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ABSTRACT

Policy Volatility, Institutions and Economic Growth*

There is a significant controversy among academics and policy-makers about whether policies matter for economic growth. Recently, Acemoglu et al. (2003) and Easterly (2004) have presented empirical evidence against the commonly held view that policies play an important role in the process of economic development. Their key conclusion is that macroeconomic policies (monetary, fiscal and trade) have an explanatory power for the cross-country variation in growth rates and income per capita *only* because they serve as proxies for institutions. While we confirm their results using levels of policy variables (inflation and government spending), we present evidence that policy *volatility* exerts a strong and direct negative impact on growth. In a cross-section of 91 countries, policy volatility emerges as a key determinant of macroeconomic performance. An increase in the volatility of fiscal policy corresponding to one standard deviation in the sample reduces long-term economic growth by about 0.75 percentage points. Political institutions have a role to play to the extent that they shape policy outcomes.

JEL Classification: E60, H11, O11 and O57
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I. Introduction

What are the main determinants of economic growth? How can governments create an environment conducive to growth? The answers to these questions have changed fundamentally over the last decades. Traditionally, the emphasis was placed on maintaining good macroeconomic policies such as low inflation, contained budget deficits and exchange rate stability. More recently, the consensus on the determinants of growth has de-emphasized macroeconomic policies in favor of focusing on the role of institutions, in a broader sense, as drivers of economic performance.[1] Is it true that macroeconomic policies do not matter for long-term growth? While there is anecdotal evidence that certain macroeconomic policies harm growth, there are three different pieces of empirical evidence that call into question the importance of policy. First, policy variables traditionally become insignificant in growth regressions where 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.

Two recent studies, Acemoglu et al. (2003) and Easterly (2004), have presented extensive evidence on the insignificance of policy variables in growth regressions. In a battery of tests, Acemoglu et al. (2003) show that once institutions are included in the regression, macroeconomic policies (inflation, the level of government spending and the overvaluation of the real exchange rate) have no predictive power for growth, output volatility or cross-country variations in income per capita. Their conclusion is that even within a given institutional setting, different macroeconomic policies do not have a significant effect on growth. As Easterly (2004) puts it, *"the evidence suggests that macroeconomic policies do not have a significant impact on economic development after accounting for the impact of institutions"*. Similarly, Acemoglu et al (2003) argue that by changing macroeconomic policies governments will not affect growth because the underlying cause of those policies, bad institutions, will

[1] In the literature, the category *Institutions* has been used to signify various characteristics of the socio-economic and political setup of a country. In this paper our main institutional characteristic is the number of constraints imposed on the executive of the country. We discuss the exact definition in Section II.

ultimately impair growth through other means. In the example that these authors discuss, bad macroeconomic policies, exemplified by inflation, can be seen as the resolution of distributional tensions in environments with low-quality institutions (which might be deeply rooted in the country). Having a proper monetary policy, even using dollarization or an independent central bank, will take care of inflation but the distributional tensions are bound to resurface in a different form. If this is true, then any attempt to correct macroeconomic policy is bound to fail.

Our paper revisits the question of whether macroeconomic policies matter for economic performance by extending the set of variables that characterize policy. While most previous empirical studies use policy levels as regressors to predict growth performance, our claim is that the key policy characteristic that matters for the long-term country performance is the volatility of policy. Thus we argue that policy volatility is a better indicator of the quality of macroeconomic policy than standard measures reflecting levels of policy instruments. The view that policy volatility is key for long-term economic performance is certainly not new: in his Nobel laureate lecture, Friedman (1977) points 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 in the level of policy but not in its second moment.

As seems to be the case with other policy characteristics, it could be that the quality of institutions also affects the volatility of government policies. Indeed, we agree with the view that institutions affect policy levels and policy volatility. Nevertheless, the question still remains whether these policies are important mediators in the relationship between institutions and growth. If policies do mediate the link between institutions and growth, then this finding will give more credibility to the claim that high-quality institutions promote growth. Furthermore, in countries that lack the required institutional structure, governments can pursue stable macroeconomic policies *in parallel* to a fundamental institutional reform. In summary, our analysis is targeted towards understanding the mechanisms through which institutions affect growth and the particular role that policy characteristics play in this relationship. Treating the relationship between institutions and growth as a black box is not only unsatisfactory from a scientific point of view, but it also leaves open the possibility that institutions simply reflect a fixed effect that is coming from some other characteristic (for example, geography, weather).

When it comes to the analysis of policy volatility we focus on fiscal policy. There are obviously many dimensions of policy that could be studied. Our interest is in macroeconomic policies and the two obvious candidates are fiscal and monetary policies. In both cases, constructing variables that can properly capture the stance of policy across a large sample of countries is a challenge. Our prior is that doing this for monetary policy is almost an impossible task. While inflation volatility has been used as a measure of volatility of monetary policy it is contaminated with volatility coming from shocks from other sources. Building an indicator of monetary policy based on the instruments used by central banks (interest rates, money supply, exchange rates,) for a large sample of countries that operate under different monetary regimes is, at this point, unfeasible. For fiscal policy we can construct an imperfect but consistent measure of policy stance using a variable such as government consumption. This variable exists for many countries, the time series are long enough to allow sensible estimation and, importantly, the definition of the series is comparable across countries.

Our findings strongly support the view that volatility in policy has a significant negative effect on long-term growth rates. In other words, macroeconomic policy matters for growth. In our analysis, we acknowledge the role of institutions as we uncover a strong relationship between institutional settings (like constraints on the executive) and fiscal policy outcomes. In this sense, institutions have an effect on growth but only through the effects that they have on macroeconomic policies. More precisely, institutions play a significant role in determining a country's well-being, but we argue that institutions matter to a large extent because they affect policy and in particular policy volatility. The key conclusion from our argument is that any policy advice should be sensitive to the institutional environment and ideally complemented by institutional change that will determine the long-term success of policy.

The following section describes our empirical strategy and reports the benchmark results for the effect of policy volatility on growth. Section III elaborates on the role of institutions and isolates the links between institutions, policy volatility and growth. Our key result, that policy volatility negatively affects economic growth, is confirmed in a battery of robustness tests reported in Section IV. In Section V we attempt to uncover the channels through which policy volatility affects growth. The paper ends with a discussion of the related literature in Section VI and concluding remarks in the final section.

II. Policy volatility and economic growth

A. Empirical strategy and data description

Our main hypothesis is that policy volatility exerts a negative impact on long-term economic growth and that this is a direct effect, not simply a spurious correlation due to the fact that both variables are caused by bad institutions. To test this hypothesis we compiled annual data for 91 countries spanning the years from 1960 to 2000. A detailed description of the series is provided in a Data Appendix to the paper. 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):

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

In this regression $\overline{\Delta y_i}$ is the average growth rate of output per capita (1960-2000) for country i. Our key regressor is the volatility of the exogenous shocks to government consumption (σ_i^{ϵ}). Throughout the paper we will refer to this variable as *policy volatility* with the obvious caveat that our measure relates only to one instrument of macroeconomic policy.[2] We also include in equation (1) variables that have been identified as having significant explanatory power for the cross-country variation in growth (this is vector X). Levine and Renelt (1992) offer an early study of the robustness of growth regressors documenting significant instability in the coefficients on several economic variables, which are believed to be among the main drivers of economic growth. A more recent study by Sala-i-Martin et al. (2004) argues that the test of Levine and Renelt is too stringent. Using Bayesian averaging of classical regression estimates for 64 determinants of growth the authors identify 18 variables for which the posterior inclusion probability increases relative to the prior. Of these variables we select four that have clear economic interpretation: (1) Initial GDP per capita; (2) Initial level of human capital; (3) Initial investment price level and (4) 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 and Romer (1999)). Finally, a set of variables are included within the vector Z. These variables enter the regressions in order to ensure that the link between policy volatility and growth is not due to a variable omitted from the baseline specification.

[2] Below we describe explicitly the specification used to construct this variable.

Several studies have estimated regressions similar to equation (1).[3] Most of the previous specifications have been designed to establish a link between output volatility and growth. Our main explanatory variable is, instead, the volatility of policy itself. In this sense, our approach is comparable to that of Acemoglu et al. (2003) but the distinguishing element is that we focus on policy volatility as the main indicator of bad economic policies.

B. Policy volatility

In this section we construct a measure that captures the use of discretion in economic policies. While we do not intend to model the origins of that discretion or volatility, we have as a framework the notion that changes in economic policies that are unrelated to the economic cycle (what we could refer to as discretionary or exogenous or politically-motivated changes in policy instruments) potentially can harm growth.[4]

Our decision to focus on the volatility of the exogenous component in government consumption requires some justification. Ideally we would construct policy volatility measures for monetary and fiscal policy separately. We decided in favor of a fiscal policy measure as opposed to a monetary one because it is difficult to operationalize a cross-country measure of monetary policy. For the OECD economies it is now conventional to use short-term interest rates as the stance of monetary policy. In a larger sample, however, this measure is not feasible because data on short-term interest rates is either not available or is not comparable across countries. A more common approach in large cross-country studies is to use inflation or the real exchange rate overvaluation (see Acemoglu et al., 2003). The problem is that in our analysis we are interested in the exogenous variation in policy and not simply in the level of the policy-related instrument or in the distortions introduced by overvaluation of the exchange rate. While we could consider measuring the volatility of inflation or the exchange rate, both of these variables are in fact outcomes rather than instruments.

Within the realm of fiscal policy, there are many time series that can be utilized. We use government consumption (as reported in the national income and

[3] Ramey and Ramey (1995), Martin and Rogers (2000), and Fatás and Mihov (2003), among others.

[4] Fatás and Mihov (2003) describe theories that can explain the origins of destabilizing discretionary fiscal policy.

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 like 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 very volatile and unreliable, regardless of the series or sources used. Given that our analysis is partial, finding strong and consistent results can be a challenge as we are leaving fundamental aspects of policy volatility outside our analysis.

Equipped with our preferred measure of policy — government consumption — our next goal is to isolate movements in government consumption that can be considered as exogenous policy decisions unrelated to the state of the economy. Once we have the exogenous component in policy, we can use it to construct for each country a measure of policy volatility. In general, the literature on fiscal policy uses several approaches to measuring policy volatility. One approach is to calculate raw standard deviations of policy variables. Another technique is to use GARCH models to construct smooth (time-varying) measures of volatility, which can be used also 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:

$$\log\big(G\big)_{i,t} = \alpha_i + \beta_i\, \Delta\log(Y_{i,t}) + \gamma_i \log\big(G\big)_{i,t-1} + \ \delta_i\, \mathbf{W_{i,t}} + \epsilon_{i,t} \qquad (2)$$

In these regressions we denote by G real government consumption spending, while Y is real GDP. We also add controls (W) like inflation and inflation squared to ensure that our exogenous component is not contaminated by inflation dynamics. Finally, we include a deterministic time trend. Equation (2) is estimated by instrumental variables because of the possible reverse causality from government spending to growth. As instruments we use two lags of output growth, lagged inflation and the logarithm of oil prices. We interpret the country-specific volatility of $\epsilon_{i,t}$ as a quantitative estimate of discretionary policy.

C. Ordinary Least Squares Regressions

We start by documenting in Figure 1 the correlation between policy volatility and long-term economic growth over the period 1960-2000. Not surprisingly, the most volatile fiscal policy is recorded in Argentina, while 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 1 – yields a negative coefficient of -1.019, which is significant at the 1% level of significance. Taken at face value, this coefficient suggests that a country like Argentina — with volatility of fiscal policy being two standard deviations above the mean volatility (which is 2.04) — could raise its growth rate by about 1.5% per year if its fiscal policy were stabilized to attain the mean of the sample.

[Insert Figure 1 here]

[Insert Table 1 here]

There are several reasons why 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 does depend on recent growth performance and is therefore endogenous to long-term economic growth. The rest of Table 1 addresses in part the first two possibilities, while the endogeneity issue is taken up in Section III.

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 identified by Sala-i-Martin et al. (2004). We note that all of the variables enter with the expected sign: *Investment price 1960* is significant at the 1% level, initial GDP per capita is significant at the 5% level, while the other three variables are insignificant. The coefficient on our key variable of interest – policy volatility – slightly increases in absolute value and remains significant at the 1% level.

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 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 3. 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.[5]

Next, we take up the possibility that the negative effect of policy instability on economic growth holds only for this particular sample. In columns 4 and 5 we split the sample into rich and poor countries.[6] In the poor countries policy volatility has a bigger impact on long-term growth than in the rich sub-sample. This is consistent with the hypothesis that one possible channel through which policy volatility affects growth is investment. It is plausible that the negative effect of instability in policy on investment is greater in poor countries where financial markets are less developed. We document these links in Section V.

In the last column of the table we restrict the regression to the countries studied by Acemoglu et al (2003). This sub-sample is important because they find that policy does not matter, and that institutions have the superior explanatory power for exactly this set of countries. We investigate below whether policy volatility also loses its significance once we include institutions, but for the time being we only document in column 6 that the significant negative effect of policy volatility on growth holds also for the sample of 45 former colonies as identified by Acemoglu et al. (2003).[7]

Overall, our measure of fiscal policy volatility enters a standard growth regression with a negative and statistically significant sign. The effects are not negligible: Argentina could raise its long-term growth rates by 1.5 percentage points were its policy volatility at the mean volatility for this sample. If this were the case, by the

[5] As pointed out by Imbs (2003) and others, 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, they display higher output volatility. Similar results are found in Ramey and Ramey (1995).

[6] In this table, rich countries are defined as GDP per capita of at least $9,500 in the 1990s. We have used also as a cutoff GDP per capita in 1960-65 of at least $5,000 and the results are the same.

[7] The Data Appendix provides a list of the countries in the full sample as well as how they enter each specific sub-sample.

end of the sample Argentina would have been one of the richest countries in the world. In general, a reduction in policy volatility corresponding to one standard deviation in our sample raises long-term economic growth by about 0.75 percentage points.

III. The role of institutions.

A. The link between policy volatility and institutions

To determine whether our measure of policy volatility is not simply a proxy for the quality of institutions, we turn now to the role of institutions. In their work, Acemoglu et al. (2003) provide empirical evidence that calls into question the effect of economic policies on growth. Under various specifications, policy variables turn insignificant once institutions are included in the regression, which implies that bad policies are simply a reflection of bad institutions. Fundamentally we agree with this assessment as we also find that standard measures of the *level* of policy do not significantly enter into growth regressions.[8] However, as shown in the previous section, governments can also hinder economic growth by conducting very volatile fiscal policy. The question is whether low-quality institutions are also behind this dimension of macroeconomic policy (volatility of fiscal policy). Before presenting a proper test of whether this result also vanishes once we control for institutions, we first analyze the influence of institutions on policy volatility.

Our main institutional variable is *Constraints on the executive in the 1960s*. This variable takes four values depending on how many checks on the executive exist. It is calculated as:

Constraints = Legislature + Upper chamber + Judiciary + Federal

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 bi-cameral legislature; *Judiciary* equals 1 for countries where the judiciary is separated from the executive branch; *Federal* equals 1 for countries with a federal structure so that the political power is shared between the central and local governments. Thus the variable *Constraints* captures potential veto points on the decisions of the executive. The data used to construct *Constraints on the executive in the 1960s* comes from Henisz (2000).

[8] We already have the results for average government consumption reported in Table 1. In our robustness section we report regressions that also include inflation as a regressor.

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: (1) the author adjusts for the ideological alignment across political institutions; and (2) the author 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.[9] We prefer to use the simple sum of constraints in 1960 because it deals in part with the possibility of endogenous response of electoral outcomes (and hence ideological alignment) to economic developments throughout the period.[10] As a robustness test we replicate below some of our results using this alternative measure of political constraints.

There are two other measures on the role of constraints 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 it is the case fot 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.[11]

[Insert Table 2 here]

Table 2 looks at 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 40% of the cross-country variation in policy instability. This is a very strong result which 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

[9] 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, i.e. there is no strong evidence of non-linearity in the effect of constraints on policy volatility.

[10] The ideological alignment across agents occupying various political institutions can be an outcome of strategic voting, as Chari et al. (1997) argue.

[11] Although not reported in the tables below, we have replicated our results using both the Polity IV and the DPI measures of checks and balances. The results are available upon request.

in the literature as determinants of policy volatility: (1) political system (presidential vs. parliamentary); (2) electoral system (majoritarian vs. proportional); (3) number of elections.[12] These variables improve the fit of the regression by raising the R^2 to 59%. 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 using, in turn, the measure of political constraints proposed by Henisz for the 1960s (column 3) and the average of the same measure over the whole sample (column 4). In both cases the coefficients are highly significant and negative. Given that these two measures use a different scale from that used in the first two columns, the magnitudes of the coefficients are not directly comparable.

The stability of the relationship between institutions and policy for different samples is tested in columns 4, 5 and 6. Somewhat surprisingly, constraints matter more in the rich countries than in the poor ones, but in both cases the coefficients are significant at the 5% level.

Are institutions endogenous? It seems reasonable to argue that institutions and economic outcomes are jointly determined – a key argument in Acemoglu et al. (2004). We have tried to eliminate possible endogeneity by using only initial constraints, but it is clear that if policy volatility is a persistent process then using the initial level will not purge the relationship of possible endogeneity. Also, the fact that we focus only on policy volatility makes the endogeneity issue less acute as one might argue that institutions are endogenous to overall economic volatility, but not to economic volatility induced by policy changes. Although we know that we can never convince the skeptics, we take one more step and report results from regressions that treat institutions as endogenous. The problem is to find instruments for the constraints on the executive. Here we use as an instrument the logarithm of settler mortality in British colonies, as constructed by Acemoglu, Johnson and Robinson (2001). We refer to this variable as the AJR instrument. Column 8 reports the results from this regression. We note that we still obtain a negative and statistically significant coefficient, which is consistent with all of our previous results.[13]

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

[13] The coefficient on constraints doubles in absolute value relative to the OLS regression from

B. Is it policy volatility or institutions that affect growth?

Table 2 has confirmed that political constraints are a determinant of policy volatility. Given this result, we are now ready to investigate further the link between policy volatility and growth to understand the role of institutions. Do institutions exert an autonomous effect on growth beyond the effect on policy volatility? Is policy volatility simply acting as a proxy for institutions? Our starting point is a battery of OLS regressions summarized in Table 3.

[Insert Table 3 here]

Here we follow very closely the methodology of Acemoglu et al (2003). We include as explanatory variables in a standard growth regression both the indicator of policy volatility and the variables that capture institutional characteristics. Leaving endogeneity issues aside (we deal with endogeneity in the next section), how should we interpret these regressions? If one of the two variables is insignificant, then it indicates that either the variable is irrelevant or that the main effects are captured by the other regressors. In the regressions reported by Acemoglu et al. (2003), the policy variable is insignificant and therefore they conclude that policy is not even a mediating factor in the effects of institutions on growth. In the case that both are significant, the conclusion is less clear cut; at most, one can say that both matter (whether policies are also caused by institutions and act as a mediating factor can only be resolved with a more structural approach).

The first column reveals that there is significant raw correlation between constraints on the executive and economic growth. The effect is relatively strong: going from a dictatorship to a relatively constrained form of political organization with a bi-cameral parliament and independent judiciary (coded as 3) leads to about a 1% point increase in economic growth. This result, however, is very fragile: column 3 includes standard controls that eliminate completely the significance of these institutions. More relevant to our discussion is that the inclusion of policy volatility — without controls as in column 2, or with controls as in column 4 — also reduces the significance of the institutional level variable, while making the policy variable highly significant and of the right sign.

The next four columns replicate the same regression for the AJR sample. Given that initially the inability of the policy variables to explain growth was

column 2. In light of this result, we will verify below that our conclusions are not sensitive to the assumption that institutions are exogenous by instrumenting for institutions whenever possible.

discovered in this particular sample, we find it useful to check the robustness of our results by excluding countries which were not used by Acemoglu et al. (2003). The pattern is the same as in the larger sample – institutional variables alone have some significance, but when policy volatility is included the significance of the constraints on the executive disappear.

Combining the findings from the columns of Table 3, we can tentatively conclude that constraints on the executive do matter for policy volatility, but their impact on growth does not extend above and beyond their effect on policy volatility. Increasing the degree of checks and balances is beneficial for the economy because it reduces policy volatility. This result is complementary to the conclusions of Acemoglu et al. (2003). In their analysis, the inclusion of institutional variables always makes policy variables insignificant. In Table 3, the fact that the significance of the policy variable is robust to different specifications in which institutions are included as explanatory variables indicates that policy *volatility* matters for growth even if policy levels do not.

C. How does policy volatility affect growth? An IV approach

Our results so far are robust. Policy volatility, which is affected by institutional quality, has a strong effect on growth. The same institutions do not seem to have an independent effect on growth. A skeptic might argue, partly motivated by our last results, that we omit one crucial issue: the 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). Notice, however, that these arguments can easily generate 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 help us deal also with measurement error problems — we have constructed the policy measure after running 91 regressions and it is clear that this variable is subject to a measurement error. The presence of measurement error creates an attenuation bias, i.e., 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 is the big concern that we address by using IVs, then we should see a *decrease* in the absolute value of the coefficient on policy volatility.

Equipped with potential instruments for policy volatility, namely institutional characteristics of the countries in our sample in the 1960s, we can now investigate the effect of policy volatility on economic growth in an instrumental variables set-up. We first replicate the results of Table 1 by using instrumental variables as presented in Table 4.

[Insert Table 4 here]

The univariate regression reported in column 1 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 1, which is consistent with the presence of measurement error in our policy variable. In column 3 we replicate the regressions with controls using the AJR sample, and the results are the same, which confirms that our results are not driven by particular observations in our sample.

It is also interesting to see whether, within the IV framework, institutions have any predictive power for long-term growth above and beyond their effect on policy volatility. Column 4 includes constraints on the executive as a regressor and uses the log mortality of settlers in British colonies to instrument for this variable. The result is a highly significant and positive coefficient. But as with Table 3, once we include policy volatility in the regression — see columns 5 and 6 — political constraints lose their predictive power. In column 5 we use the AJR instrument as well as the political system, the electoral system and the number of elections to instrument *both* for constraints and for policy. In column 6 we even give a better chance for institutions by including them directly in the regression and instrumenting *only* policy volatility. Irrespective of the variation in the specification we see that the volatility measure remains negative and highly significant.

The last column in Table 4 again addresses the question of whether our measure is simply a reflection of output volatility. We note that the inclusion of output volatility has almost no effect on the policy coefficient and its significance (the p-value is 0.014).

Next we want to establish whether institutions have any marginal explanatory power for growth once we use the IV estimation. Table 5 presents the results. Contrary to the results presented in Table 4, we instrument only policy volatility, leaving the constraints on the executive as independent variables. In all variations reported here 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.

[Insert Table 5 here]

In summary, our results so far offer strong support for the view that policy volatility matters for growth. Institutions are important because they affect policy volatility, but they do not seem to have any marginal effect of their own. These results can be justified by various political economy theories. Governments that face several checks and balances — from parliament or from the judiciary — cannot use fiscal policy too aggressively. Indeed, such governments generate policy which is highly predictable conditional on the state of the cycle. This predictability and lack of volatility help growth. There are several theories consistent with this story and we discuss them briefly in the literature review. These results lead to important policy recommendations: there is room for both institutional reform *and* good macroeconomic policies as recipes for growth. A simple way to illustrate this point is to check how policy affects growth *within* similar institutional settings. In Table 6 we split the sample by the value of the political constraints measure and estimate our baseline regression for each sub-sample using both OLS and IV regression methods. Both for the group of countries with low-quality institutions and for those with high-quality ones, the effect of policy volatility on economic growth is negative and highly significant. Interestingly, the initial GDP per capita is statistically significant only for the group of countries with initially high levels of political constraints. This implies that convergence occurs only in countries that have a good institutional set-up. Finally, columns 3 and 6 indicate that even if there are no constraints on the executive, those countries where discretionary fiscal policy has been relatively stable have experienced higher long-term growth rates. Thus, Table 6 provides some evidence that even when institutions cannot be changed, good macroeconomic policy still can lead to better growth performance.

[Insert Table 6 here]

IV. Robustness

In this section we verify the robustness of our baseline results in several dimensions. The first set of estimates are presented in Table 7. The results in columns 2 to 7 are perturbations of the baseline IV regression from Table 4, which

is reproduced here in column 1 for convenience. We start with the sub-sample stability for the IV estimation and in columns 2 and 3 we present estimates for the rich and poor countries. As with the OLS estimation in Table 1, there is a noticeable difference in the effect of policy volatility on growth across countries, with the impact in the poor countries being six times larger than in the rich countries. This is not entirely unreasonable — one possibility is that volatility affects growth through different channels in rich and poor countries. As we document in the next section, policy volatility is negatively related to capital accumulation in poor countries while it has very little effect on capital accumulation in the subset of the rich economies. This implies that volatility has a strong impact on the speed of convergence, while in the rich economies any effect must be through the rate of productivity growth. With different channels it is conceivable that the elasticity of growth rates to policy volatility varies.

[Insert Table 7 here]

Another issue concerns the role of monetary policy in the relationship between volatility and growth. Monetary policy can potentially affect both long-term growth and fiscal policy and therefore our main estimates can suffer from omitted variables bias. To explore the role of monetary variables we use the level of inflation (column 4) and the variance of inflation (column 5) as regressors. In both cases our main results are unaffected by these modifications. We also note that these results corroborate the findings of Acemoglu et al. (2003) that the level of policy has no explanatory power for economic growth.

In the last two columns of Table 7 we investigate the possibility that our first-stage regression (equation 2) is misspecified. Although we have explored this possibility with a reasonable number of variations in the specifications, we report here only two specifications — column 7 has all variables in levels in the first stage regression. In this case, we retain the same specification but instead of using the growth rate of output as a control we use the log level of output and we instrument it with two lags of log output. In column 8 our first stage regression is a VAR in output, government spending and inflation, and the innovation is extracted assuming that fiscal policy reacts with a lag to changes in the economic environment. Presumably, this is the least plausible specification for data at annual frequency, but its appeal is that it is related to the VAR literature on fiscal policy. As with our previous variations in the specification, we conclude from the last two columns of Table 7 that the relationship between policy volatility and economic

growth is negative, robust and statistically significant at conventional levels of significance.

Possibly the most interesting direction of further investigation is the study of policy changes on economic growth across time. Ideally, one would like to see how shifts in policy volatility affect growth *within* a country. Indeed there is a growing literature employing techniques developed initially by labor economists to study the effect of retraining programs for jobless individuals on their future earnings. Unfortunately, this approach — known as 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. One possibility would be to provide indirect evidence by tracking institutional changes and evaluating policy volatility before and after the change in the institutional environment. To be feasible, this approach would require that institutional changes persist for at least 10 years so that our measure of policy volatility meets reasonable statistical requirements. In our data set, however, countries have either very stable institutions or when an institutional change is implemented it is often reversed soon afterwards.

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. Table 8 reports estimates from 10-year averaged data in the spirit of Barro (1997). We have four non-overlapping periods starting in 1965. The first three periods each cover 10 years of data, while the fourth uses the last five years in our data set. The years from 1960 to 1964 are used as initial conditions. In order to minimize the problems of endogeneity, our controls are averaged over the period preceding the period for the dependent variable. Policy volatility is measured over the current period but we have also used lagged volatility without any significant change in our results. We also estimate regressions by instrumenting current policy volatility with pre-determined variables.

[Insert Table 8 here]

The first column reconfirms the strong negative correlation between policy volatility and economic growth. Although the effect seems to be smaller now, its statistical significance remains quite strong. The next three columns provide reasonable variations in the univariate regressions — in column 2 we use the same controls as in the cross-sectional regressions, then in the adjacent two columns we include lagged growth rates and lagged constraints respectively. In columns 5

to 7 we use fixed country and time effects in order to shed some light on the within-country link between volatility and growth. The results clearly indicate that the effect of policy volatility on growth is not driven by some unobserved fixed factor. Finally, we instrument for current policy volatility with lagged constraints and lagged policy volatility. The coefficient remains significant at better than the 1% level. Thus, all results from Table 8 indicate that countries with very volatile fiscal policy have experienced lower growth rates.

V. Channels of transmission. Why does policy volatility affect growth?

Having documented the importance of fiscal policy volatility for long-term economic growth, we now turn to a question of another order of magnitude: how does volatility affect growth? Ultimately, unstable policy must either reduce the rate of capital accumulation, the rate of human capital accumulation, or the rate of productivity growth. A thorough analysis of the channels of transmission is beyond the scope of this paper, and our goal in this section is only to see whether the data supports the capital accumulation channel. We focus on capital accumulation because in the empirical growth literature is one of the main determinants of growth. However, several economists have recently questioned its role (e.g. Easterly and Levine, 2001).[14] We leave this debate aside and analyze the link between policy volatility and investment rates.

Somewhat more relevant for our analysis is the study of Ramey and Ramey (1995) in which they document the negative effect of *overall* macroeconomic volatility on growth. They argue that the effect of volatility on growth cannot be through investment because there is no correlation between investment and volatility in the data. We start by replicating their regressions in columns 1 and 2 of Table 9. As Ramey and Ramey (1995) report, macroeconomic volatility measured as the standard deviation of output growth has no discernible effect on investment. One possible explanation for this result is that volatility might be detrimental to investment because of the higher uncertainty generated, but at the same time countries with high growth rates (high investment rates) adopt riskier technologies and thus have more volatile economic activity — that is, growth and volatility are

[14] As expected, this statement has been challenged on several occasions. Two recent contributions are Bernanke and Gurkaynak (2001) and Bond, Leblebicioglu and Schiantarelli (2004).

choices along a mean-variance curve.[15]

[Insert Table 9 here]

Because we only look at volatility induced by policy changes, the argument that there might be a positive link between investment or growth and volatility, does not apply to our analysis. This is confirmed in column 3 where we add our measure of policy volatility. It enters the regression with a negative and significant coefficient, which implies that more aggressive use of fiscal policy leads to lower investment. Once again, and as discussed before, one might suspect that the link between these two variables could be the result of not having purged our measure of policy volatility from output fluctuations. To address this issue we have also included output volatility in this regression. If policy volatility is driven by output volatility then the latter variable should be significant. Instead, we find that the coefficient on output volatility is still insignificant.

The final two columns check whether the effect of policy volatility on investment holds when we instrument for policy volatility with the institutional determinants of policy (column 6) or with the AJR instrument (column 7). The results still hold, although now the coefficients are significant only at the 10% level. To illustrate the link between policy volatility and investment rates, we generate the fitted value of our policy measure by regressing it first on its institutional determinants, as described in Section II. In Figure 2 we plot the fitted policy volatility against investment rates.

[Insert Figure 2 here]

Next, we explore the stability of our results within sub-samples. In columns 4 and 5 we split the sample into initially rich and initially poor countries. Interestingly — and in contrast to the results for growth reported in Table 1 — we find that policy volatility affects investment rates differently in rich and poor countries. While countries with GDP per capita above $5,000 in 1960 (column 5) do not see a significant reduction in investment due to higher policy volatility, investment in the other group is clearly affected by policy volatility.

How can we reconcile this finding with the results from Table 1 where we showed that both in rich and poor countries growth suffers from higher policy volatility? One possibility is that in poor countries borrowing constraints bind

[15] Imbs (2003) and Koren and Tenreyro (2005) explore the issue of reverse causality in the relationship between volatility and growth.

more often than in rich countries. In this case countries with volatile fiscal policy and thus higher macroeconomic uncertainty will find it harder to finance capital accumulation. In rich countries policy volatility affects growth primarily through alternative channels. The sensitivity of the link between volatility and investment and the presence of clear correlation between policy volatility and growth is reminiscent of the variation in regression results obtained by Easterly and Levine (2001) and Bond et al. (2004). The negative correlation between volatility and investment rates in poor countries and the lack of such a correlation in rich countries is clearly an important topic that we leave for future research.

VI. A Brief Overview of the Literature on Policy, Institutions and Growth

In this section we provide a highly selective review of the literatures that study policy and institutions within the context of economic growth. Several streams of research are linked to our paper. First, our paper builds on the works of Acemoglu et al. (2003) and Easterly (2004) by exploring 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, i.e., 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 colonies). These two papers belong to a much broader and earlier literature on the effects of institutions on growth or volatility, (going back to North, 1981), which is surveyed in the paper by Acemoglu et al.(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 recent 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 which 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 US 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 von Hagen, Hallett, and Strauch (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.

The last strand of literature that relates to our paper studies the link between macroeconomic volatility (including policy volatility) and growth. From a theoretical point of view, the relationship between volatility and growth is not an obvious one. In a standard neoclassical model where agents (firms) are risk-neutral, investment should increase with uncertainty (at least in prices) because of the convexity of the profit function. 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. What if more fluctuations meant deeper recessions relative to unchanged expansions? Rodrik (1991), for example, considers the case of policy reform and the uncertainty introduced by the possibility that reform may be reversed. In his model, additional uncertainty not only increases risk but also lowers the average return on investment, because it is assumed that no reform will lead to larger distortions. The link between volatility and growth could also be happening through uncertainty. Feeney (1999) argues that risk sharing (through trade) and the associated decrease in uncertainty and volatility can have positive effects on growth. Hopenhayn and Muniagurria (1996) discuss growth and welfare effects of policy volatility and persistence within a standard AK model of growth. They find that an increase in the frequency of policy changes can lower growth, but higher amplitude of policy changes is associated with higher growth rates. An endogenous growth model can also introduce general equilibrium effects of uncertainty on growth through investment, consumer behavior and the labor supply, as in Barlevy (2004), Jones et al. (2005) or de Hek and Roy (2001).

The empirical evidence on the link of volatility and growth can be summarized in two groups. One set of papers 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 (2003) and Martin and Rogers (2000). A second group of papers explores specific sources of uncertainty and how this uncertainty has affected long-

term growth. For example, Alesina et al. (1996) and Dutt and Mitra (2004) 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. The latter paper finds that in panel OLS regressions the volatility of inflation has a significant and negative effect on growth. Our paper differs from their study by focusing on the volatility of discretionary fiscal policy and by using instrumental variables to deal with potential endogeneity issues.

VII. Conclusions

Do macroeconomic policies represent a significant determinant of economic growth? Our answer is 'Yes'. The results documented in this paper show that macroeconomic policies have a first-order effect on long-term economic performance and that this effect stems from the volatility of policy rather than the level of policy. Countries where governments use aggressively discretionary fiscal policy for reasons not related to the state of the cycle experience a slower rate of economic growth.

This result is contrary to recent evidence that economic policies are simply a proxy for poor institutions and do not even have a significant role as mediators in this relationship. Without denying the importance of institutions, we show that economic policies cannot simply be ignored. We document how institutions shape policy outcomes and we agree that certain institutions create incentives for bad economic policy, but 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 in a horse race between policy volatility and institutions it is policy volatility that remains a significant determinant of economic growth. A question for future research is: what drives good fiscal policy above and beyond good institutions?

To the extent that institutions can shift policy behavior, it would also be useful to direct future research efforts in establishing what institutional change could be most beneficial for the economy. We find that increases in the political constraints on the executive serve as a disciplinary device to limit unnecessary and possibly harmful changes in economic policy.

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 (e.g. 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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Appendix: Data description

We use annual data for ninety-one countries over the period 1960-2000. The choice of our sample is dictated by data availability. We started with a sample of 109 countries listed in Appendix C in Jones (2002). Eighteen countries in this sample had to be dropped either because fiscal data were not available or because the time span was too short for a meaningful estimation of time-series regressions in the paper. We keep the following ninety-one countries for which we have at least twenty-five years of data.

List of Countries

Algeria	Germany*ˆ	Niger
Argentina*	Ghana	Nigeria
Australia*	Greece*ˆ	Norway*ˆ
Austria*ˆ	Guatemala	Pakistan
Bangladesh	Guinea-Bissau	Panama
Belgium*ˆ	Haiti	Papua New Guinea
Benin	Honduras	Paraguay
Bolivia	Hong Kong*	Peru
Botswanaˆ	Iceland*ˆ	Philippinesˆ
Brazil	India	Portugal*ˆ
Burkina Faso	Indonesia	Rwanda
Burundi	Ireland*ˆ	Senegal
Cameroon	Israel*ˆ	Singapore*
Canada*	Italy*ˆ	South Africa
Central African Rep.	Jamaica	Spain*ˆ
Chad	Japan*ˆ	Sri Lanka
Chile	Kenya	Sweden*ˆ
Colombia	Korea, Rep.*ˆ	Switzerland*ˆ
Congo, Dem. Rep.	Lesothoˆ	Syriaˆ
Congo, Rep.	Madagascar	Thailandˆ
Costa Rica	Malawiˆ	Togo
Cote d'Ivoire	Malaysia	Trinidad and Tobago*
Denmark*ˆ	Mali	Tunisia
Dominican Rep.	Mauritania	Turkeyˆ
Ecuador	Mauritius*	United Kingdom*ˆ
Egypt	Mexico	United States*
El Salvador	Morocco	Uruguay
Fiji	Netherlands*ˆ	Venezuela
Finland*ˆ	New Zealand*	Zambiaˆ
France*ˆ	Nicaragua	Zimbabweˆ
Gabon		

The countries with an asterisk are in the group of rich countries with over $9500 income per capita in the 1990s. The countries which are it not in the AJR data set are marked by ˆ .

Data series used in the country time-series regressions:

Growth rate of real government consumption — Calculated as the difference in the logarithm of general government final consumption expenditure (percent of GDP) adjusted for the growth rate of real GDP (which is described below). General government final consumption expenditure includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation. Data are from World Development Indicators, CD-ROM 2002. Series identifier in the original data set: *General government final consumption expenditure (percent of GDP) (NE.CON.GOVT.ZS).*

Growth rate of real government consumption for Germany, Israel and Panama — These series are calculated using data from the International Financial Statistics CD-ROM applying the same methodology as above. We use IFS data for these three countries because of the following reasoning: (a) For Germany WDI does not report any data prior to 1972. The IFS series goes back to 1960 and in the period of the overlap (1972-2000) the values are very close to the WDI data. (b) For Panama we have the same reasoning with WDI availability starting in 1980. (c) For Israel the WDI series has a jump of seven percentage points in 1965, which is absent in the IFS series. These series are from International Financial Statistics, CD-ROM December 2002. Series identifiers in the original data set: *GOVERNMENT CONSUMPTION EXPEND.(...91F..ZF...)* and *GROSS DOMESTIC PRODUCT SA (...99B..ZF...).*

Growth rate of real GDP — Calculated as the difference in the logarithm of real GDP in constant local currency units from World Development Indicators, CD-ROM 2002. Series identifier in the original data set: *GDP (constant LCU) (NY.GDP.MKTP.KN).*

Growth rate of real GDP for Germany 1960-1972 — Calculated as the difference in the logarithm of GDP volume (index number) from International Financial Statistics, CD-ROM December 2002. Series identifier in the original data set: *GDP VOL. (1995=100) (13499BVRZF...).*

Inflation — Calculated as the difference in the logarithm of the GDP deflator from World Development Indicators, CD-ROM 2002. Series identifier in the original data set: *GDP deflator (NY.GDP.DEFL.ZS).*

Inflation for Germany 1960-1972 — Calculated as the difference in the logarithm

of the GDP deflator. The GDP deflator is obtained by converting the GDP volume index described above to real GDP in local currency units and then dividing nominal GDP by this series. The GDP series are obtained from International Financial Statistics, CD-ROM December 2002. Series identifiers in the original data set: *GDP VOL. (1995=100) (13499BVRZF...)* and *GROSS DOMESTIC PRODUCT SA (13499B.CZF...)*.

Index of oil prices — logarithm of Petroleum spot price from International Financial Statistics, CD-ROM December 2002. Series identifiers in the original data set: *Average crude price (US dollars per barrel, 00176AAZZF...)*.

Data series used in the cross-sectional regressions:

Real GDP per capita — Real GDP per capita on Purchasing Power Parity basis from Penn World Tables (version 6.1). Series identifier in the original data set: *rgdpch*.

Investment price — Price level of investment on Purchasing Power Parity basis from Penn World Tables (version 6.1). Series identifier in the original data set: *pi*.

Government size — logarithm of the ratio of government consumption to GDP. The definition of the series are the same as those used in the construction of the growth rate of real government consumption described above.

Openness — logarithm of the sum of imports and exports as percent of GDP from World Development Indicators, CD-ROM 2002. Series identifier in the original data set: *Exports of goods and services (percent of GDP) (NE.EXP.GNFS.ZS)* and *Imports of goods and services (percent of GDP) (NE.IMP.GNFS.ZS)*.

Political system — dummy variable that takes a value of 1 for presidential regimes and 0 for parliamentary regimes. Data for fifty-one countries are from Persson and Tabellini [2001]. Series identifier in the original data set: *pres*. From the Database of Political Institutions (Beck et al. [2000]), for forty countries. The DPI variable *system* is recoded from the original 0, 1, 2 values to a dummy variable that takes a value of 1 for presidential regimes. Series identifier in the original data set: *System*.

Electoral system — dummy variable that takes a value of 1 for majoritarian systems and 0 for proportional systems. Data for fifty-one countries are from Persson and Tabellini [2001]. Series identifier in the original data set: *maj*. From the Database of Political Institutions for forty countries. Series identifier in the original data set: *Pr*.

Number of elections — the average number of elections over the time period for which macroeconomic data are available. The series is constructed as the sum of legislative and executive elections from the Database of Political Institutions. Series identifiers in the original data set: *legelec* and *execelec*.

Constraints on the executive — from Henisz [2000]. Updated from author's web-site. Calculated as the sum of four dummy variables indicating the existence of government branches independent of the executive. Series identifiers in the original data set: *L1, L2, J, F*.

Political constraints — from Henisz [2000]. Updated from author's web-site. Series identifier in the original data set: *POLCONV_2002*.

Primary schooling of males over 25 — from Barro and Lee [2000]. Downloaded from the NBER web-site.

Investment rate — Investment as percentage of GDP from Penn World Tables (version 6.1). Series identifier in the original data set: *ci*.

Log European settler mortality — Log of estimated mortality of European settlers during the early period of European colonization. See Acemoglu et al. (2001) for data description.

Table 1. Economic Growth and Policy Volatility

Dependent variable: Growth rate of output per capita 1960-2000

	(1)	(2)	(3)	(4) Rich	(5) Poor	(6) AJR Sample
Policy volatility	-1.019	-1.123	-1.172	-0.546	-1.527	-1.251
	(0.193)**	(0.351)**	(0.408)**	(0.144)**	(0.491)**	(0.461)**
Government size (60-65)		-0.004	-0.006	-0.032	0.064	-0.004
		(0.049)	(0.051)	(0.022)	(0.047)	(0.056)
Investment price (60-65)		-0.014	-0.014	-0.001	-0.013	-0.012
		(0.003)**	(0.003)**	(0.006)	(0.002)**	(0.002)**
GDP per capita (60-65)		-0.615	-0.609	-2.08	-1.146	-0.414
		(0.291)*	(0.301)*	(0.236)**	(0.278)**	(0.372)
Primary schooling (60-65)		0.018	0.018	-0.014	0.032	0.027
		(0.011)	(0.011)	(0.007)*	(0.012)*	(0.016)
Openness (60-65)		0.478	0.458	0.337	-0.447	0.574
		(0.503)	(0.473)	(0.211)	(0.460)	(0.606)
Output volatility			0.139			
			(0.490)			
Constant	3.911	7.325	7.259	22.288	14.141	5.059
	(0.367)**	(3.146)*	(3.236)*	(2.374)**	(2.851)**	(4.028)
Observations	91	72	72	27	45	45
R-squared	0.19	0.38	0.38	0.88	0.52	0.42

Robust standard errors in parentheses.
* significant at 5%; ** significant at 1%

Table 2. Institutions and Policy Volatility

Dependent variable: Policy volatility 1960-2000

	(1)	(2)	(3)	(4)	(5) Rich	(6) Poor	(7) AJR Sample	(8) IV
Constr. on the executive (60-69)	-0.401 (0.053)**	-0.266 (0.058)**			-0.327 (0.092)**	-0.146 (0.057)*	-0.214 (0.064)**	-0.526 (0.167)**
Presidential		0.761 (0.145)**	0.656 (0.181)**	0.391 (0.186)*	0.836 (0.476)	0.306 (0.169)	0.27 (0.213)	-0.175 (0.421)
Majoritarian		0.022 (0.106)	0 (0.107)	-0.004 (0.105)	0.314 (0.241)	-0.2 (0.112)	-0.183 (0.135)	-0.088 (0.181)
Number of elections		-1.857 (0.520)**	-1.953 (0.538)**	-1.162 (0.611)	-1.395 (1.126)	-1.66 (0.571)**	-1.47 (0.612)*	-0.576 (0.838)
Political constr. (60-69) (Henisz)			-0.999 (0.259)**					
Political constr. 60-99 (Henisz)				-1.404 (0.307)**				
Constant	2.533 (0.084)**	2.468 (0.177)**	2.554 (0.192)**	2.69 (0.189)**	2.203 (0.354)**	2.816 (0.192)**	2.834 (0.232)**	3.182 (0.386)**
Observations	84	83	83	88	26	57	55	55
R-squared	0.4	0.59	0.56	0.57	0.5	0.26	0.45	0.17

Robust standard errors in parentheses. AJR sample refers to European ex-colonies studied by Acemoglu et al (2001).
In column (8), constraints on the executive are instrumented with the logarithm of settlers' mortality.
This instrument is described in the Appendix and in Acemoglu et al. (2001).
* significant at 5%; ** significant at 1%

Table 3: Average growth, policy volatility and institutions (OLS)

Dependent variable: Growth rate of output per capita 1960-2000

	Full sample				AJR Sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constr. on the executive (60-69)	0.359 (0.138)*	-0.113 (0.153)	0.224 (0.189)	0.044 (0.173)	0.383 (0.141)**	0.002 (0.183)	0.649 (0.268)*	0.241 (0.274)
Policy volatility		-1.178 (0.251)**		-1.064 (0.357)**		-1.277 (0.459)**		-1.115 (0.544)*
Government size (60-65)			0.068 (0.070)	0.035 (0.068)			0.084 (0.099)	0.062 (0.092)
Investment price (60-65)			-0.017 (0.002)**	-0.015 (0.002)**			-0.016 (0.002)**	-0.013 (0.003)**
GDP per capita (60-65)			-0.299 (0.326)	-0.663 (0.334)			-0.875 (0.519)	-0.723 (0.533)
Primary schooling (60-65)			0.022 (0.012)	0.02 (0.012)			0.029 (0.015)	0.035 (0.016)*
Openness (60-65)			0.331 (0.615)	0.394 (0.603)			0.604 (0.787)	0.621 (0.766)
Constant	1.375 (0.298)**	4.36 (0.633)**	1.949 (3.326)	7.312 (3.505)*	0.938 (0.303)**	4.261 (1.170)**	4.182 (5.076)	5.684 (4.992)
Observations	84	84	68	68	56	56	41	41
R-squared	0.06	0.21	0.29	0.39	0.06	0.17	0.38	0.45

Robust standard errors in parentheses. AJR sample refers to European ex-colonies studied by Acemoglu et al (2001).
* significant at 5%; ** significant at 1%

Table 4: Average growth and policy volatility: Instrumental variables estimation

Dependent variable: Growth rate of output per capita 1960-2000

	(1)	(2)	(3) AJR Sample	(4) Using AJR instrument	(5) Using AJR instrument	(6) Using AJR instrument	(7) Using AJR instrument
Policy volatility	-1.369	-2.649	-2.25		-2.659	-3.436	-3.115
	(0.295)**	(0.835)**	(0.800)**		(1.039)*	(1.089)**	(1.204)*
Government size (60-65)		-0.025	0.033	0.024	-0.007	0.017	-0.005
		(0.072)	(0.086)	(0.116)	(0.095)	(0.093)	(0.106)
Investment price (60-65)		-0.011	-0.01	-0.019	-0.011	-0.007	-0.01
		(0.004)**	(0.003)**	(0.004)**	(0.004)*	(0.004)	(0.003)**
GDP per capita (60-65)		-1.381	-0.751	-2.454	-1.562	-0.405	-0.849
		(0.488)**	(0.454)	(0.689)**	(0.696)*	(0.791)	(0.542)
Primary schooling (60-65)		0.015	0.04	0.023	0.038	0.047	0.044
		(0.013)	(0.017)*	(0.021)	(0.022)	(0.021)*	(0.018)*
Openness (60-65)		0.477	0.649	0.696	0.706	0.656	0.453
		(0.711)	(0.770)	(0.950)	(0.899)	(0.790)	(0.687)
Constr. on the executive (60-69)				2.154	0.676	-0.609	
				(0.591)**	(0.824)	(0.686)	
Output volatility							1.099
							(1.052)
Constant	4.648	16.654	8.53	15.504	15.295	8.811	10.582
	(0.587)**	(4.910)**	-4.621	(4.588)**	(4.736)**	-5.219	-5.234
OID test (p-value)	0.011	0.145	0.165	0.225	0.817	0.337	0.219
Observations	83	68	41	41	41	41	41

Robust standard errors in parentheses. Instruments for all columns: political system dummy, electoral system dummy, average number of elections. Additional instrument for columns (1), (2), (3) and (7) is constraints on the executive in the 1960s. In columns (4) to (7) also the AJR instrument is used (the instrument is the logarithm of settlers' moratility in European ex-colonies). For all regressions the instrumented variable is policy volatility and in columns (4) and (5) constraints are also instrumented.
* significant at 5%; ** significant at 1%

Table 5: Average growth, policy volatility and institutions (IV)

Dependent variable: Growth rate of output per capita 1960-2000

	Full sample		AJR Sample	
	(1)	(2)	(3)	(4)
Policy volatility	-2.499	-3.161	-3.208	-3.119
	(0.586)**	(0.918)**	(1.498)*	(1.067)**
Constr. on the	-0.666	-0.312	-0.601	-0.494
executive (60-69)	(0.270)*	(0.332)	(0.493)	(0.643)
Government		-0.031		0.023
size (60-65)		(0.076)		(0.091)
Investment		-0.01		-0.008
price (60-65)		(0.004)*		(0.004)
GDP per capita		-1.381		-0.449
(60-65)		(0.542)*		(0.750)
Primary schooling		0.015		0.045
(60-65)		(0.014)		(0.020)*
Openness (60-65)		0.52		0.651
		(0.737)		(0.780)
Constant	7.763	17.888	9.346	8.385
	(1.504)**	(5.302)**	(3.947)*	(5.045)
OID test	0.163	0.186	0.177	0.201
(p-value)				
Observations	83	68	55	41

Robust standard errors in parentheses.
Policy volatility is instrumented with political system, electoral system and number of elections.
* significant at 5%; ** significant at 1%

Table 6: Average growth and policy volatility for different institutional constraints

Dependent variable: Growth rate of output per capita 1960-2000

	OLS			IV		
	(1) Polcon<2	(2) Polcon>=2	(3) Polcon=0	(4) Polcon<2	(5) Polcon>=2	(6) Polcon=0
Policy volatility	-1.59	-1.758	-1.844	-3.359	-2.066	-2.318
	(0.483)**	(0.423)**	(0.513)*	(0.924)**	(0.568)**	(0.583)**
Government size (60-65)	0.065	-0.064	0.147	0.089	-0.016	0.145
	(0.078)	(0.040)	(0.084)	(0.069)	(0.075)	(0.088)
Investment price (60-65)	-0.014	0.014	-0.014	-0.009	0.017	-0.013
	(0.003)**	(0.006)*	(0.003)**	(0.004)*	(0.007)*	(0.004)*
GDP per capita (60-65)	-0.406	-1.57	-1.624	-0.704	-1.86	-1.846
	(0.408)	(0.524)**	(0.861)	(0.559)	(0.477)**	(0.726)*
Primary schooling (60-65)	0.034	-0.002	0.057	0.04	-0.002	0.058
	(0.015)*	(0.009)	(0.031)	(0.016)*	(0.011)	(0.031)
Openness (60-65)	0.609	0.551	-1.948	0.568	0.253	-2.192
	(0.766)	(0.381)	(1.414)	(0.880)	(0.363)	(1.384)
Constant	4.774	16.465	22.569	10.467	19.824	26.187
	(4.471)	(5.169)**	(11.193)	(4.591)*	(4.949)**	(8.629)*
R-squared	0.48	0.52	0.85			
OID test (p-value)				0.237	0.075	0.575
Observations	41	31	13	41	27	13

Robust standard errors in parentheses. In the IV columns, policy volatility is instrumented with political system, electoral system and number of elections. In columns (4) and (5) political constraints are also used as an instrument.
* significant at 5%; ** significant at 1%

Table 7: Robustness

Dependent variable: Growth rate of output per capita 1960-2000

	(1) Baseline	(2) Rich	(3) Poor	(4) Inflation	(5) Var(Infl.)	(6) Levels	(7) VAR
Policy volatility	-2.649	-0.665	-3.735	-3.319	-2.844	-3.187	-3.395
	(0.835)**	(0.241)*	(1.144)**	(1.276)*	(0.974)**	(1.265)*	(1.172)**
Government size (60-65)	-0.025	-0.035	0.117	-0.016	-0.015	-0.009	-0.037
	(0.072)	(0.031)	(0.075)	(0.072)	(0.071)	(0.080)	(0.083)
Investment price (60-65)	-0.011	-0.001	-0.007	-0.016	-0.014	-0.007	-0.008
	(0.004)**	(0.006)	(0.003)*	(0.006)**	(0.005)**	(0.005)	(0.005)
GDP per capita (60-65)	-1.381	-2.179	-1.235	-1.614	-1.489	-1.522	-1.717
	(0.488)**	(0.311)**	(0.401)**	(0.599)**	(0.538)**	(0.659)*	(0.646)**
Primary schooling (60-65)	0.015	-0.014	0.037	0.012	0.016	0.018	0.016
	(0.013)	(0.007)*	(0.014)*	(0.014)	(0.013)	(0.014)	(0.014)
Openness (60-65)	0.477	0.313	0.096	1.005	0.565	0.419	0.471
	(0.711)	(0.261)	(0.631)	(0.848)	(0.725)	(0.776)	(0.778)
Inflation				0.046			
				(0.027)			
Inflation variance					0.000		
					(0.000)		
Constant	16.654	23.422	16.577	17.416	17.433	3.776	4.798
	(4.910)**	(3.027)**	(5.220)**	(5.594)**	(5.404)**	(3.504)	(3.494)
Observations	68	26	42	68	68	68	68
R-squared	0.15	0.86	0.37	0.06	0.11	0.04	0.03

Robust standard errors in parentheses. All regressions are estimated by instrumental variables. Policy volatility is instrumented with political system, electoral system, number of elections, and constraints on the executive.
* significant at 5%; ** significant at 1%

Table 8: Average growth and policy volatility (decadal regressions)

Dependent variable: Growth rate of output per capita 1965-74, 1975-84, 1985-94, 1995-2000

	(1) Univariate	(2) Baseline	(3) Lagged growth	(4) Constraints	(5) Time effects	(6) Fixed effects	(7) Time and country effects	(8) IV
Policy volatility	-0.526 (0.073)**	-0.695 (0.126)**	-0.602 (0.129)**	-0.675 (0.129)**	-0.634 (0.127)**	-0.733 (0.200)**	-0.541 (0.195)**	-0.605 (0.164)**
GDP per capita (lag)		-0.271 (0.243)	-0.446 (0.260)	-0.225 (0.280)	-0.194 (0.210)	-2.353 (0.593)**	-2.74 (0.656)**	-0.104 (0.275)
Primary schooling (lag)		0.009 (0.007)	0.006 (0.007)	0.008 (0.007)	0.007 (0.008)	-0.001 (0.015)	-0.002 (0.014)	0.008 (0.007)
Openness (lag)		0.361 (0.262)	0.204 (0.279)	0.321 (0.291)	0.384 (0.265)	0.048 (0.675)	-0.147 (0.665)	0.291 (0.289)
Government size (lag)		-0.073 (0.034)*	-0.052 (0.038)	-0.079 (0.039)*	-0.062 (0.030)*	-0.071 (0.050)	-0.045 (0.051)	-0.076 (0.038)*
Investment price (lag)		-0.013 (0.005)*	-0.008 (0.005)	-0.012 (0.005)*	-0.012 (0.004)**	0.007 (0.007)	0.006 (0.007)	-0.012 (0.005)*
Growth (lag)			0.248 (0.076)**					
Contr. on the executive (lag)				0.057 (0.153)				
Observations	364	299	288	288	299	299	299	288
R-squared	0.1	0.16	0.21	0.16	0.2	0.17	0.26	
Number of countries						80	80	

Robust standard errors in parentheses. All regressions include an intercept. All lags are calculated as averages over the five-year period preceding the start of the current decadal average. In column (8) current policy volatility is instrumented with lagged policy volatility and lagged constraints on the executive.

* significant at 5%; ** significant at 1%

Table 9: How does policy volatility affect growth?

Dependent variable: Investment Rate 1960-2000

	(1)	(2)	(3)	(4) Initially Poor	(5) Initially Rich	(6) IV	(7) IV with AJR Instr.
Output volatility	-0.715	0.598	2.482	0.546	1.66		
	(1.332)	(1.290)	(1.675)	(1.711)	(3.737)		
Policy volatility			-2.441	-3.594	-1.834	-4.003	-4.956
			(1.186)*	(1.594)*	(1.560)	(2.329)	(2.509)
Government size (60-65)		0.117	0.049	0.185	-0.389	0.011	0.062
		(0.148)	(0.139)	(0.187)	(0.274)	(0.242)	(0.182)
Investment price (60-65)		-0.026	-0.024	-0.02	-0.021	-0.019	-0.013
		(0.006)**	(0.006)**	(0.008)*	(0.025)	(0.008)*	(0.007)
GDP per capita (60-65)		0.714	-0.063	-1.316	-0.5	-1.468	0.036
		(0.938)	(0.999)	(1.782)	(1.936)	(1.475)	(1.341)
Primary schooling (60-65)		0.045	0.041	0.047	0.022	0.035	0.031
		(0.035)	(0.036)	(0.052)	(0.029)	(0.038)	(0.048)
Openness (60-65)		2.435	2.172	3.944	0.476	2.87	2.809
		(1.264)	(1.212)	(1.515)*	(1.177)	(1.663)	(1.629)
Constant	21.835	2.96	13.271	19.023	31.247	28.832	18.37
	(1.725)**	(8.067)	(8.926)	(13.122)	(21.711)	(15.109)	(13.755)
Observations	91	72	72	47	25	68	45
R-squared	0	0.23	0.28	0.38	0.29	–	–
OID test (p-value)						0.397	

Robust standard errors in parentheses. Policy volatility in column (6) is instrumented with political system, electoral system, number of elections, and constraints on the executive in the 1960s. In column (7) the instrument for policy volatility is the logarithm of settlers' mortality.
* significant at 5%; ** significant at 1%

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Figure 1. Policy volatility and economic growth

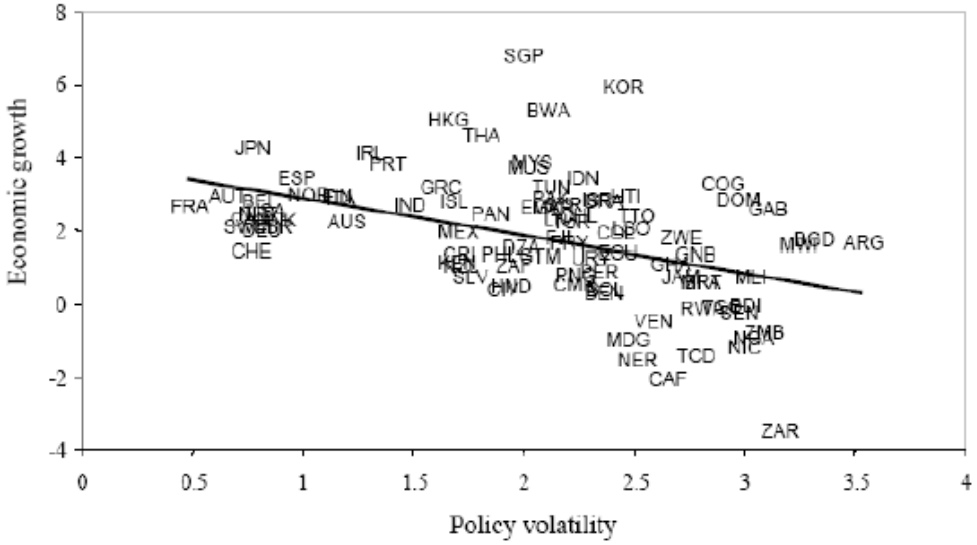

Figure 2. Predicted policy volatility and investment