treatment effects in order to control for observed heterogeneity across countries and evaluate whether differences in policy volatility in otherwise similar countries lead to differences in growth rates. Unfortunately, the estimation of treatment effects is very difficult to implement in our setting. The main reason is that we do not know exactly when treatment—in our case, the shift in policy volatility—has occurred. Despite the difficulties in addressing the time variation in our data series, we have attempted to provide at least a partial view of the robustness of our results using within-country variation.

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TABLE 7.—PANEL ESTIMATION I, POOLED OLS
Dependent Variable: Growth Rate of Output per Capita by Decades: 1965–1974, 1975–1984, 1985–1994, 1995–2004

	(1) Univariate	(2) Baseline	(3) With Lagged Volatility	(4) Rich	(5) Poor	(6) With Output Volatility	(7) With Lagged Growth
Policy volatility	−0.678	−0.918					
	(0.150)***	(0.279)***					
Lagged policy volatility			−1.042	−0.343	−1.294	−0.976	−0.957
			(0.274)***	(0.453)	(0.356)***	(0.294)***	(0.264)***
Initial GDPpc		−1.152	−1.086	−0.565	−1.073	−1.110	−1.207
		(0.286)***	(0.306)***	(0.808)	(0.369)***	(0.309)***	(0.313)***
Primary schooling		3.262	3.064	3.171	2.996	3.075	3.360
		(0.817)***	(0.939)***	(2.216)	(1.040)***	(0.944)***	(0.945)***
Openness		0.011	0.011	0.009	0.011	0.012	0.01
		(0.003)***	(0.003)***	(0.006)	(0.003)***	(0.003)***	(0.002)***
Government size		−0.05	−0.056	−0.056	−0.052	−0.054	−0.044
		(0.025)**	(0.022)**	(0.045)	(0.025)**	(0.022)**	(0.023)*
Investment price		−0.006	−0.001	−0.010	0.000	−0.001	0.000
		(0.003)*	(0.004)	(0.007)	(0.005)	(0.004)	(0.004)
Lagged growth							0.167
							(0.070)**
Lagged output volatility						−0.060	
						(0.116)	
Constant	2.821	11.602	10.856	5.874	11.109	11.084	11.081
	(0.226)***	(2.460)***	(2.578)***	(7.131)	(3.039)***	(2.595)***	(2.609)***
Observations	351	292	221	86	135	221	221
R^2	0.06	0.20	0.18	0.14	0.18	0.18	0.21

Robust standard errors in parentheses. Significant at *10%, **5%, ***1%. The dependent variable and policy volatility are calculated for the periods 1965–19774, 1975–1984, 1985–1994, and 1995–2000. When lagged policy volatility is used, it is the policy volatility for the previous decade. The controls are calculated for the three-year periods preceding the decade for which the growth rate is calculated.

We start by creating a panel of ten-year averaged data. We have four nonoverlapping periods: 1965–1974, 1975–1984, 1985–1994, and 1995–2004. For each decade of growth, we use as initial conditions data on income per capita, primary education, investment price, government size, and openness. These initial conditions are calculated as averages for the three years preceding the relevant decade. For example, when growth covers the 1985–1994 period, the initial conditions are calculated as the average from 1982 to 1984. All variables have the same definitions as before except primary education. In the cross-sectional regressions, we used primary school enrollment in 1960 because we argued that enrollment in 1960 will determine to a large extent the educational level of the population in our growth sample period from 1970 to 2007. In the panel, however, primary school enrollment from 1982 to 1984 is clearly a poor predictor for the level of education of the labor force from 1985 to 1994. So instead of enrollment, we use the percentage of population with primary education.

In table 7 we present results from this panel by using first pooled OLS. Columns 1 and 2 start by reporting regressions where policy volatility is measured over the decade period. Focusing on the estimates in column 2, we notice that the coefficient on policy volatility is again negative and highly significant, but it is somewhat smaller in magnitude compared to our cross-sectional estimate from table 2. All of the controls are also highly significant and of the expected sign.

In columns 3 to 7, we report results where policy volatility is lagged one period (one decade). This is an important perturbation of our regression because it deals with the criticism of reverse causality. A skeptic might argue that our results in the cross-section or in columns 1 and 2 are driven by the fact that in a low-growth environment, governments are tempted to try various spending programs to jump-start growth. In columns 3, 4, and 5, our baseline regression uses policy volatility from the previous decade to explain current growth for the full sample, or from the two groups separated by their income per capita. The result is very encouraging for our argument: governments that use fiscal policy too aggressively and for reasons other than to smooth business cycles have generated lower growth in subsequent years. Only for the group of rich countries does the effect become statistically insignificant, even though it is still negative. Column 6 confirms once again that this claim is not due to omitting the overall economic volatility from the equation.

Although the results are sufficiently robust to every modification of these panel equations, it is important to report one particular modification in which we include lagged growth rates as regressors. The reason for this inclusion is the following: current growth rates cannot affect past policy volatility, and yet it is still possible that our results are biased if there is reverse causality within the period and at the same time innovations to growth are highly persistent. In this scenario, a positive innovation to the growth rate may reduce contemporaneously policy volatility (if there is reverse causality within the period) and raise future growth rates (because of persistence). One way to address this concern is to include lagged growth in the estimation. We report the results in column 7. Indeed lagged growth enters with a positive sign and a statistically significant coefficient. Nevertheless, the effect of this modification on the coefficient on policy volatility is minimal.

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TABLE 8.—PANEL ESTIMATION II, CONTROLLING FOR FIXED EFFECTS

Dependent Variable: Growth Rate of Output per Capita by Decades: 1965–1974, 1975–1984, 1985–1994, 1995–2004

	(1) Univariate Country Effects	(2) Baseline Country Effects	(3) Baseline Time Effects	(4) With Time and Country Effects	(5) Output Volatility Time and Country Effects	(6) Arellano Bond Estimator	(7) Arellano Bond Estimator with Time Effects
Lagged policy volatility	−0.172	−0.921	−1.032	−0.857	−0.867	−1.033	−0.730
	(0.323)	(0.323)***	(0.278)***	(0.299)***	(0.300)***	(0.189)***	(0.195)***
Initial GDPpc		−5.219	−1.050	−6.506	−6.478	−3.813	−4.304
		(0.707)***	(0.306)***	(0.710)***	(0.713)***	(0.227)***	(0.360)***
Primary schooling		9.418	2.876	1.308	1.213	2.447	−0.453
		(2.005)***	(0.921)***	(2.449)	(2.459)	(1.171)**	(1.225)
Openness		0.018	0.011	0.015	0.015	0.014	0.015
		(0.011)*	(0.003)***	(0.010)	(0.010)	(0.004)***	(0.004)***
Government size		−0.016	−0.058	−0.040	−0.042	−0.049	−0.033
		(0.038)	(0.022)***	(0.037)	(0.037)	(0.019)***	(0.016)**
Investment price		0.008	−0.002	0.011	0.011	−0.005	0.000
		(0.009)	(0.004)	(0.008)	(0.008)	(0.002)**	(0.003)
Lagged output volatility					0.036		
					(0.060)		
Lagged growth						−0.297	−0.256
						(0.027)***	(0.044)***
Lagged growth (2nd)						−0.231	−0.129
						(0.034)***	(0.040)***
Constant	1.647	40.525	11.069	58.225	57.985	35.981	41.471
	(0.547)***	(5.762)***	(2.576)***	(6.481)***	(6.509)***	(2.234)***	(2.701)***
Country effects	Yes	Yes	No	Yes	Yes	Yes	Yes
Time effects	No	No	Yes	Yes	Yes	No	Yes
Observations	259	221	221	221	221	143	143
Number of countries	93	78	78	78	78	77	77
R^2	0.00	0.32	0.19	0.43	0.43		
OID Test						0.114	0.100
1st-order serial correlation						0.004	0.005

Robust standard errors in parentheses. Significant at *10%, **5%, ***1%. The dependent variable and policy volatility are calculated for the periods 1965–1974, 1975–1984, 1985–1994, and 1995–2000. When lagged policy volatility is used, it is the policy volatility for the previous decade. The controls are calculated for the three-year periods preceding the decade for which the growth rate is calculated.

Relative to column 3, the current estimate is marginally lower, but its significance is left virtually intact.

By including lagged growth in the regression, we also control to a certain extent for fixed effects that explain cross-sectional differences in growth rates. In table 8, we document the sensitivity of our key findings to the direct inclusion of country and time fixed effects. Because of the well-known bias in the estimation of panel regressions with fixed effects and lagged dependent variable, initially we drop lagged growth from the regression. The coefficient is somewhat lower in magnitude but remains significant when controls are added.

The following three columns include our baseline controls within the panel regression and estimate the model successively with country effects, with time effects, and with both country and time fixed effects. The stability of the coefficient on policy volatility is quite remarkable. Among the controls, the variable that exhibits the most consistent sign and significance is initial GDP per capita. Including output volatility as a separate control has no impact on the regression (column 5).

Note that the estimation in table 8 has used lagged policy volatility as a regressor, and therefore one can interpret the results as showing that neither omitted fixed effects, such as geography or weather, nor reverse causality can provide a reasonable alternative interpretation. What about reverse causality through persistence of growth innovations as an alternative interpretation? In columns 6 and 7, we estimate the panel regression by using the Arellano and Bond (1991) methodology, which allows us to include both fixed effects and lagged growth rates. All variables included in the regression are treated as predetermined, which implies that they might be correlated with lagged growth rate innovations but are not correlated with future growth innovations. The estimation is a two-step GMM using all available lags of the dependent variable dated before the date of the included change in the lagged growth rate as instruments for the change in lagged growth. We include two lags of output growth since both lags seem to be highly significant. The results are quite telling: in this most demanding specification, policy volatility once again emerges as an important determinant of future changes in growth rate. The specification tests in the last rows indicate that the conditions required for this method to deliver consistent estimates are present: the test of overidentification indicates no correlation between instruments and residuals, and the test for autocorrelation confirms the presence of a first-order correlation induced by differencing the data.

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To sum up the panel estimation, we note that the negative impact of higher policy volatility on growth is confirmed in a wide variation of specifications. Even within countries, governments that pursue unstable fiscal policy create an environment that harms the subsequent growth performance of the country.

V. Discussion

The research agenda most closely linked to this paper focuses on the relationship between macroeconomic volatility (including policy volatility) and growth. One set of papers in this literature looks directly at the relationship between volatility and growth without focusing on a specific channel through which the effects take place. This group includes Ramey and Ramey (1995), Kormendi and Meguire (1985), Imbs (2007), Martin and Rogers (2000), Hnatkovska and Loayza (2005), and Aghion et al. (2005). All of these papers document a negative relationship between overall macroeconomic volatility and economic growth.[26]

When examining the relationship between volatility and growth, there is concern about omitted variables and reverse causality as there may be factors that drive both the growth rate and the volatility of the country (as Imbs, 2007, argues). To overcome these econometric issues, one approach is to identify and isolate an exogenous source of volatility. For example, Alesina et al. (1996) and Dutt and Mitra (2008) study the effects of political instability on macroeconomic outcomes, including growth, while Judson and Orphanides (1999) analyze the effects of the volatility of inflation on growth. Ramey and Ramey (1995) also follow this route by using fiscal policy changes as an instrument for output volatility. In this respect, our paper builds on their approach by focusing on the volatility of discretionary fiscal policy as an exogenous source of volatility in the economy. By using instrumental variables and also checking a much larger set of controls, we provide a more robust set of results.

Aghion et al. (2006) study a different dimension of policy volatility: the effect of exchange rate volatility on productivity growth. Their results are consistent with the results we presented in this paper. They find that volatility (of the exchange rate) has a negative effect on growth.

Finally, there is a set of papers that has looked at the effects of alternative dimensions of fiscal policy on growth. Aghion and Marinescu (2006) and Woo (2009) both study the link between the degree of countercyclicality of fiscal policy and growth. In Aghion and Marinescu (2006), less procyclical fiscal policy ("better fiscal policy") is associated with higher growth rates of productivity. Woo (2009) presents evidence suggesting that countries that run a more procyclical fiscal policy have lower growth rates. Both papers are consistent with our results. Although their policy variable is not volatility, one could establish links between the cyclical stance of fiscal policy and its overall volatility. It is possible that both might be affected by the same budgetary processes or institutional variables that we use in our instrumental variables estimation; a higher degree of discretion in fiscal policy could be linked to more procyclical fiscal policy.

Although our paper is empirical, it is also interesting to understand the link to theoretical models. In endogenous growth models and from a theoretical point of view, the relationship between volatility and growth is not an obvious one, as first documented in King, Plosser, and Rebelo (1988). In a standard neoclassical model where agents (firms) are risk neutral, investment might increase with uncertainty (at least in prices) because of the convexity of the profit function. Aghion and Banerjee (2005) make this theoretical point within the AK model. There are several ways of modifying the analysis so that volatility and uncertainty become detrimental to investment and long-term growth. The first is very mechanical and consists of thinking about fluctuations as asymmetric, as in Rodrik (1991). The link between volatility and growth could also be happening through uncertainty, as in Feeney (1999). Finally, an endogenous growth model can also introduce general equilibrium effects of uncertainty on growth through investment, consumer behavior, and the labor supply, as in Aghion et al. (2005), Barlevy (2004), Jones et al. (2005), or de Hek and Roy (2001).

When we turn specifically to policy, we find fewer theoretical papers that establish a link between policy volatility and growth. Aizenman and Marion (1993) show that higher policy volatility (modeled as higher dispersion of tax rates) is detrimental for growth. Hopenhayn and Muniagurria (1996) discuss growth and welfare effects of policy volatility and persistence within a standard AK model of growth and find that an increase in the frequency of policy changes can lower growth, whereas a greater amplitude of policy changes is associated with higher growth rates. The role of policy volatility can also be detected in Barro (1990), who shows that growth is a concave function of government size and it is straightforward to demonstrate in his model that an increase in spending volatility will reduce growth. Chong and Gradstein (2006) emphasize a different and, in our view, a plausible mechanism: in countries where governments cannot commit to a stable tax rate, fewer firms enter into productive industries, which in turn lowers the aggregate growth rate. Using data from about eighty countries, they document a negative effect of policy volatility on firms' growth rates.

In general, theoretical models emphasize the uncertainty related to the level of taxes and show that an increase in the variance of tax rates lowers growth.[27] Our empirical estimation suggests that volatility of government spending lowers growth. One way to link our finding to the theoretical

[26] Koren and Tenreyro (2007) also document that the volatility of country-specific shocks, which they interpret as policy shocks or political stability, is more important for the overall macroeconomic volatility in poor rather than in rich countries. Their study relates volatility to the stages of economic development and thus is complementary to studies that link volatility and growth.

[27] The fact that higher variance of tax rates has detrimental welfare effects was first emphasized by Barro (1979).

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literature on policy volatility is that an increase in spending volatility implies either a concomitant increase in tax rate volatility or, more plausibly, raises uncertainty about future tax rates, which in turn reduces investment and growth.

Our paper also builds on several streams of research that link policy, economic growth, and institutions. First, following Acemoglu et al. (2003), we explore the role of institutions and policies for economic development. Our main innovation is that we do not consider the level of policy variables (inflation, government consumption, or overvaluation of the exchange rate, that is, standard macroeconomic policy variables) but instead argue that it is policy volatility that is detrimental to macroeconomic performance. Relative to Acemoglu et al. (2003), we also extend the analysis to a larger set of countries (not only former colonies). These two papers belong to a much broader and earlier literature on the effects of institutions on growth or volatility, which is surveyed in Acemoglu, Johnson, and Robinson (2004).

Another stream of literature that is related to our paper analyzes the effects of institutions on macroeconomic policy outcomes. This is a growing field with important contributions by Persson and Tabellini (2003, 2004) who study how constitutional rules shape fiscal policy outcomes. Within this literature, several papers have specifically looked at the role of constraints in determining policies. The main hypothesis is that governments where power is more concentrated and that face fewer veto points are less constrained in the implementation of fiscal and monetary policy changes. In the case of fiscal policy, there is plenty of empirical evidence in favor of the idea that constraints matter. Roubini and Sachs (1989) present evidence for OECD economies that governments where power is more concentrated create an excessive fiscal policy response to economic shocks. Similar evidence exists for U.S. states. Both Poterba (1994) and Alt and Lowry (1992) show that divided state governments display a less reactive fiscal policy to changing economic conditions. There is also plenty of evidence that veto points in budgetary processes affect fiscal policy outcomes (see Tsebelis, 2002). Talvi and Vegh (2000) present evidence of differences in fiscal policy behavior across countries and examine how these differences are associated with different political institutions or economic structures.

VI. Conclusions

Does macroeconomic policy volatility represent a significant determinant of economic growth? Our answer is yes. The results documented in this paper show that the volatility of fiscal policy has a first-order effect on long-term economic performance. Countries where governments use aggressively discretionary fiscal policy for reasons not related to the state of the cycle experience a lower rate of economic growth.

This is an important result in light of the recent revival of fiscal policy as a tool to manage business cycles. While our results do not question the effectiveness of fiscal policy as a stabilizing tool, they raise some serious concerns about the consequences of its use. We show that exogenous changes in fiscal policy cause unnecessary output volatility and harm economic growth. Although by construction these changes are unrelated to the business cycle and, as such, one might think that they are unrelated to countercyclical fiscal policy, there can be a clear connection between the two. First, if the timing of countercyclical fiscal policy is not right, it will show up in the measure of fiscal policy volatility in our regressions. Second, if the asymmetric use of countercyclical fiscal policy leads to accumulation of debt, the government will be required to go through a fiscal consolidation that will also be captured by our measure of volatility. Of course, our measure of volatility also includes changes in fiscal policy unrelated to the business cycle—changes that are motivated by political decisions or changes in the agenda of the party in power.

The fact that macroeconomic policy is an important determinant of economic growth runs contrary to some of the recent results in the literature suggesting that economic policies are simply a proxy for poor institutions and do not have a significant role even as mediators in this relationship. By measuring macroeconomic policy in changes and in levels, as previous papers have done, we show that the result is robust to the inclusion of a long list of controls, including institutional variables. To be clear, we do not deny the role of institutions; indeed we document how institutions, and in particular constraints on the executive, shape policy outcomes. But at the same time, we show that economic policies cannot simply be ignored. In this respect, while we agree that certain institutions create incentives for bad economic policy, we do not conclude that the only way forward is to improve institutions so that policy improves (and thus leads to higher growth); one can also envision improving policies without changing institutions. In fact, in our sample, policies do vary within the same set of institutions, and this variation is robustly related to the subsequent growth of the country. A question for future research is: What drives good fiscal policy above and beyond good institutions?

Finally, it is important to frame our results regarding fiscal policy properly and within the limits of this analysis. Our findings warn of the potential costs of policy changes. It is, however, conceivable that in certain situations, such as fiscal consolidations, a sharp and unexpected policy change might improve the long-term performance of the economy. Our results simply imply that policy changes should be implemented carefully, with an appropriate calculation of the long-term effects stemming from policy instability.

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