



DEPARTMENT OF ECONOMICS
UNIVERSITY OF MILAN - BICOCCA

WORKING PAPER SERIES

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No. 116 - May 2007

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<http://dipeco.economia.unimib.it>

Public expenditure and growth volatility: do "globalisation" and institutions matter?

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This version: may 2007

Abstract

We revisit the empirical relationship between output volatility and government expenditure in a model where the two are jointly determined. The key regressors in our model are trade and financial integration indicators, institutional variables, including central bank independence, and a measure of *de facto* exchange rate flexibility. Our findings consistently signal that government discretion has destabilising effects on growth volatility. We confirm that government size increases with trade integration, but this has adverse effects because public spending is positively related to growth volatility. Institutions that increase policy-makers accountability limit the level of public expenditure and volatility. In this regard, our results support the view that stronger institutions increase policy efficiency.

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JEL Classification: F10, F30, E58, E60, F43, E30.

Keywords: Output volatility, government expenditure, trade openness, financial openness, central bank independence, political institutions.

1 Introduction

The emerging consensus on the large costs of wide economic fluctuations¹ has propelled a lively debate on the sources of output growth volatility and the possible smoothing role of policies and institutions. In a famous contribution Rodrik (1998) argued that trade openness is a major cause of external risk and that fiscal policy should be used as an insurance tool. This argument resurrects the old keynesian theme on the stabilising role of government intervention (Gali, 1994).

We contribute to this literature by revisiting the empirical relationship between output volatility and government expenditure in a large sample of countries over the period 1970-2000. Our modeling approach rests on two key considerations. First, output volatility and expenditure are jointly determined. Second, both variables might respond to structural factors such as institutions and the degree of trade and financial openness of the economy. In line with these considerations, we estimate a two-equations system where variables describing cross-country differences in terms of politico-institutional arrangements and external openness are included in the list of regressors.

The literature has identified three key determinants of government expenditure: institutions and government failures (i.e. constitutional arrangements, policy-myopia and political instability), economic fundamentals (i.e. the stage of economic development, demographic forces, country size), globalisation (i.e. trade and financial openness).² With regard to the sources of output volatility, conventional wisdom emphasises the role of country exposure to shocks and of the associated economic policy responses. These, in turn, are affected by structural factors such as economic fundamentals and institutions.³ Our paper brings together these two strands of literature.

We obtain a number of results. First, economic volatility calls for higher government expenditure, but this in turn appears to increase output volatility. We argue that this latter effect operates through the volatility of government expenditure: higher expenditure is also more volatile, and a more volatile expenditure raises the volatility of output if expenditure is procyclical. Our

¹Following Ramey and Ramey (1995), various papers have identified a strong and persistent negative effect of output volatility on output growth (see inter alia Fatas (2002) and Hnatkovska and Loayza (2005). Aghion et al. (2005) show that this effect gets stronger the lower the degree of financial development of the economy. Kose et al. (2006) find that trade and financial integration significantly reduce the strength of the relationship. Chatterjee and Shukayev (2006) however suggest that the relationship might be sensitive to changes in the specification of growth regressions.

²Persson and Tabellini (2003, 2004) and Persson et al. (2006) provide comprehensive discussions of the determinants of fiscal policy outcomes.

³See Bejan (2004) for a survey of the empirical evidence in this field.

evidence complements the results of Fatas and Mihov (2003).

Second, trade openness increases economic volatility and hence expenditure, as argued by Rodrik (1998). However, this is not the end of the story. In fact trade openness has a direct effect on expenditure over and above its impact on volatility. Our interpretation is that this direct effect represents government response to trade-induced changes in relative incomes, calling for redistributive policies.

Third, the other main dimension of globalisation, namely financial openness, generates complex effects. On the one hand it increases volatility, in line with theoretical arguments on the effects of international risk sharing on specialisation (Kalemli-Ozcan et al., 2003) and boom-bust cycles (Aghion et al., 1999). On the other it has a direct disciplining effect on government expenditure: more financially open economies are associated with lower spending. Therefore the overall impact of financial openness on government expenditure and output volatility is ambiguous.

Fourth, we find that political institutions affect output volatility through their impact on government expenditure. In fact, similarly to Persson and Tabellini (2004), expenditure tends to be higher in parliamentary systems and in worse polities. We will provide a common interpretative framework for these two effects.

Fifth, there is an additional institutional effect: greater central bank independence lowers economic volatility. This finding is in contrast with the well known neutrality result obtained by Alesina and Summers (1993), but it is consistent with our other finding that government expenditure raises growth volatility. If government discretion has destabilising effects, then restricting its ability to affect central bank decisions should reduce output fluctuations.

The remainder of the paper is organised as follows. Section 2 provides a brief review of the literature. Section 3 introduces the econometric model. Results from the baseline specifications are discussed in Section 4. Section 5 presents some extensions. Section 6 concludes. A complete description of the variables can be found in the Appendix.

2 Literature review

In this section we briefly discuss the key contributions of the literature to the issues analysed in the paper.

Public expenditure and openness. The original argument put forward by Rodrik (1998) links the effect of openness on public expenditure to the increased risk exposure that globalisation brings about and therefore to the increased demand for insurance. However, in addition to risk-insurance, other channels link

openness to spending. For instance, openness to trade can sharpen inequalities across sectors of the economy and/or between workers with different skills (Kletzer, 2002). These growing inequalities might then translate into stronger redistributive demands and increased public spending.⁴ Our explicit modeling of the joint effect of globalisation on volatility and fiscal policy allows us to shed light on this issue and improve the understanding of the transmission channels.

Fiscal policy and output volatility. Gali (1994) documents a negative serial correlation between government size and output volatility. This result is confirmed and apparently reinforced in Fatas and Mihov (2001), who show that even after controlling for endogeneity, the negative correlation is still present and, in some cases, it becomes even more significant. Andres et al. (2004) provide a rigorous theoretical underpinning for this result. In their framework, the working of automatic stabilizers should imply a negative correlation between public spending and volatility. However, a growing amount of evidence points to a pro-cyclical pattern of fiscal policy (see Lane (2003), Kaminsky et al. (2004) Alesina and Tabellini (2006)). If the discretionary component of expenditure is pro-cyclical, then the sign of the correlation between expenditure and volatility becomes ambiguous. This issue has been investigated in Fatas and Mihov (2003) who report that the discretionary component of fiscal policy has a strong volatility effect. Yet there are substantial differences between our approach and theirs, as they analyse a single equation model, where the determinants of fiscal policy are largely unexplained.

Political institutions and public expenditure. Persson et al. (2000) formally study how different regimes (parliamentary vs. presidential) affect the size and scope of government. They conclude that parliamentary regimes are associated with higher taxes and overall spending. In parliamentary regimes accountability towards voters is weaker and politicians are more likely to collude, this in turn results in higher rents and higher taxation.⁵ Persson and Tabellini (2003, 2004) provide evidence that government expenditure in percent of GDP is lower in presidential regimes and in countries with a majoritarian rule. Institutions might also affect volatility through their influence on government expenditure. Acemoglu et al. (2003) explicitly test the volatility effect of the quality of institutions, as measured by the extent of constitutional limits on the exercise of arbitrary power by the executive. They conclude that poor institutions lead to economic instability and to bad macroeconomic policies via a variety of mediating channels. Henisz (2004), using a measure of checks

⁴Kim (2007) shows that much of the openness-spending nexus should be attributed to channels other than insurance against increased volatility.

⁵Austen-Smith (2000) and Persson et al. (2006) obtain similar results using different theoretical approaches.

and balances, obtains that worse institutions increase fiscal policy volatility by allowing policymakers to suddenly revert the existing course of policy action. Policy volatility can therefore be the link between institutions and output volatility. Our paper contributes to this strand of research by providing an explicit estimates of the direct and indirect (via government expenditure) impact of institutions on volatility.

Central bank independence output volatility and public expenditure. Early models of monetary policy delegation postulated a positive correlation between central bank independence and output volatility (Rogoff, 1985). Alesina and Summers (1993) produced a celebrated neutrality result, subsequently rationalised by a voluminous theoretical research. Alesina and Gatti (1995) pointed out that delegation schemes entailed a trade-off, in terms of output volatility, between the distortionary responses of conservative central bankers and the beneficial effects of monetary policy independence from political cycles. Our results go well beyond the neutrality result indicating that the delegation of monetary policy indeed has a stabilising effect.

3 Econometric modeling

3.1 Model set-up and estimation

We estimate the following two-equations model:

$$\sigma_{ct} = A_1 X_{ct} + \alpha_2 g_{ct} + \varepsilon_{ct} \quad (1)$$

$$g_{ct} = B_1 W_{ct} + \beta_2 \sigma_{ct} + v_{ct} \quad (2)$$

where σ is a measure of economic volatility, g is government expenditure, subscripts c and t respectively denote a generic country and time, X and W are two sets of regressors (each including a constant term, time dummies and/or regional dummies), A and B are the associated vectors of parameters, ε and v are error terms. Some of the regressors might appear on the r.h.s. of both equations; that is, X and W are allowed to have some elements in common.⁶

We consider a general structure of residuals, allowing for heteroskedasticity, contemporaneous correlation of the residuals across equations and non-zero correlation between some of the regressors and the error term in each equation. Under these assumptions, the Generalized Method of Moments (GMM) provides robust estimation of the parameters of the model, without requiring

⁶The order and rank conditions for identification of the system limit the number of regressors that can appear in both equations.

information of the exact distribution of the disturbances. In fact, many standard estimators (i.e. OLS, SUR, 2SLS, 3SLS) can be derived as special cases of the GMM estimator (see Wooldridge, 2002).

In applying the GMM procedure, we use White’s heteroskedasticity consistent covariance matrix. For each set of estimates we run the diagnostic test of overidentifying restrictions to check the validity of our choice of instruments (see also Section 3.4). The dataset used for estimation is a panel covering a large sample of countries and spanning over a 30 years spell, from 1970 to 2000. Data are averaged over a period of five-years as we are not interested in short term effects. Tables 3 and 4 provide the list of countries included in the analysis and some descriptive statistics of the variables.

3.2 Specification of the volatility equation

In line with the literature, our measure of economic volatility (*econovol*) is the standard deviation of aggregate output growth over a five-year period.⁷ On the r.h.s. of the volatility equation (1) there is the other endogenous variable of the system, total government expenditure in percent of GDP (*govexp*). Following Gali (1994) the expected sign on government size should be negative.

The key regressors in our analysis fall into two broad categories: open economy and institutional factors.

Exposure to external shocks should be an important source of volatility. Rodrik (1998) stresses the importance of trade openness. By contrast, financial openness should have a stabilising effect by favouring risk diversification. However, high volatility of international capital movements could be a source of risk *per se*.⁸ We account for these effects by including the imports plus exports to GDP ratio (*tradeopen*), and an index of international capital flows liberalisation (*finopen*).⁹ In line with the argument of Rodrik (1998), *tradeopen* is weighted by the period standard deviation of terms of trade (*voltot*), to obtain an overall measure of “external risk” (*tradeopen*voltot*). In addition we consider an index based on the *de facto* classification of exchange rate regimes proposed by Reinhart and Rogoff (2004). This variable (*excharr*) takes higher values (from 1 to 5) the more flexible the regime is. The effect of *excharr* on growth volatility is a priori ambiguous. On the one hand, countries that peg their currency to an external anchor lose the possibility of using monetary policy for domestic stabilisation purposes. If the economy is prevalently

⁷Using the standard deviation of per-capita income growth does not alter the results (available upon request).

⁸See for instance the discussion in Easterly et al. (2000), Buch et al. (2002), Bekaert et al. (2006), Kose et al. (2003, 2006).

⁹The index is taken from Chinn and Ito (2006). See the appendix for further details.

hit by asymmetric real shocks, this should increase volatility. On the other hand, flexible exchange rate arrangements leave room for a discretionary conduct of macroeconomic policies that is often associated with more, rather than less, volatility. The prediction on the sign of the estimated coefficient is thus uncertain ex-ante.

Turning to institutional factors we provide an explicit treatment of institutional variables that shape policymakers' incentives. For the case of fiscal policy, the effect of institutions is most likely observed indirectly through public spending. This implies that after including *govexp* in the volatility regression, institutions should have no residual direct effect. However, if institutions affect other dimensions of the policy space, then the inclusion of fiscal spending would not exhaust the effect of institutions on volatility. Persson and Tabellini (2003, 2004) have become a key reference in the empirical treatment and analysis of the economic effects of institutional arrangements. Following their contributions, we will focus on three dimensions of a country's institutional setting: the quality of the polity (*polity*), the type of political system (*system*), and the electoral rule (*rule*). The first is an index ranging from -10 to +10, with higher values denoting better polities. The second is a thricotomous variable taking value 0 for presidential and authoritarian, 1 for assembly-elected and 2 for parliamentary systems. The third is a binary dummy taking value 1 for plurality (as opposed to proportional) electoral rule.

To complete the analysis of institutional aspects we include a measure of *de facto* central bank independence. We use the turnover rate of central bank governor (*cbturn*):¹⁰ higher values indicate lower independence. The expected sign on this variable is ambiguous depending on whether central bank independence isolates monetary policy from political instability or generates distorted responses to shocks as in Rogoff (1985).

Finally we consider other controls already used in the empirical literature: the level of per-capita GDP (*GDP p.c.*), to proxy for the stage of economic development (Acemoglu and Zilibotti, 1997), and the ratio of domestic credit to the private sector to GDP (*findpth*), to account for the depth of domestic financial markets.

3.3 Specification of the expenditure equation

The dependent variable of equation (2) is government expenditure to GDP ratio, *govexp*. We employ total expenditure, rather than government consumption, because policymakers are likely to use transfers and subsidies as

¹⁰See Ghosh et al. (2002)

insurance tools.¹¹

Output volatility now appears as a regressor. If government expenditure provides individual risk insurance and business cycle stabilisation, then output volatility in equation (2) should display an estimated positive coefficient.

Rodrik (1998) argues that trade exposure is a major source of risk, calling for larger government expenditure. Note that if this effect works through the increased volatility of output, then the contemporaneous inclusion of *econovol* on the r.h.s of equation (2) should make the coefficient on *tradeopen* not significant. Extending Rodrik's argument to financial factors, financial openness should affect spending through its effect on growth volatility. However, governments may consolidate their fiscal stance to stabilise capital flows. In other words, financial openness could discipline governments. In this case we should observe a direct negative effect of *fnopen* on government spending.

Extending the mainstream empirical literature, we include the variable *excharr*. There are various theoretical arguments implying that exchange rate arrangements might be an important determinant of spending. Countries pegging their currency to an external anchor cannot use monetary policy for domestic stabilisation purposes and therefore rely more heavily on fiscal policy. This argument can be reversed: policymakers might overspend under a flexible exchange rate regime because the latter leaves room for discretionary policies. To the contrary, the sustainability of a peg may require a tighter fiscal stance. In the end, different effects of opposite sign are likely to be at work and the role of *excharr* remains theoretically ambiguous.

The treatment of the politico-institutional determinants of spending follows Persson et al. (2006). Proportional systems are more likely to generate coalition governments and political fragmentation, thus reducing the overall accountability of decision-makers towards the electorate. This increases politicians' incentive to appropriate the common pool of resources, leading to an inefficient policy equilibrium characterised by high spending. The dummy *rule* captures the type of electoral rule, with the prediction of a negative coefficient. A similar argument applies to political systems. Parliamentary systems tend to have a larger incidence of coalition governments. The accountability of each single coalition member falls in fragmented governments, thus leading to overspending equilibria. The variable *system* is therefore expected to display a positive coefficient. Finally, we control for the quality of the polity through the variable *polity*. We expect a negative correlation between *polity* and *govexp*, as worse polities weaken checks and balances, reducing politicians' accountability to voters.

¹¹Andres et al. (2004) show the importance of different components of government spending in generating a stabilising effect on output volatility.

Turning to the other controls, our specification is in line with recent studies in the field (i.e. Persson and Tabellini, 2003). The level of per-capita income, *GDP p.c.*, accounts for Wagner’s Law. This is the hypothesis that countries at more advanced stages of development can afford proportionally greater spending (because, for instance, they tend to have comparably more efficient tax collection systems). The log of population size (*pop*) controls for possible scale effects. Alesina and Wacziarg (1998) suggest that when the costs of partially or completely non-rival public goods can be shared over larger populations, per-capita expenditure on these goods is lower and hence spending ratios should negatively correlate with population size. To account for the greater spending of ageing societies, we also add the share of population above 65 (*oldshr*).

3.4 Our choice of instruments

The need to employ instruments comes from the fact that regressors other than the endogenous dependent variables could be correlated with the error terms in the two equations. For instance, this is likely to be the case for the log of per-capita income. Both theoretical and empirical models of growth emphasise the effects of government expenditure on the average growth rate, and hence on per-capita income (Barro, 1990; Barro and Sala-I-Martin, 1995). Similarly, there is now a voluminous literature on the interactions between output volatility and output growth.¹² Another likely candidate for endogeneity is the exchange rate regime, as the evidence reported by Carmignani et al. (2006) suggests. Finally, the turnover of the central banker, being potentially determined by the economic performance of the country, is also treated as endogenous. By contrast, we follow the literature and set institutional variables as exogenous. The remaining exogenous variables are trade and financial openness, the share of population above 65, domestic credit to the private sector, and population size.

Finding good instruments is always a paramount task. Lagged values of the endogenous variables often prove to be only weakly exogenous (see Lundberg and Squire, 2003). We take then a pragmatic approach to the issue. Existing empirical evidence suggests that institutional quality is a determinant of income and exchange rate arrangements. At the same time, some of the determinants of institutional quality are clearly exogenous. One of these is country’s distance from the equator (see La Porta et al., 1999), which therefore figures in our set of instruments together with time and regional dummies and the whole of the exogenous variables. To achieve a greater number of overidentifying restrictions, we integrate this set of instruments with three indicators of the

¹²See the references quoted in the introduction.

degree of competitiveness and openness of the executive recruitment process. These are in fact measures of institutional quality that we think unlikely to be endogenous.¹³

When included in the model specification, the volatility of government expenditure is also treated as endogenous and instrumented by an indicator of government turnover from the DPI (*polch*), a measure of constraints on policy changes (*polconv*) from Henisz (2000), and a dummy variable to pick incumbents with a right-wing ideological orientation (*dright*). This latter instrument (coded from information in the DPI) is included because the ideological orientation of the government determines the more or less active role of fiscal policy and hence the volatility of fiscal instruments. Finally, *polch* and *polconv* also serve as instruments in the specifications that include the turnover of the central bank. In these cases, the group of instruments is further extended to include (i) three indicators of the quality of the polity that are likely to affect the *de facto* turnover of the central banker and (ii) a non time-varying country-fixed effect representing the degree of government interference in the economy.¹⁴ A detailed list of all instruments is reported at the bottom of the tables 1 and 2.

We are then left with two questions. First, is our choice of instruments good? Second, are there any other endogenous variables in the system? We rely on a few tests to answer these two questions. We run an F-test on the regression of endogenous variables on instruments and we always reject the null hypothesis that the estimated coefficients are jointly insignificant. Then, we always run the Sargan test and never reject the null that our overidentifying restrictions are correct. Finally, we apply the Hausmann test to check for the endogeneity of other regressors, always rejecting the endogeneity hypothesis. While we reckon that none of these tests is the ultimate proof of instruments validity, we take it as a good battery of diagnostics that support our choices.

4 Results: baseline specifications

4.1 Base model

In order to facilitate comparison with the rest of the literature we now present a baseline version of the model that does not include *cbturn* in the growth

¹³These indicators are the variables *xconst* and *xrcomp* in the Database of Political Institutions, and an indicator of sociopolitical risk from the CNTS (*sociopolrisk*).

¹⁴The three indicators of polity quality are the variables *xrreg*, *parreg* and *xropen* from the Polity IV database. The country-fixed effect is the variable *wagepri* from the Index of Economic Freedom.

volatility equation. Results are reported in column I of table 1.¹⁵

The first striking result concerns the simultaneous interaction between public expenditure and growth volatility. The latter in equation (2) has a positive effect on government expenditure. At first sight, this should confirm the view that fiscal policy is a shock absorber. However, in equation (1) we find that spending increases volatility. It seems that economic volatility feeds back on itself through spending. As we discuss later, the transmission mechanism from public spending to growth volatility might operate through the volatility of government expenditure.

The effects of globalisation are complex. External risk increases economic volatility and hence expenditure. This confirms the cornerstone of Rodrik's argument: economies that are more open to trade face greater risk and hence require greater insurance. In addition to that, we find a direct effect of trade openness on public spending. This might be due to the unequal distribution of costs and benefits of trade integration across sectors and socio-economic groups, that increase pressure for redistribution through public spending (see for instance Kletzer (2002) for the US economy). We also find a clear volatility-increasing effect of financial openness. Various channels could instead explain the positive coefficient on *finopen* in equation (1). Financially open economies are more vulnerable to the risk of speculative attacks and hence more likely to experience financial crises that cause sharp output fluctuations. Moreover, the volatility of capital flows tends to induce boom-bust cycles (Aghion et al., 1999). Another possible explanation is that increased risk sharing opportunities lead to more specialised productive structures, thus exposing the country to the risk of idiosyncratic shocks (Kalemli-Ozcan et al., 2003). In equation (2) we find that financial openness has a negative direct effect on spending. Since integration into global financial links rewards good macroeconomic policy management, financial openness seems to discipline policymakers. However, this effect is to some extent offset by the positive feedback operating through economic volatility.

More flexible exchange rate regimes are associated with lower government spending and with greater output growth volatility. Taking into account the apparent procyclical behaviour of fiscal and monetary policies, the negative direct effect of *excharr* on *govex* suggests that exchange rate regime choice and fiscal interventism are substitutes. For instance countries pegging their currency to an external anchor cannot use discretionary monetary policy and therefore rely more heavily on fiscal policy.

¹⁵Throughout the rest of this section and the next one we always report at the bottom of the table the value of the Sargan test statistic of overidentifying restrictions. All equations include time dummies, not reported in the tables.

The estimated coefficients on the political variables in equation (2) are in line with the theoretical expectations, with a positive sign for *system* and a negative sign for *polity* and *rule* (the latter not statistically significant), whereas we cannot detect any direct effect of these variables in (1).¹⁶ Column II in 1 shows that removing institutional variables from (1) does not affect other results. The only marginal changes concern *finddepth* in equation (1) and *rule* in equation (2) that become marginally significant. Overall, the evidence depicts an intuitively appealing picture of the role of institutions. Institutions matter in so far as they affect the accountability of politicians to voters. Proportional systems are characterised by a prevalence of fragmented ruling coalitions, governments are typically short-lived, but changes in government do not often lead to changes in the composition of the ruling coalition. Worse polities envisage weaker checks and balances of power. Both fragmentation and weaker checks and balances reduce the accountability of decision-makers to voters. The resulting policy equilibrium will be then characterised by overspending. On the contrary, greater accountability to voters is likely to induce less spending. Given the adverse effect of public expenditure in equation (4), institutions that discipline public spending also dampen growth volatility.

Turning to the remaining controls, with respect to equation (2) we find support for Wagner’s law and for a positive effect of ageing on public expenditure, whereas the coefficient on *pop* is not significant. In equation (1) we cannot find a significant impact of financial depth on output volatility. In fact, different theoretical arguments can be put forward to explain the role of financial depth. On the one hand, if deeper financial systems imply better smoothing of shocks, then financial development should reduce volatility. On the other hand, domestic credit to private sector as a share of GDP tends to rise in the advent of credit booms, which are a source of volatility. In this respect, our chosen measure of financial depth should sharpen output growth fluctuations. Easterly et al. (2000) suggest that effects of opposite sign lead to a non-linear relationship between financial development and volatility. The estimated coefficient in a linear specification would therefore result instable and generally not significant. Further research on this relationship is certainly needed.

4.2 Refinements

Columns III and IV of Table 1 present two refinements of the volatility equation. First of all, we re-estimate our parsimonious specification of column II by replacing the interactive term *tradeopen*voltot* by the non-weighted indica-

¹⁶Entering political variables one at the time, or in pairs of two, would not change the results.

tor of openness, *tradeopen*. As already noted, the use of the interactive term allows for a better representation of external risk. However, we want to make sure that our estimates are not sensitive to this choice. As a matter of fact, the results reported in column III are not qualitatively different from those in column II. The only thing to notice is that *finddepth* in equation (1) and *rule* in equation (2) return to be insignificant, as they were in the baseline model of column I.¹⁷

The second refinement concerns the exclusion of those variables whose estimated coefficients happen to be largely insignificant in the previous specifications. This is indeed a test of robustness to spurious correlations eventually emerging from the inclusion of noise variables in the model. We therefore drop population size and the rule dummy from the expenditure equation, and the political variables and financial depth from the volatility equation.¹⁸ As reported in column IV, results concerning the remaining variables are unaffected.

5 Extensions

We take the refined baseline specification in column IV of Table 1 as the starting point to explore some extensions and, at the same time, further check the robustness of results. This new evidence is reported in Table 2.

5.1 Volatility of expenditure and volatility of output

The finding that government expenditure increases the volatility of output suggests that automatic stabilisers are weak and/or more than offset by discretionary procyclical spending. We further investigate this relationship by proposing two variations of the basic model. First, in Column I of Table 2 we explore whether OECD countries behave differently from the rest of the sample. As a matter of fact, previous evidence (i.e. Gali, 1994) indicates that in OECD economies fiscal policy works as an automatic stabiliser. We therefore add an interactive term defined as the product of *govexp* times an OECD dummy.

¹⁷We also tried to add the volatility of terms of trade to the baseline specification without interacting it with trade openness. The large standard errors that we obtained are however indicative of some multicollinearity problem and that is why in the rest of the paper we prefer using the interactive term.

¹⁸In fact, financial depth is significant at the 10% level of confidence in the specification of column II. However, when left in the parsimonious specification of column IV, its coefficient turns largely insignificant. In general, its inclusion does not alter the results on the other variable and its estimated coefficient remains not different from zero.

The estimated coefficient on *govexp* remains positive and significant. The one on the interactive term is negative, but not statistically different from zero. This means that the effect of fiscal spending on volatility in OECD countries is not substantially different from the sample average, albeit it could be slightly less strong. In this sense, our results are more in line with Koskela and Viren (2003).

In the second variation of the model, we further investigate the transmission mechanism linking expenditure and output volatility. Our candidate is the volatility of government expenditure. Countries that heavily rely on discretionary fiscal instruments are likely to experience both higher spending levels and greater spending volatility. In turn, the volatility of spending is a source of output volatility to the extent that fiscal policy takes a pro-cyclical stance. To shed light on this conjecture we add the volatility of government expenditure (*volgovexp*), to the set of regressors in the output volatility equation. The results in Column II of Table 2 are clearly indicative of a multicollinearity problem between the level and the volatility of spending (and possibly between government volatility and per-capita GDP). On the basis of our conjecture, this was expected.¹⁹ To address the multicollinearity issue, we drop *govexp* from the r.h.s. of the output volatility equation. This is equivalent to imposing the restriction $\alpha_2 = 0$ in equation (1). Results are displayed in Column III. In line with our proposed conjecture, the volatility of government expenditure now has a positive and statistically significant coefficient. Therefore, it seems that expenditure levels affect output volatility through the volatility of expenditure. This result is complementary to the cross-country evidence of Fatas and Mihov (2003).

5.2 Central bank independence and output volatility

An important extension of our base model concerns the role of central bank independence in determining volatility. The *de facto* measure of independence *cbturn* is added to the output volatility equation. To the best of our knowledge, this is the first attempt to estimate the effect of de facto independence on volatility within a structural model of two endogenous equations.²⁰ Results are given in Column IV of Table 2. To interpret the estimated coefficient recall that higher values of *cbturn* indicate lower central bank independence.

The positive estimated coefficient on *cbturn* means that less independent central banks cause greater output volatility. The standard view incorporated

¹⁹Note however that all other results are confirmed.

²⁰Cecchetti et al. (2006) try to use a similar measure in a single equation model. They obtain that central bank independence is never statistically significant in the output volatility regression.

in monetary theory (i.e. Rogoff, 1985) holds that an independent central bank trades-off output volatility for inflation stabilisation, thus implying that greater independence will increase volatility. However, some earlier empirical findings (i.e. Alesina and Summers (1993); Cukierman (1992) and recently Cecchetti et al. (2006)) gave way to the hypothesis that monetary arrangements are neutral. Our result instead pushes the neutrality argument one significant step further: central bank independence not only does not increase volatility, it actually reduces volatility. Our intuition for this result extends the argument of Alesina and Gatti (1995). The independent central banker attaches more importance to low inflation than to output stabilisation. This in turn increases output volatility due to economic shocks. However, the independent central banker also isolates monetary policy from the distortionary effect of the political cycle. In this sense, it reduces output volatility due to political shocks. The estimated negative coefficient on *cbturn* means that the second effect prevails. An interesting hypothesis to be tested in the future is that the relative strength of the political effect decreases at more advanced stages of economic and institutional development. This non-linearity would also explain why other empirical work that mainly focuses on industrial economies has not found evidence of a positive impact of *cbturn* on output volatility.

The implications of this finding are significant. If central bank independence reduces volatility, then the trade-off between inflation and stabilisation in the delegation of monetary policy disappears. Furthermore, by lowering volatility, central bank independence reduces fiscal expenditure, thus facilitating the consolidation of the fiscal stance. In this perspective, not delegating monetary policy to an independent central bank turns out to be a major policy and institutional failure.²¹

In column V we document the existence of an interactive effect between central bank independence and financial openness on volatility. Intuitively, if the vulnerability of a country to sudden changes in capital flows depends on the credibility of its macroeconomic institutions, then the importance of central bank independence in stabilising output volatility should increase with the degree of financial openness. The joint term *cbturn*finopen* captures this interaction. Its estimated coefficient is positive; at the same time the coefficient on *cbturn* remains positive and significant while the coefficient on *finopen* becomes insignificant. Accordingly, our interpretation is twofold. First, in line with the above intuition, central bank independence reduces volatility and this effect is reinforced the more open to international financial flows the country is. Second, in countries where central banks are largely independent, financial openness

²¹Results concerning *cbturn* are qualitatively unchanged if the output volatility equation includes the volatility, rather than the level, of government expenditure.

has a small effect on output volatility. On the contrary, financial openness becomes more significantly destabilising in countries where the turnover of the central banker is high. Finally, all of the other results are unchanged.²²

5.3 Freely falling regimes

The classification proposed by Reinhart and Rogoff (2004) includes a number of “freely falling” regimes. These are countries that are experiencing flexible exchange rate regimes combined with high inflation. We test the robustness of our findings to the exclusion of these regimes. To this purpose, we re-estimate the model with central bank turnover only on the sample of non-freely falling regimes. The new results are reported in column VI.

It turns out that little changes. In the volatility equation, the *excharr* variable loses some of its statistical significance, but the estimated coefficient still passes the zero restriction test at the 10% level of confidence. The coefficient on *finddepth* is largely insignificant, but this was indeed the case also in some of the previous specifications. All of the other results are not weakened, but if possible statistically strengthened by the exclusion of freely falling regimes.²³

6 Conclusions

Our findings on the role of public expenditures, exchange rate regime choice and central bank independence consistently signal that government discretion has destabilising effects on growth volatility. Institutions that increase policy-makers accountability limit the adverse effects of fiscal discretion on volatility. In this regard our results support the view that strengthening institutions is a key to improve the efficiency of policies?

Our analysis also sheds light on the multifaceted effects of globalisation. Both trade and financial openness have direct and indirect effects on volatility. For financial openness these effects are of different sign. International

²²We also tried to add central bank turnover directly into the spending equation. This poses problems of multicollinearity, since the institutional variables in the spending equation are also determinants of *cbturn*. As a matter of fact, all of the institutional variables become insignificant, while *cbturn* takes a negative sign. All of the other coefficients are unchanged (results are available upon request). A possible avenue of future research would explicitly model the determinants of central bank turnover in a system of three endogenous equations, so to avoid the multicollinearity problems.

²³Column VI reports the model without interactive term *cbturn*finopen*. The results obtained when re-estimating the model inclusive of the interactive term on the sample on non-freely falling countries are qualitatively very similar to those in Column V and they are available upon request.

financial integration directly increases volatility, but it also lowers spending and (indirectly) volatility. For trade openness, these effects appear to go in the same direction. Not only trade implies exposure to shocks, it also seems to raise pressures from redistributive fiscal policies. Once more, strengthening institutions is the key to preserve the benefits from trade integration.

We conclude with three directions of future research. First, the formalisation of the link between monetary policy and fluctuations must be revisited in view of our findings concerning the role of central bank independence. Second, the link between levels and volatility of government expenditure must be made explicit, allowing for feedback effects from output volatility. Third, with longer and more detailed series on fiscal variables becoming available over time, it will be interesting to look at individual components of expenditure in addition to total government spending.

References

- Acemoglu, Daron and Fabrizio Zilibotti**, “Was Prometheus Unbound by Chance? Risk, Diversification and Growth,” *Journal of Political Economy*, 1997, *105* (4), 709–751.
- , **Simon Johnson, James Robinson, and Yunyong Thaicharoend**, “Institutional Causes, Macroeconomic Symptoms: Volatility, Crises and Growth,” *Journal of Monetary Economics*, 2003, *50* (1), 49–123.
- Aghion, Philippe, Abhijit Banerjee, and Thomas Piketty**, “Dualism and Macroeconomic Volatility,” *Quarterly Journal of Economics*, 1999, *114*, 1359–1397.
- , **George-Marios Angeletos, Abhijit Banerjee, and Kalina Manova**, “Volatility and Growth: Credit Constraints and Productivity Enhancing Investment,” 2005. mimeo, Harvard University.
- Alesina, Alberto and Guido Tabellini**, “Why is Fiscal Policy Often Procyclical?,” 2006. mimeo Harvard University.
- **and Larry Summers**, “Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence,” *Journal of Money, Credit and Banking*, 1993, *25* (2), 151–162.
- **and Roberta Gatti**, “Independent Central Banks: Low Inflation at No Cost?,” *American Economic Review*, 1995, *85*, 196–200.
- **and Romain Wacziarg**, “Openness, Country Size, and Government,” *Journal of Public Economics*, 1998, *69*, 305–321.
- Andres, Javier, Rafael Domenech, and Antonio Fatas**, “The Stabilizing Role of Government Size,” 2004. mimeo, Insead.
- Austen-Smith, David**, “Redistributing Income under Proportional Representation,” *Journal of Political Economy*, 2000, *108*, 1235–1269.
- Barro, Robert**, “Government Spending in a Simple Model of Endogenous Growth,” *Journal of Political Economy*, 1990, *98*, S103–S125.
- Barro, Robert J. and Xavier Sala-I-Martin**, *Economic Growth*, McGraw Hill, 1995.
- Bejan, Maria**, “Trade Openness and Output Volatility,” 2004. mimeo, Itam.

- Bekaert, Geert, Campbell Harvey, and Christian Lundblad**, “Growth Volatility and Financial Liberalization,” *Journal of International Money and Finance*, 2006, 25 (3), 370–403.
- Buch, Claudia, Jrg Dpke, and Christian Pierdzioch**, “Financial Openness and Business Cycle Volatility,” Working Paper N.1121, Kiel Institute of Economics 2002.
- Carmignani, Fabrizio, Emilio Colombo, and Patrizio Tirelli**, “Exploring Different Views on Exchange Rate Regime Choice,” 2006. mimeo, University of Milano Bicocca.
- Cecchetti, Stephen, Alfonso Flores-Lagunes, and Stefan Krause**, “Assessing the Sources of Changes in the Volatility of Real Growth,” Working paper N.11946, NBER 2006.
- Chatterjee, Partha and Malik Shukayev**, “Are Average Growth Rate and Volatility Related?,” Working Paper N.24, Bank of Canada 2006.
- Chinn, Menzie and Hiro Ito**, “What Matters for Financial Development? Capital Controls, Institutions, and Interactions,” *Journal of Development Economics*, 2006, 81 (1), 163–192.
- Cukierman, Alex**, *Central Bank Strategy, Credibility and Independence*, MIT Press, 1992.
- Easterly, William, Roumeen Islam, and Joseph Stiglitz**, “Shaken and Stirred: Explaining Growth Volatility,” in “Annual World Bank Conference on Development Economics” 2000.
- Fatas, Antonio**, “The Effects of Business Cycle on Growth,” in N. Loyoza and Soto, eds., *Economic growth: Sources, Trends and Cycles*, Central Bank of Chile, 2002.
- **and Ilian Mihov**, “Government Size and Automatic Stabilizers: International and Intranational evidence,” *Journal of International Economics*, 2001, 55, 3–28.
- **and –**, “The Case for Restricting Fiscal Policy Discretion,” *Quarterly Journal of Economics*, 2003, 118 (4), 1419–1447.
- Gali, Jordi**, “Government Size and Macroeconomic Stability,” *European Economic Review*, 1994, 38, 117–132.

- Ghosh, Atish, Anne-Marie Gulde, and Holger Wolf**, *Exchange Rate Regimes: Choices and Consequences*, MIT Press, 2002.
- Henisz, Withold**, “The Institutional Environment for Economic Growth,” *Economics and Politics*, 2000, 12, 1–31.
- , “Political Institutions and Policy Volatility,” *Economics and Politics*, 2004, 16, 1–27.
- Hnatkovska, Viktoria and Norman Loayza**, “Volatility and Growth,” in J. Aizenmann and B. Pinto, eds., *Managing Volatility*, Cambridge: Cambridge University Press, 2005.
- Kalemli-Ozcan, Sebnem, Bent Sorensen, and Oved Yosha**, “Risk Sharing and Industrial Specialization: Regional and International Evidence,” *American Economic Review*, 2003, 93 (3), 903–918.
- Kaminsky, Graciela, Carmen Reinhart, and Carlos Vègh**, “When It Rains, It Pours: Procyclical Capital Flows and Macroeconomic Policies,” in Mark Gertler and Ken Rogoff, eds., *NBER Macroeconomics Annual*, 2004.
- Kim, Su Young**, “Openness, External Risk, and Volatility,” *International Organisation*, 2007, 61, 181–224.
- Kletzer, Lori**, “Imports, Exports, and Jobs What Does Trade mean for Employment and Job Loss?,” 2002. mimeo, W.E. Upjohn Institute for Employment Research.
- Kose, Ayhan, Eswar Prasad, and Marco Terrones**, “Financial Integration and Macroeconomic Volatility,” *IMF Staff Papers*, 2003, 50, 119–142.
- , – , and – , “How do Trade and Financial Integration Affect the Relationship between Growth and Volatility?,” *Journal of International Economics*, 2006, 69 (1), 176–202.
- Koskela, Erkki and Matti Viren**, “Government Size and Output Volatility New International Evidence,” Discussion Paper N. 857, ETLA 2003.
- La Porta, Rafael, Florencio Lopez de Silanes, Andrei Shleifer, and Robert Vishny**, “The Quality of Government,” *Journal of Law Economics and Organisation*, 1999, 15 (1), 222–279.
- Lane, Philip**, “The cyclical behaviour of fiscal policy: evidence from the OECD,” *Journal of Public Economics*, 2003, 15 (12), 2661–2675.

- Lundberg, Mattias and Lyn Squire**, “The Simultaneous Evolution of Growth and Inequality,” *Economic Journal*, 2003, (113), 326–344.
- Persson, Torsten and Guido Tabellini**, *The Economic Effects of Constitutions*, MIT Press, 2003.
- and –, “Constitutional Rules and Fiscal Policy Outcomes,” *American Economic Review*, 2004, *94*, 25–45.
- , **Gerard Roland, and Guido Tabellini**, “Comparative Politics and Public Finance,” *Journal of Political Economy*, 2000, *108*, 1121–1161.
- , –, and –, “Electoral Rules and Government Spending in Parliamentary Democracies,” 2006. forthcoming, *Quarterly Journal of Economics*.
- Ramey, Garey and Valerie Ramey**, “Cross-Country Evidence on the Link Between Volatility and Growth,” *American Economic Review*, 1995, *85*, 1138–51.
- Reinhart, Carmen and Kenneth Rogoff**, “The Modern History of Exchange Rate Arrangements: A Reinterpretation,” *Quarterly Journal of Economics*, 2004, *119* (1), 1–48.
- Rodrik, Dani**, “Why Do More Open Economies Have Bigger Governments?,” *Journal of Political Economy*, 1998, *106* (5), 997–1032.
- Rogoff, Kenneth**, “The Optimal Degree of Commitment to an Intermediate Economic Target,” *Quarterly Journal of Economics*, 1985, *100*, 1169–1189.
- Wooldridge, Jeffrey**, *Econometric Analysis of Cross Section and Panel Data*, MIT Press, 2002.

Table 1: Baseline model
I II III IV

	I	II	III	IV
Output volatility				
Constant	0.048	0.062**	0.082***	0.049*
Tradeopen*voltot	0.378*	0.473***		0.498***
GDP p.c.	-0.015**	-0.021***	-0.022***	-0.018***
Excharr	0.026***	0.034***	0.033***	0.030***
Finopen	0.008***	0.010***	0.009***	0.009***
Govexp	0.138**	0.171***	0.126**	0.166***
Findepth	0.012	0.020*	0.015	
Tradeopen			0.039**	
System	-0.003			
Rule	-0.001			
Polity	0.000			
Government expenditure				
Constant	-0.107	-0.088	-0.045	-0.113
Tradeopen	0.128***	0.131***	0.107**	0.138**
Finopen	-0.026***	-0.026***	-0.027***	-0.025***
Econvol	1.795**	1.414**	1.512**	1.316*
Pop	0.002	0.001	-0.001	
Oldsh	0.958***	0.941***	0.975***	0.915***
GDP p.c.	0.037***	0.038***	0.038***	0.041***
Excharr	-0.053***	-0.052***	-0.058***	-0.047**
System	0.023***	0.019***	0.019***	0.017***
Rule	-0.01	-0.013*	-0.01	
Polity	-0.003***	-0.004***	-0.004***	-0.004***
N. obs	332	332	332	345
J-stat	0.045	0.04	0.044	0.052

Note: Estimated coefficients on the time dummies are not reported.

*, **, *** denote statistical significant at 10, 5 and 1 percent respectively.

Endogenous variables: dependent variables GDP p.c., excharr, voltot

Instruments: exogenous variables, xconst, latitude, sociopolrisk, xrcomp, regional dummies, time dummies.

For variables description and list of countries included see the appendix

Table 2: Extensions

	I	II	III	IV	V	VI
Output volatility						
Constant	0.031	0.009	-0.024	0.055**	-0.01	0.001
Tradeopen*voltot	0.399**	0.401**	0.522**	0.303*	0.619***	0.696***
GDP p.c.	-0.014***	-0.006	-0.001	-0.016***	-0.013***	-0.014***
Excharr	0.027***	0.016***	0.013***	0.014***	0.022***	0.021***
Finopen	0.008***	0.003*	0.003*	0.007***	-0.002	0.008***
Govexp	0.169***	0.045		0.178***	0.207***	0.213***
Govexp*dOECD	-0.024					
Volgovexp		0.409	0.589**			
Cbturn				0.080***	0.125***	0.112***
Cbturn*Finopen					0.062**	
Government expenditure						
Constant	-0.135*	-0.164**	-0.161	-0.214**	-0.162*	-0.174*
Tradeopen	0.119**	0.130***	0.130**	0.075*	0.084*	0.081*
Finopen	-0.027***	-0.024***	-0.024***	-0.030***	-0.026***	-0.026***
Econvol	1.267*	1.651***	1.353*	2.202***	1.528**	1.645***
Oldsh	0.865***	0.909***	0.907***	0.683***	0.676***	0.670***
GDP p.c.	0.048***	0.045***	0.045***	0.062***	0.056***	0.058***
Excharr	-0.056**	-0.045***	-0.041**	-0.073***	-0.069***	-0.071***
System	0.015***	0.021***	0.022***	0.018***	0.028***	0.025***
Polity	-0.004***	-0.004***	-0.004***	-0.003***	-0.004***	-0.004***
N. Obs	345	322	350	340	324	308
J-stat	0.057	0.087	0.084	0.081	0.072	0.081

Note: Estimated coefficients on the time dummies are not reported.

*, **, *** denote statistical significant at 10, 5 and 1 percent respectively.

Endogenous variables: dependent variables GDP p.c., excharr, voltot

Instruments: Col I, same as table 1, Col II same as table 1 plus polch, polconv and dright,

Col IV to VI same as table 1 plus polch, polconv, xrreg, parreg, xropen, wagepri.

For variables description and list of countries included see the appendix

Table 3: List of countries

Algeria	Estonia	Korea	Romania
Argentina	Finland	Kyrgyz Rep.	Russia
Armenia	France	Latvia	Slovak Rep.
Australia	Gambia	Lesotho	Slovenia
Austria	Ghana	Libya	South Africa
Azerbaijan	Greece	Lithuania	Spain
Belarus	Guatemala	Malawi	Sri Lanka
Belgium	Haiti	Malaysia	Swaziland
Bolivia	Honduras	Mauritius	Syria
Brazil	Hungary	Mexico	Tanzania
Chile	Iceland	Moldova	Thailand
China	Indonesia	Morocco	Turkey
Colombia	Iran	Nepal	Uganda
Costa Rica	Ireland	Netherlands	United Kingdom
Cyprus	Israel	New Zealand	United States
Czech Rep.	Italy	Nigeria	Uruguay
Denmark	Jamaica	Pakistan	Venezuela
Dominican Rep	Jordan	Peru	Zambia
Ecuador	Kazakhstan	Philippines	Zimbabwe
Egypt	Kenya	Portugal	

Table 4: Descriptive statistics

	Mean	Median	Max.	Min.	Std. Dev.	N. Obs
Cbturn	0.24	0.20	1.40	0.00	0.26	633
Tradeopen	0.39	0.32	1.35	0.06	0.23	860
Finopen	-0.04	-0.47	2.66	-1.79	1.46	773
Econvol	0.04	0.03	1.09	0.00	0.05	979
Oldsh	0.06	0.04	0.18	0.01	0.04	958
Gdppc	8.06	8.07	10.53	5.55	1.12	693
Excharr	2.31	2.00	5.00	1.00	1.23	717
System	0.81	0.60	2.00	0.00	0.86	789
Polity	-0.43	-3.80	10.00	-10.00	7.49	866
Voltot	0.08	0.06	0.61	0.00	0.08	938
Govexp	0.28	0.27	0.54	0.10	0.11	646
Findepth	0.34	0.26	1.18	0.04	0.26	788
Xconst	3.89	3.00	7.00	1.00	2.26	866
Sociopolrisk	0.02	-0.44	9.96	-0.72	1.14	881
Latitude	0.28	0.24	0.72	0.01	0.19	978
Xrcomp	1.66	1.00	3.00	0.00	1.07	866
Polch	0.17	0.20	1.00	0.00	0.21	947
Polconv	0.26	0.00	0.89	0.00	0.32	870
Drigh	0.29	0.00	1.00	0.00	0.42	728
Xrreg	2.34	2.00	3.00	1.00	0.60	866
Xropen	3.28	4.00	4.00	0.00	1.40	866
Wagepri	2.78	2.71	5.00	1.20	0.74	876
Parreg	3.74	4.00	5.00	2.00	0.94	866

Dataset References

Chinn and Ito financial openness measure: Cinn M., and Ito I., “What Matters for Financial Development? Capital Controls, Institutions, and Interactions”, Journal of Development Economics, forthcoming.

<http://www.ssc.wisc.edu/~mchinn/research.html>

CNTS Dataset: Banks, A., ”Cross-National Time Series Database”.

<http://www.databanks.sitehosting.net>

DPI 2000: Beck T., Keefer P., and Clarke G., “Database of Political Institutions”.

<http://www.worldbank.org>

Ghosh et. al. Dataset: Ghosh A., Gulde A.M., and Wolf H. “Exchange Rate Regimes, Choices and Consequences”, MIT Press, 2002.

IFS: International Monetary Fund, International Financial Statistics, 2004, CD Rom.

<http://www.imf.org/external/pubind.htm>

Index of Economic Freedom: The Heritage Foundation.

<http://www.heritage.org/research/features/index/index.cfm>

La Porta et. al. dataset: La Porta R., Lopez-de-Silanes F., Shleifer A., and Vishny R., “The Quality of Government”, Journal of Law, Economics and Organization, 1999.

<http://www.andrei-shleifer.com/data.html>

Polity IV Project: Monty G., Marshall M. and Jaggers K. “Political Regime Characteristics and Transitions, 1800-2003”.

<http://www.cidcm.umd.edu/inscr/polity>

Political Constraint Index: Henisz W. “The Institutional Environment for Economic Growth”, Economics and Politics 2000.

<http://www.management.wharton.upenn.edu/henisz/POLCON>

Reinhart and Rogoff exchange rate regime classification: Reinhart C., and Rogoff K. “The Modern History of Exchange Rate Arrangements: A Reinterpretation”, Quarterly Journal of Economics, 2004.

<http://www.wam.umd.edu/~creinhar/Links.html>

WDI: World Bank, World Development Indicators 2004, Washington, DC: The World Bank.

<http://publications.worldbank.org/WDI/>

Data source

Model variables	Description
<i>Tradeopen</i>	Trade openness: exports+imports in percent of GDP, source WDI
<i>Finopen</i>	Financial openness: First standardised principal component of R_1 , R_2 , $SHARE_3$ and R_4 , where: (i) R_1 takes value 1 in the absence of multiple exchange rates, (ii) R_2 takes value 1 if current account transactions are not restricted, and (iii) R_3 takes value 1 if capital account transactions are not restricted, (iv) R_4 takes value 1 in the absence of a requirement of surrender of export proceeds. $SHARE_3$ is then constructed for each year as the average of R_3 in that year and in the four preceding years (Chinn and Ito, 2001)
<i>GDP p.c.</i>	Log of per-capita real GDP, source WDI
<i>Econvol</i>	Volatility of aggregate GDP growth: standard deviation of the annual growth rate of GDP over the five-year window
<i>Govexp</i>	Total government expenditure in percent of GDP, source WDI
<i>Volgovexp</i>	Volatility of government expenditure in percent of GDP: standard deviation of the annual expenditure of GDP ratio over a five-year window.
<i>Oldsh</i>	Population aged 60 and above in percent of total population, source WDI
<i>Pop</i>	Log of total population, source WDI
<i>Findepth</i>	Financial depth: domestic credit to private sector in percent of GDP, source WDI
<i>Excharr</i>	Exchange rate regime: Variable taking values from 1 (extreme pegs) to 5 (freely falling), based on Reinhart and Rogoff (2004) de facto classification of exchange rate regimes.
<i>Cbturn</i>	Central bank turnover rate, source Ghosh <i>et al.</i> (2002)
<i>Voltot</i>	Volatility of terms of trade: standard deviation of (log) terms of trade over the five year window, source WDI
<i>System</i>	Type of political system: taking values 1 (presidential), 2 (assembly elected) or 3 (parliamentary) depending on the constitutional arrangements disciplining the exercise of power, source DPI.
<i>Polity</i>	Index of quality of polity, source Polity IV.
<i>Rule</i>	Dummy variable taking value 1 if country has a plurality (majoritarian) electoral rule, authors' calculations
<i>Xconst</i>	Executive constraints: measures the presence of institutionalized constraints on executive's decisionmaking powers, source Polity IV.
<i>Sociopolrisk</i>	Index of socio political risk, first principal component of: assassinations, general strikes, guerrilla warfare, purges, riots, revolutions, anti-government demonstrations, source CNTS.
<i>Latitude</i>	Latitude of a nation's capital.

Model variables	Description
<i>Xrcomp</i>	Competitiveness of executive recruitment: measures the extent that prevailing modes of advancement give subordinates equal opportunities to become superordinates, source Polity IV.
<i>Polch</i>	Dummy for political change, authors' calculations.
<i>Polconv</i>	Measure of credible commitment, source Henisz.
<i>Drigh</i>	Dummy for right wing governments, source DPI.
<i>Xrreg</i>	Regulation of chief executive: measures the extent to which a polity has institutionalized procedures for transferring executive power, source Polity IV.
<i>Xropen</i>	Openness of executive recruitment: measures the extent that all the politically active population has an opportunity, in principle, to attain the position, source Polity IV.
<i>Wagepri</i>	Wage and price controls, source Index of Economic Freedom
<i>Parreg</i>	Regulation of participation: measures the extent that there are binding rules on when, whether, and how political preferences are expressed, source Polity IV.