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Alternation of parties in power and economic volatility: testing the rational partisan hypothesis and policy learning hypothesis

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Abstract Right and left parties have distinct macroeconomic preferences that could create different levels of volatility during their executive tenures. But rational partisan theory argues that, because actors in the economy anticipate ruling party behavior, partisan differences only matter when election outcomes are uncertain. We argue that policy risk from ruling parties extends beyond elections, leading to important variation in growth volatility that occurs during a ruling party's tenure. Building on theories of policy risk and learning, we argue that after elections, economic actors still face uncertainty about the policies of new ruling parties. With time in power, new ruling parties build policy track records, reducing policy risk and, thus, volatility. We estimate a learning curve model of ruling party duration's effect on the variation in quarterly GDP growth rates. Using data from 44 democracies between 1981 and 2009, we find that learning processes extend beyond the conclusion of uncertain elections.

Keywords Economic volatility · Policy risk · Rational partisan hypothesis · Ruling party duration

1 Introduction

While studies of economic performance typically focus on explaining levels of growth, scholars have recognized the normative importance of volatility. Aside from being intrinsically undesirable, higher economic volatility has been found to reduce economic growth (Martin and Rogers 2000; Pritchett 2000; Ramey and Ramey 1995;

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Wolfers 2003). These studies suggest that understanding volatility may ultimately be useful in explaining long-term differences in economic performance between states.

Certainly, some variation in volatility between countries is attributable to external shocks and the robustness of the domestic economic structures (Ahmed 2003; Becker et al. 2006; Collier and Gunning 1999; di Giovanni and Levchenko 2009; Haddad et al. 2013; Raddatz 2007; Rodrik 1999). Yet, politics is also important, as research demonstrates that democracies exhibit less volatility than non-democracies. The greater policy autonomy of non-democracies relative to democracies leads to higher levels of policy risk faced by actors within these economies (Mobarak 2005). By contrast, the dispersion of political power within the government in democracies means that democratic leaders will face more tightly constrained options than autocrats (Henisz 2000; Weede 1996), leading to the suppression of volatility. Empirical findings in this literature consistently support the various models that posit an inverse relationship between democracy and volatility (Almeida and Ferreira 2002; Armijo and Gervasoni 2010; Cuberes and Jerzmanowski 2009; Klomp and de Haan 2009; Mobarak 2005; Rodrik 1999; Weede 1996).

Politics also has been shown to affect volatility within democracies. Analogous to research across regime types, some of this work focuses on how variation in institutional constraints within democracies explains growth volatility, with more tightly constrained governments producing less policy risk and, hence, less volatility (Nooruddin 2011). Other research emphasizes how majoritarian electoral institutions increase volatility by promoting more fiscal interventions (Béjar and Mukherjee 2011). Yet, non-institutional factors such as ruling party behavior appear to be important as well. Hibbs' (1977) original partisan hypothesis suggests that right and left parties pursue distinct macroeconomic agendas; this should lead to macroeconomic outcome variation across parties, not just institutional constraints. This suggests that the impact of partisanship remains constant over time throughout the duration of a ruling party's tenure. Rational partisan theory (RPT) argues that, because actors in the economy anticipate party behavior and adjust their choices accordingly, partisan differences only affect macroeconomic outcomes when the results of upcoming elections are uncertain.

We argue that the policy risk connected to changes in ruling parties extends beyond the outcome of elections, leading to dynamic variation in growth volatility during a ruling party's tenure. We build on the concept of policy risk (Fowler 2006) and show that after the conclusion of elections, economic actors still face uncertainty about which policies new ruling parties will implement. With time in power, new ruling parties establish a policy track record, while actors learn to adjust to the new political environment, reducing policy risk and, thus, volatility.[1] The current Trump administration demonstrates the uncertainty created by the arrival of a new ruling party, both over its policy preferences and its ability to see them implemented, even in a context of unified government.

We posit a learning curve relationship between ruling party duration and volatility. We test the effect of ruling party duration (transformed to model the learning curve),

[1] To be sure Noorudin's study (2011) also suggests that policy uncertainty influences economic volatility. However, his study focuses on the effects of institutional veto players on volatility.

measured as the length of time a party retains control of the chief executive office, on the variation in quarterly growth rates of real GDP.[2] Our analysis uses time series cross-section data covering 44 democracies between 1981 and 2009.

In the process, we confront confounding methodological problems in dealing with endogeneity between ruling party duration and volatility as well as problems associated with duration data; previous studies avoid survival data when the problem of endogeneity is tackled. We employ a multiple equation approach utilizing survival analysis to generate first stage estimates of duration which are then used to predict volatility to account for the endogeneity problem. In the second stage, even after controlling for the institutional constraints, partisanship, and electoral uncertainty, we find evidence of a learning curve between duration and volatility. This result is robust to changes in both model specification and estimation strategy. Our study also demonstrates that the relationship is indeed endogenous: volatility decreases the likelihood of ruling party survival, while increase in ruling party survival decreases volatility.

1.1 Partisan effects and economic performance

While apolitical processes, such as changes in labor productivity or the terms of trade, can create economic volatility, the politics of economic management does as well. While the rise of international capital mobility constrains monetary policy, fiscal policy choices play an increasingly important role in shaping growth volatility (Fatas and Mihov 2013; Fatás and Mihov 2003; Turnovsky and Chattopadhyay 2003).[3] From this standpoint then, identifying the conditions under which a given set of policy choices will be made allows the prediction of differences in volatility within and between countries. Partisan control of the government offers one avenue to do this as the pursuit of specific macroeconomic policies has been associated with ruling parties' ideological orientations (Boix 1998; Hibbs 1977).

Hibbs' (1977) partisan hypothesis suggests that right and left parties pursue distinct macroeconomic agendas when handed the reins of power. Left-wing parties target unemployment, taking an interventionist approach and increasing public expenditures by raising taxes among the middle and upper classes, but risk inflation (Boix 1998; Hibbs 1977). Right-wing parties target inflation and long-term economic growth, relying on market mechanisms and reducing taxes and government spending. This line of argument suggests that the level of volatility will vary with the ideological orientations of governing parties and that this level may remain constant during the tenure of party.

In contrast, RPT is more dynamic in that it focuses on how economic performance changes over time based on economic agents' decisions in the face of electoral uncertainty. RPT builds on work on the rational expectations hypothesis in economics, specifically the policy ineffectiveness proposition (PIP). Agents in the economy are forward-looking and develop assessments of probable future conditions including government policy outputs. Initially formulated by Sargent and Wallace (1975), the

[2] Other measures will also be used to check for the robustness of the results.

[3] For example, Ansolabehere and Snyder (2006) argue that governing parties distribute public expenditures and pork to their constituents as rewards to strengthen the chance of winning the next election.

PIP suggests that the wage-price expectations of these agents (and consequent adjustments of wage and price demands) renders monetary policy ineffective at altering real output; only unanticipated policy shocks lead to short-term macroeconomic changes. Differences in partisan control of the government then should not be associated with persistent differences in macroeconomic outcomes, as agents develop clear and accurate policy expectations based on parties' ideological preferences.

By contrast to a situation of stable expectations about government behavior, uncertainty by agents over future policy outputs induces economic volatility by altering real decisions, particularly those regarding investment. RPT predicts that this policy uncertainty is generated only by closely contested elections and disappears at their conclusion (Alesina 1987). Agents develop clear and accurate expectations when ruling parties have avowed policy preferences that are tied to their supporters' interests. Elections raise the possibility that the ruling party may be replaced by a rival with substantially different policy preferences. Yet, if agents can anticipate election outcomes (e.g., when elections are not expected to be close), they can anticipate ruling party changes and adjust their behavior rapidly. Hence, RPT predicts that the effects of policy risk on the real economy would only occur when elections are tightly contested and would not last in the long term.[4]

1.2 Policy risk

While electorally-induced uncertainty undoubtedly plays a role in driving macroeconomic instability, political uncertainty does not vanish altogether with the conclusion of an election as RPT expects, and can remain as an important factor in the course of ruling party tenures. The literature on investment irreversibility does not focus directly on electoral uncertainty, but instead discusses policy risk created in the normal course of government deliberations over choices such as investment tax credits and macroeconomic management. Uncertainty about these policy outcomes alters investor decisions (Bernanke 1983; Pindyck 1991; Price 1995), which in turn creates macroeconomic volatility.

A number of scholars have noted that policy risk can be particularly elevated when challengers have won the election, since the challengers have less of a policy record than the incumbents. In particular, Fowler (2006) argues that it is difficult to predict whether or not the winning parties implement more extreme or moderate version of their preferred policy. The idiosyncratic nature of party leaders and legislators also makes the prediction difficult (Fowler 2006), regardless of which party comes to power.

[4] Some empirical evidence suggests that some indicators of volatility do indeed rise temporarily during contested elections as RPT predicts. Uncertainty generated by elections has been shown to trigger higher assessments of inflation risk and nominal interest rates; Fowler (2006), for example, finds that inflation risk increases with the expectation of Democratic victories in the US. Electoral uncertainty also increases stock market volatility (Fuess and Bechtel 2008). This has the effect of reducing aggregate investment by private actors in the economy (Canes-Wrone and Park 2012); Julio and Yook (2012) estimate the reduction of firms' investment expenditures to be 4.8% due to uncertain elections. Consequently, electoral uncertainty generates fluctuations in real output levels (Carlsen and Pedersen 1999). Heckelman (1999, 2001a, b, 2006) notes that empirical findings of RPT are affected by model specification, but nonetheless finds some support for its contentions.

Backus and Driffill (1985) model the problem as a repeated game between a new regime with uncertain inflation-fighting credibility and a public with uncertain wage demands over time. To account for this, Rodrik (1991) models the impact of public uncertainty over a government's commitment to carrying through with a difficult reform agenda. In Fowler's (2006) model, the inflation preference for each party is treated as a random variable with known mean and variance; while agents do have expectations for parties, the variance term represents uncertainty and policy risk around that mean.

Empirical work also demonstrates that policy uncertainty indeed plays a role in the decision-making of economic actors. Firm-level evidence on investment decisions show that managers pay close attention to the government's policy behavior in general and beyond the time of elections and reduce investment when the future content of policy is uncertain (Kang et al. 2014; Wang et al. 2014). At the aggregate level, policy uncertainty in general produces volatility in stock markets (Pastor and Veronesi 2012, 2013). Concerns about policy reversals (Yago and Morgan 2008) and the variability of policy outputs (Aizenman and Marion 1993; Feng 2001) also ultimately lead to a reduction of aggregate investment.[5]

Taken in sum, these studies discuss a wide range of policy outputs (monetary, fiscal, and microeconomic interventions) over which actors in the economy face uncertainty even after the conclusion of elections. There are likewise a number of mechanisms through which uncertainty might increase volatility. One channel commonly cited in the business cycle literature is the financial accelerator process. Policy uncertainty magnifies the problem of information asymmetries in financial markets leading to deteriorating credit conditions that amplify the real impact of shocks on the economy (Bernanke et al. 1999).

1.3 Learning effects and ruling party duration

While uncertainty involving changes in ruling parties increases economic volatility, ruling party duration facilitates learning processes by economic and political actors that reduce policy risk. New ruling parties are observed by uncertain actors within the economy whose contingent decisions shape the success of policy efforts. As mentioned above, these actors will be initially uncertain about the exact policy preferences of new ruling parties and require a track record of revealed preferences. The alternation of ruling parties often causes change across a range of policies affecting economic actors' decisions. Bernanke (1983) and Cukierman (1980) point out that agents delay investments to make correct decisions, but uncertainty is reduced over time. Similarly,

[5] Moreover, this relationship appears to be stable across time. Bittlingmayer (1998) contends that the case of Weimar Germany illustrates the link running from political uncertainty to investment behavior to macroeconomic volatility. Schwert (1989) suggests that uncertainty over economic policy and the potential for radical departures from capitalism by the government may have driven Depression-era volatility in the US. The possibility of socialist outcomes contributed to the reduction of business investment and consumer spending. More recently, Ferre (2012) finds that greater uncertainty about EU members' commitment to the Stability and Growth Pact leads to greater economic volatility; in this case, it is not elections but sitting ruling parties' adherence to deficit ceilings that drives uncertainty.

Backus and Driffill (1985) show that, over time, Bayesian learning between a new regime with private inflation-fighting preferences and a public with private preferences over wage demands reduces uncertainty and creates the basis for rational expectations.

As actors in the economy are observing government behavior, ruling parties themselves may also face a learning curve with regard to macroeconomic management. Governments have access to a wide array of macroeconomic and microeconomic policy tools. There exists seemingly little consensus over time and space on their proper usage, as recent debates in the U.S. over the response to the recession have shown.[6] Poor or distortionary macroeconomic policy choices are known to increase volatility in general (Rodrik 1999). New ruling parties will need to adjust to a macroeconomic environment with challenges that may differ greatly from when the party last held power. The absence of clear choices in a complex economic environment requires parties to learn through experimentation (Wohlgemuth 2002).

New ruling parties must also operate and negotiate within a new political landscape. A party new to leadership must learn how to achieve compromises across and within political parties. As new ruling parties will differ in their ability to negotiate with other parties (Fowler 2006), observers within the economy will also require a track record of the new ruling party's competence at negotiating political challenges. This is especially true, since new ruling parties often assume office after elections which might have produced very different party environments, with shifts in the party allocations of seats as well as party policy positions. Achieving successful economic management also involves solving coordination problems among competing interest groups (Rodrik 1999). The learning effects above suggest that the initially high levels of volatility that ruling parties face subside as they stay in power longer.

Hypothesis High initial levels of volatility are reduced gradually over time by ruling party duration.

1.4 Functional form

Drawing on the discussion above, we expect that ruling party duration will lead to reductions in perceived policy risk. To capture these effects, we use a learning curve to model the relationship between duration and economic volatility. In Wright's (1936) initial formulation, learning curves were used to model the effect of scale on the efficiency of airframe production.[7] We adapt this model to volatility. Operating through policy risk, ruling party duration leads to reductions in volatility such that:

$$v_t = ad^b \tag{1}$$

[6] The efficacy and wisdom of both the fiscal stimulus and the Fed's monetary choices (including interest rate twists and quantitative easing) as responses to the recession have been questioned. Even with hindsight, disagreement remains between those who believe the efforts were successful (Chodorow-Reich et al. 2012) and others arguing that they failed (Conley and Dupor 2013).

[7] The cumulative average model for a learning curve for production is parameterized as follows: $Z = aX^b$, where Z is the cumulative average time (or cost) per unit, X is the cumulative number of units produced, a is the time required to produce the first unit, and b is log of the learning rate/log of 2.

v_t economic volatility, d ruling party duration, a initial level of volatility, b log of the learning rate/log of 2.

The specification of this curve is consonant with our theory of the impact of the observation of ruling party policy behavior. Greater reductions in uncertainty are achieved through initial observations than subsequent observations. The curved relationship also avoids the dubious assumption of linearity between two variables, volatility and duration, that cannot take on negative values. Failure to identify "conceptually forbidden areas" (Taagepera 2008, p. 37) where data points cannot possibly be found can lead to the adoption of functional forms that generate nonsensical predictions. As neither volatility nor ruling party duration can take on negative values, the areas outside of the first quadrant are conceptually forbidden. Specifying a linear relationship when the association is negative and the values of ruling party duration are sufficiently large will lead to the prediction of negative values for volatility. If the tendency of the relationship is negative, it is more appropriate to specify a convex curve such as the learning curve.

This formulation also allows for a test of the competing claims of RPT and our theory. RPT suggests that policy uncertainty is eliminated immediately after uncertain elections and the macroeconomic effects decay quickly. Any continued effect on the economy past the election simply represents the lags in the transmission mechanisms connecting economic actors' responses and macroeconomic policy to the real economy. By contrast, the implication of the policy risk theory is that the marginal effects of duration well beyond the inaugural year of a ruling party will continue to be negative and substantively large. Continued reductions in volatility would suggest that learning takes place beyond the conclusion of election night.

2 Econometric problems and estimation

The data structure required to test our hypotheses and the complex relationships among the variables create important econometric challenges. First, using pooled OLS to estimate models with cross-sectional time series data can generate error terms with serial correlation, contemporaneous correlation, and heteroskedasticity. This leads to inefficient estimates.

Second, the potential reciprocal relationship between ruling parties' duration and economic volatility may create simultaneity bias.[8] Quinn and Woolley (2001) find that because voters prefer less volatility, ruling parties who create it will lose support of voters as well as investors. As a result, economic volatility is expected to shorten the life of ruling parties. Accordingly, we perform a Hausman test for endogeneity to see if the two variables are in a reciprocal relationship and indeed find the relationship to be endogenous.

[8] Another potential problem is post-treatment bias. The use of instrumental variables and matching may solve problems of post-treatment bias. With regard to our hypotheses, we find no indication in the literature that ruling party duration is a predictor of the other variables in the model.

We use two-stage estimation to deal with this issue. In the first stage, d is regressed on X_d, X, and X_v to obtain $\hat{d}$ the predicted values of d (where d = duration of ruling party, X consists of exogenous variables common to both volatility and duration, X_d consists of instruments for duration, and X_v consists of instruments for economic volatility). The variable v, the standard deviation of GDP growth rates across four quarters, is also regressed on X_d, X, and X_v to obtain $\hat{v}$, the predicted values of v.

$$\widehat{d_{it}} = \alpha_d X_{d,it} + \beta_d X_{it} + \beta_{dv} X_{v,it} + u_1 \tag{2}$$

$$\widehat{v_{it}} = \alpha_y X_{v,it} + \beta_v X_{it} + \beta_{vd} X_{d,it} + u_2 \tag{3}$$

We adapt the Wright's (1936) learning curve model to estimate the learning effects of duration in reducing volatility such that:

$$v_{it} = a\widehat{d_{it}}^{b} \tag{4}$$

To derive b, we estimate the model:

$$log(v_{it}) = \log(a) + b\log\left(\widehat{d_{it}}\right) \tag{5}$$

Having estimated b, we transform the duration variable to model the learning curve shape. In the second stage, the duration and volatility equations are estimated with $\hat{v}$ and $\widehat{d^b}$.

$$d_{it} = \alpha_d X_{d,it} + \beta_d X_{it} + \gamma_d \widehat{v_{it}} + u_1 \tag{6}$$

$$v_{it} = \alpha_v X_{v,it} + \beta_v X_{it} + \gamma_v \widehat{d_{it}}^{b} + u_2 \tag{7}$$

In addition to the endogeneity problem, we must also deal with time issues that complicate estimation. The violation of the normality assumption, presence of right-censored and left-truncated data, and potential for negative predicted values make OLS unsuitable for estimating d; this requires the use of event history models.[9] Cox proportional hazard models are often favored when dealing with event history models because no prior assumptions are required about the baseline hazard rate; however, because the Cox model does not allow us to estimate d, we must choose a parametric model. The difficulty in choosing among alternative models is specifying the nature of the time dependency when there are several possible hazard rate shapes. Choosing the model incorrectly could generate biased coefficient estimates. We follow Box-Steffensmeier and Jones (2004) and fit a generalized gamma model and use the resulting estimates of the shape parameters to determine which of the models nested within the gamma is

[9] Discrete models such as complementary logit models are often used to analyze TSCS data. We use continuous models, since it is difficult to estimate predicted values of duration using discrete models. Fortunately, these models produce similar results, since we are analyzing single event data.

most appropriate. Based on this analysis, we select the log-normal model.[10] We use an accelerated failure time model to estimate d.

Having estimated predicted duration in the first stage, we use three estimators for the second stage volatility equation to ensure that our results are robust. We use panel models and estimate both random and fixed effects. Also, following Beck and Katz (1995), we estimate the volatility model using panel corrected standard errors (PCSE). The PCSE approach allows for different error variances for each unit as well as contemporaneous correlation among errors across units.[11] With each of the estimators, we include lagged dependent variables to model serial correlation.

2.1 Endogenous variables

The outcome variable is *Volatility*, v. Because monthly data on economic volatility are unavailable, we must proxy them with another measurement. We utilize the standard deviation of four quarters of GDP growth rates with data from the International Monetary Fund's International Financial Statistics (IFS) (2011). We lead the variable such that for each time point, v consists of the standard deviation of the growth rate over the previous, current, and two subsequent quarters. While the presence of a unit root is always a concern in economic time series, Fisher tests for panel data suggest that the data are stationary.

Ruling party duration is also treated as an endogenous variable. Ruling party duration, d, is the number of months that a member of the same party holds the chief executive's office.[12] The data sources are Woldendorp et al. (2000), Schemmel (2011), and Chow (2011). Each case in the dataset represents a month for a country that has been classified as a democracy (i.e., POLITY score of 6 or better). To model the learning curve relationship, duration is raised to the power -0.42, the value of b derived from the process described above.

[10] Cox models were performed without the volatility equation. This preliminary analysis showed that the base line hazard function is inverted-U shaped. Hazard increases until about 200 months and declines after 200 months. These results suggest that Weibull models are not effective, since Weibull models assume that base line hazard monotonically decreases or increases over time. However, since most of the ruling parties do not survive beyond 200 months, Weibull models may be still acceptable. Since plotting of the basic hazard using Cox does not help us in determining which models are better, we use log-normal models following the method suggested by Box-Steffensmeier and Jones (2004).

[11] Generalized least squares estimates of random and fixed effects models (each with errors clustered by country) are included in the appendices for comparison.

[12] Ruling parties' tenures end because of voters and parties' behavior. They are terminated either when coalitions are terminated by the ruling parties in inter-election periods or when voters vote them out of office in elections. In this study, we do not distinguish the two types of termination in order to make the study manageable. The occurrence of elections does not cause a termination of ruling parties, if the same ruling party returns to office.

2.2 Exogenous variables (X)

These variables are predictors of both of our endogenous variables and, as such, they are included in both equations as control variables.[13] First, we include a measure of the level of democracy, *Democracy*, from the POLITY IV dataset (Marshall and Jaggers 2002). A higher level is expected to be associated with shorter duration of ruling parties and less economic volatility than a lower level.

Second, a dummy variable, *Competitive election year*, is added. The data for this variable comes from the National Elections Across Democracy and Autocracy dataset (Hyde and Marinov 2012). To capture competitive elections, we code this variable "0" when the dataset indicates that the incumbent party is confident of victory and/or favorable polling data exists.[14] Otherwise, the variable is coded "1" for the election month and the 5 months preceding it.[15] Competitive elections should be negatively associated with ruling party durations and, according to RPT, positively associated with growth volatility.

Third, the institutional variable, veto players, also belongs to this category. The Checks variable in the Database of Political Institutions (DPI) accounts for the number of veto players in the system and the ideological distance of veto players (Beck et al. 2001). Nooruddin (2011) finds that the presence of veto players stabilizes investor expectations, which in turn, reduces volatility. Because the distribution of veto players is skewed (with a mean of roughly 4 but individual cases ranging as high as 17), we log-transform the variable. We also standardize it to ease interpretation of coefficients on interactions. Constraints on ruling parties are expected to provide greater political and economic stability (Nooruddin 2003).

2.3 Exogenous variables for volatility ($\mathbf{X_y}$)

This group consists primarily of ten control variables identified by Mobarak (2005) and Yang (2008) as important predictors of an economy's volatility. These variables are only included in the volatility equations. First, we include *GDP* per capita, which are obtained from the World Development Indicators (WDI) (World Bank 2010). More developed countries should experience less volatility than less developed countries. Second, we include a variable which measures shocks to the terms of trade, *Terms of trade shock*; larger shocks should increase economic volatility (Raddatz 2007). Using data from WDI, this variable is the absolute value of the percentage change in the terms of trade. Third, we include *Trade* to represent trade openness (imports and exports as a share of GDP) to capture connection to the world economy. The data for

[13] It is sometimes difficult to determine to which equation a variable should belong. Hence, we follow the existing literature to form the equations.

[14] We acknowledge here the difficulty in capturing the perception of election competitiveness in a consistent way across many countries and time periods. While some sort of election futures market indicator would be ideal, such data does not exist for all of our sample.

[15] Choosing the number of forward months presents a challenge. It requires determining at what point prior to an election economic agents begin adjusting their behavior in response to the uncertainty. We used several values and saw little to no change to our overall results.

this variable comes from WDI. States with greater connection to the world trade have a higher exposure to shocks from the world economy; trade openness is expected to increase volatility (di Giovanni and Levchenko 2009). Fourth, we include the data for *Ethnic fractionalization*, and fifth, an interaction term between democracy and ethnic fractionalization, *Democracy*Fractionalization*. As fractionalization is computed as a Herfindahl index such that higher levels indicate heterogeneity, the coefficient for ethnic fractionalization is expected to be positive, meaning that more ethnic fractionalization is associated with higher volatility. The coefficient for the interaction term is expected to be negative, indicating that increases in democracy lead to greater reductions of volatility in heterogeneous societies (Yang 2008). The data source for ethnic fractionalization is Alesina et al. (2003). Sixth, we include *Sectoral concentration* to capture the sectoral concentration of the economy. Derived from WDI data, this is a Herfindahl index of the shares of the economy of agriculture, manufacturing, and services. Because a diversified economy is less susceptible to shocks, higher levels of this index (indicating less diversification) should be associated with higher levels of volatility (Mobarak 2005). Seventh, we include *Log population* from the WDI data; larger countries should have economies that are more robust to economic volatility. Eighth, we include *Private credit,* credit provided to the private sector as a percentage of GDP; this data also comes from WDI. This variable measures the depth of the financial sector. States with stronger financial systems are better able to withstand changing economic conditions. Ninth, the dummy variable for EU is added, since the EU nations experience a similar pattern of volatility.[16] Tenth, as an econometric consideration, we include a lagged measurement of volatility, $Volatility_{t\text{-}12}$, to deal with serial correlation.

2.4 Exogenous variables for duration ($\mathbf{X_d}$)

Because few studies examine ruling party stability (as opposed to cabinet stability), we draw on Maeda and Nishikawa (2006) to identify predictor variables. First, an investiture rule (the formal vote requirement at the beginning of ruling parties' tenures) may strengthen the legitimacy of the ruling parties and elongate their survival time. The variable, *Investiture*, variable is a dummy variable derived from Woldendorp et al. (2000). Second, we control for constitutional inter-election periods, *Term length*; greater length of terms between elections is expected to increase duration. In both presidential and parliamentary systems, the tenure of chief executive is usually fixed as 4 or 5 years. The source is King et al. (1990). Third, the dummy variable, *President*, is added to this group. The presidential variable is created based on the DPI.[17] Fourth, we include an interaction term between Presidentialism and *Term length*, as the terms of legislators and presidents may affect government duration differently. Fifth, the

[16] This variable is not used in Mobarak (2005) or Yang (2008). However, it is included, since it is often used in analyzing economic performance. Dropping this variable does not change the results in any substantive way.

[17] A potential problem with the use of the DPI is that it does not distinguish between presidentialism and semi-presidentialism. As a result, this may muddle the difference between presidentialism and parliamentarism.

presence of a limit on the number of terms a current executive can serve is expected to shorten duration. The variable, *Term limits*, is drawn from the DPI. Sixth, we include the rate of GDP growth; higher growth rates are expected to increase government duration.

In addition to the controls suggested by Maeda and Nishikawa (2006), we include three more variables to capture the partisan political context. First, legislative fractionalization may reduce ruling party duration. Less fractionalized legislature may increase the stability of the party system. The *Legislative fractionalization* variable measures the probability that any two deputies in the legislature are from different parties.[18] Second, the variable, *Margin of majority*, is added, since greater margins of majority of the executive in the legislature are expected to lengthen ruling party duration. Third, *Democratic duration* is added. Democratic duration is also expected to lengthen ruling party duration, since mature democracies are expected to have more stable party systems. The data for these variables are drawn from the DPI.[19]

3 Data

Each case in our dataset is a country-month, creating two potential problems. First, many of the variables are measured yearly. However, the important variables in our analysis are not annual data. The variables for volatility and ruling party duration are quarterly and monthly data, respectively.[20] Some of the control variables, such as *Democracy*, which are taken from the POLITY IV dataset also contain monthly information. For variables with this interpolation problem, we apply the annual value to each month within the year. Second, unlike typical economic volatility models (see, for example, Klomp and de Haan 2009), we do not utilize ten year averages of growth rates, since the focus of our analysis is to track the changes over time.[21] Nonetheless, our findings from the volatility models below correspond broadly to those of the economic volatility literature.

Countries with polity scores of six or better in POLITY IV are included in the analysis.[22] However, the range of time that is covered by the study is limited by the availability of data, particularly the quarterly growth rate data used to create the volatil-

[18] While a measure of ideological compactness would be ideal, government fractionalization allows us to cover a larger number of cases.

[19] The previous ruling parties' duration may influence the current ruling parties' duration. However, this variable is excluded from the duration equation, since a significant number of cases will be dropped from the analysis because of the missing data. Moreover, the impact of this variable is insignificant. Similarly, coalition types, such as minimal winning coalition and minority or surplus coalition are excluded because of the increase in the number of missing cases.

[20] Some countries experience changes in ruling parties more than once a year.

[21] De Haan (2007) suggests that the use of 10 year averages ignores business cycles and hence the difference between short- and long-term growth.

[22] POLITY data covers a wide range of countries and is updated regularly.

ity variable. The analysis covers forty-four democracies between 1981 and 2009.[23] The countries in the analysis are shown in "Appendix 1", while the descriptive statistics of the variables in the growth equation are shown in "Appendix 2".[24]

4 Results

Because the Hausman test confirms the presence of the reciprocal relationship between volatility and duration, we utilize two stage estimations as discussed above. This initial finding differs from that of Béjar and Mukherjee (2011) who do not find duration to be endogenous. There may be several reasons for this difference from our finding. First, our analysis utilizes event history models to estimate duration. Second, it is possible that we have operationalized ruling party duration differently than these authors. Third, our dependent variable differs as it is the standard deviation of growth rates rather than a measure of annual change. Finally, we measure both the independent and dependent variables at much shorter time intervals, allowing us to capture the effect of time more accurately. Measuring the variables annually would, for example, not allow us to distinguish between a case-year where two ruling party changes took place and a case-year where just one happened.

We present our main results in Table 1. We estimate a progression of models. Model 1 shows the effects of ruling party duration controlling for economic variables. Model 2 adds political variables. Model 3 adds the Left Party variable to test the Partisan Hypothesis, while Model 4 adds the Competitive Election Year variable to test RPT. Model 5 is the full model which includes all of the control variables.

In Table 1, the coefficients for the duration variable are positive and significant in all of the models. Because of the transformation we utilize, the interpretation of this finding is not readily intuitive. The duration variable is transformed and entered in the regression as

$$\frac{1}{(\widehat{d})^{.42}}$$

Hence, increases in ruling party duration are associated with reductions in the level of volatility. The predicted volatility levels across a ruling party duration when other variables in the model are set to their means follows the Wright learning curve shape with the transformed duration variable. We note that simply using duration untransformed yields significant and negative effects. However, beyond observing that the slope in these results is not steep (perhaps driven by reductions in volatility that occur later in duration), imposing a linear relationship does not allow us to adjudicate between the hypotheses of RPT and the policy risk model.

[23] The vast majority of cases missing from our panel are due to missing quarterly data for real GDP growth, which is in turn used to construct the volatility variable. Data availability for this variable correlates to the level of development. Nonetheless, we have a wide range of levels of development in the sample and control for the variable in our models.

[24] All the appendices are included in the supporting materials.

Table 1 Growth volatility with RE estimates (monthly)

	Model 1	Model 2	Model 3	Model 4	Model 5
Volatility$_{t-12}$	0.3753**	0.2835**	0.2810**	0.2656**	0.2620**
	(0.0339)	(0.0303)	(0.0319)	(0.0338)	(0.0358)
Ruling party duration$^{-.42}$	11.6544*	21.7558**	22.0621**	24.1601**	24.6428**
	(4.6486)	(5.1084)	(5.2873)	(5.1917)	(5.3856)
GDP per capita	− 0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Terms of tradeshock	0.3192	− 0.9497	− 0.9928	− 1.2651	− 1.3328
	(0.9276)	(0.8235)	(0.8142)	(0.8352)	(0.8267)
Trade	− 0.0041	− 0.0047	− 0.0048	− 0.0043	− 0.0045
	(0.0043)	(0.0043)	(0.0044)	(0.0043)	(0.0044)
Sectoral concentration	0.0004	0.0005*	0.0005*	0.0005*	0.0005*
	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Log population	− 0.2347*	− 0.2185	− 0.2231	− 0.2061	− 0.2112
	(0.1047)	(0.1269)	(0.1284)	(0.1296)	(0.1310)
Private credit	− 0.0011	− 0.0017	− 0.0017	− 0.0019	− 0.0019
	(0.0017)	(0.0016)	(0.0016)	(0.0016)	(0.0016)
Democracy		− 0.3253*	− 0.3253*	− 0.3221*	− 0.3219*
		(0.1535)	(0.1536)	(0.1542)	(0.1543)
Ethnic fractionalization		0.0063	0.0081	0.0165	0.0194
		(0.1251)	(0.1270)	(0.1300)	(0.1322)
Democracy* ethnic fractionalization		− 0.0284	− 0.0229	− 0.0057	0.0037
		(0.1619)	(0.1561)	(0.1631)	(0.1573)
EU member		0.2416	0.2526*	0.243*	0.2582*
		(0.1243)	(0.1254)	(0.1254)	(0.1249)
Log(Veto players)		− 0.4064**	− 0.4114**	− 0.4445**	− 0.4523**
		(0.1039)	(0.1060)	(0.1038)	(0.1061)
Majoritarian		0.2829	0.2975	0.2995	0.3201
		(0.1792)	(0.1871)	(0.1938)	(0.2013)
Left party			0.0465		0.0660
			(0.0933)		(0.0947)
Competitive Election year				− 0.3395*	− 0.3487*
				(0.1493)	(0.1503)
Constant	1.6827	− 0.7186	− 0.7170	− 1.4983	− 1.5322
	(1.8691)	(2.3628)	(2.3847)	(2.4093)	(2.4395)
R squared					
Within	.2186	.2563	.2566	.2615	.2621
Between	.4990	.3549	.3498	.3266	.3196
Overall	.3396	.3331	.3305	.3223	.3187
Number of groups	44	44	44	44	44
N	8561	8561	8561	8561	8561

*$p < 0.05$; **$p < 0.01$

In addressing the competing hypotheses, initially we expect the coefficients for the left party variable to be positive. Approaches rooted in Hibbs' partisan hypothesis predict persistent differences between parties, with left party governments producing less beneficial macroeconomic outcomes. Presumably, this leads to heightened levels of inflation in the pursuit of full employment. This should lead, in turn, to greater volatility. Yet, the findings suggest that the effects of the left parties are insignificant.

The competitive election year variable is significant and negative. This does not support the RPT predictions that the election years should be associated with spikes in volatility. We tried several indicators for this variable, including various codings of the NELDA, varying lengths of time prior to election months, and even a simple election year (competitive or not) variable. None of them produced positive and significant results across the models estimated.[25] Given the challenges in capturing ex ante perceptions of competitive elections, we do not consider our findings to be the final word on RPT as electoral uncertainty may still be important.

Indeed, the learning curve estimated for ruling party duration does indicate that volatility is elevated at the beginning of a new ruling party's tenure. If there are lags in the effects of electoral risk, this could support RPT. Of course, the data includes all ruling parties not just those who earned victories in tightly contested or unpredictable elections. So, one would not expect to see such a strong effect if only unanticipated electoral results lead to volatility.

Moreover, the shape of the curve supports the policy risk/learning effects hypothesis that policy risk continues to decline after the inaugural year.[26] In Fig. 1, we show the marginal effect of each month of duration on volatility.[27] As is dictated by the functional form, substantial reductions in volatility come in the early months of a ruling party's tenure. As tenure continues, the effect of duration is still negative and significant. At much later durations, the effect becomes substantively unimportant. But, the net effect of these initial years is important; the predicted reduction of volatility associated with year three is roughly 60% of a standard deviation of volatility. The fourth year yields a reduction in volatility equal to 37% of a standard deviation.

Although our data structure diverges from much of the volatility literature in that our dependent variable is a four quarter rather than multi-year standard deviation of growth rates, our findings nonetheless are broadly consistent with this work. We find evidence that sectoral concentration raises volatility, as poorly diversified economies are less robust to shocks. Also, the coefficients for population are negative for all the models, although it is significant at the .05 level only in Model 1. Larger countries tend to enjoy greater economic stability than smaller countries.

As to the results for political institutions, we find some support for Yang (2008) that democracy is important to resolving social conflicts that create volatility. Higher levels of democracy are associated with less volatility; the democracy coefficients are

[25] Neither do the election variables yield positive coefficients even when duration is removed from the equation.

[26] This finding is consistent with learning by either actors in the economy or ruling parties or some combination of both. We leave this issue for further study.

[27] Note that the marginal effects figure begins at 12 months in order to allow clearer depiction of the subsequent years.

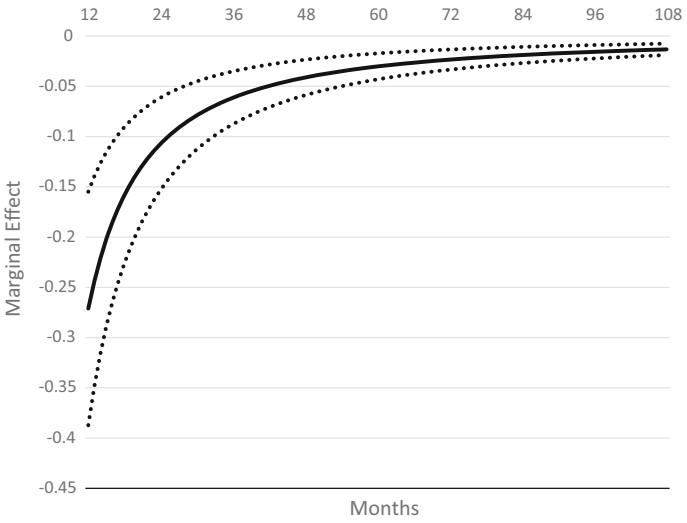

Fig. 1 Predicted effect of each month on volatility

negative and significant across all models. Increases in the level of democracy reduce volatility, but we do not find this effect to be enhanced when ethnic fractionalization is high as the interaction term is not significant. We do not find support for the results of Béjar and Mukherjee (2011), since the majoritarian variable is insignificant. However, our findings are consistent with the work of Nooruddin (2003, 2011) indicating that veto players reduce policy volatility.

Table 2 shows the results for the equation for ruling party duration, which was used to estimate the coefficients in the multiple equation estimation in Table 1. It confirms that ruling party duration and growth volatility are in a reciprocal relationship. The coefficient for the predicted volatility ($\hat{v}$) is negative and significant. This demonstrates that growth volatility reduces ruling party duration. The Hausman test also confirms this result. According to the model, about 80% of ruling parties are terminated by 100 months, when the value of volatility is 3, whereas only about 60% of ruling parties are terminated by 100 months, when the value is 1. These results suggest that constituents replace ruling parties that are incapable of stabilizing the economy.

4.1 Robustness check

We generate results using several estimators; our results are robust across random effects (Table 1), fixed effects ("Appendix 3"), and panel corrected standard error ("Appendix 4") specifications. The models produce similar results when we drop some variables or replace them with other variables that represent similar concepts. For example, we use the TENSYS variable in the DPI to represent democratic duration in the duration equation, but when we replace this variable with the democratic duration variable that was created based on POLITY IV, our results remain substantively unchanged. The results are also substantively the same when we replace the depen-

Table 2 Results for duration equation

Variables	Lognormal
Predicted volatility	− 0.188*
	(0.080)
GDP growth	0.031
	(0.027)
Democracy	− 0.222
	(0.121)
Investiture	0.345
	(0.271)
Margin of majority	1.124
	(0.742)
Legislative fractionalization	− 1.863*
	(0.757)
Term length	− 0.057
	(0.183)
Election year	− 0.203
	(0.355)
Presidentialism	− 2.399
	(1.259)
Term length * Presidentialism	0.689*
	(0.283)
Multiple terms	0.496
	(0.343)
Democratic duration	0.017**
	(0.005)
EU member	0.072
	(0.267)
Constant	3.849**
	(1.293)
N	8625
No. of subjects	156
Likelihood ratio	41.64

*$p < 0.05$; **$p < 0.01$

dent variable, VOLATILITY, with an alternative measure used by Nooruddin (2011), consisting of the standard deviation of the residuals from an autoregressive process for quarterly growth rates. Also, the replacement of the lognormal models in the duration equation with the Weibull models produces similar results. Changes in the calculation of the volatility data from three quarters to five quarters do not influence our conclusion, either. Moreover, changes in the selection method of democracies from Polity IV of 6 or above to 5 or above do not influence the results. Furthermore, dropping an outlier, namely Botswana which has particularly long-lived ruling parties, from the data does not influence the results.

We also replaced the duration variable with a variable that accounts for changes in coalition. As mentioned earlier, the ruling party duration variable in this study represents the lengths of the time that the same ruling party controls the executive branch. This measurement is insensitive to the changes in coalition governments. We replaced the duration variable with the variable that is more sensitive to this issue. We used a duration variable that is created considering the government change index of 75 (Maeda and Nishikawa 2006) as the termination of ruling parties (i.e. Ruling parties are considered to be terminated, when 75% or more of the seats that the government parties held in the previous legislature was replaced by the new incoming parties.) The impact of the duration variable on volatility loses significance with this variable. However, this does not necessarily contradict with the theory of policy risk. It is rather expected that the impact is weakened with this variable, since the effects are expected to be smaller, if the replacement of a part of the coalition is considered as the termination of ruling parties. Although we believe that cabinet duration as a concept is very different from ruling party duration and it is beyond the scope of this study, we explored the effects of cabinet duration variable. The effects of cabinet duration are quite inconsistent, suggesting that the impact of cabinet duration is not as important as ruling party duration. This is also expected since a cabinet is often short lived, because it is considered terminated, when there is an election even without a change in ruling parties.

We address the potential problem that is caused by using country-months as our unit of analysis. Because many of our variables are not measured monthly, the data must be interpolated. To examine whether this interpolation drives our results, we tested the hypotheses with quarterly data (i.e. country-quarterly data) and annual data (i.e. country-year data).The quarterly and annual data results are shown in "Appendix

Table 3 Fiscal volatility (monthly)

	Model 1	Model 2
Fiscal volatility$_{t-12}$	0.6628**	0.6196**
	(0.0204)	(0.0159)
Ruling party	0.0051**	0.0065**
Duration$^{-.42}$	(0.0012)	(0.0010)
Checks		− 0.0002
		(0.0001)
Plurality		− 0.0028**
		(0.0003)
Election year		0.0017**
		(0.0006)
President		0.0014**
		(0.0004)
Constant	0.0037**	0.0053**
	(0.0004)	(0.0005)
N	13801	12722
R squared	.4455	.5096

*$p < 0.10$; **$p < 0.05$; ***$p < 0.01$

5" and "Appendix 6", respectively. These estimations reproduce the learning curve finding on ruling party duration, consistent with Table 1.

As a final check on robustness, we examine the causal mechanism posited by our theory. If, as our theory suggests, ruling party duration operates through policy risk, we should observe a similar learning relationship for proxies of risk. To test the learning effects of party duration on policy uncertainty, we follow Bleaney and Halland (2014) who use fiscal policy volatility as a proxy. We follow their method in constructing an indicator of fiscal policy volatility, regressing government consumption on lagged consumption, growth, lagged growth, inflation, lagged inflation, and squared lagged inflation; the residuals from this regression are the indicator of fiscal volatility. We test the effect of transformed duration and include controls identified by Fatás and Mihov (2003) to estimate the model in Table 3. Again, the significant and positive coefficient indicates that duration follows a learning curve relationship with fiscal volatility.

5 Conclusion

Political stability has been generally understood to produce positive macroeconomic outcomes; government turnovers have been shown to reduce the level of economic growth (Alesina et al. 1996). Yet, our findings demonstrate that the relationship between stability, as indicated by the absence of government turnover, and economic volatility is complex and non-linear. The learning curve relationship between duration points to the importance of how public perceptions of political leaders evolve over time.

This finding speaks to the mechanism that connects political stability to economic volatility. The policy risk created by political instability shapes the decision-making of market actors inducing and amplifying growth volatility. The stark difference in outcomes between regime types is driven by institutional differences that more sharply constrain policy risk in democracies. We show that within democracies there are important behavioral sources of policy risk. Learning processes that occur among and between ruling parties and market actors lead to reductions in policy risk over time.

While our work helps explain variation in an important economic outcome, it also has implications more broadly for our understanding of how information flows shape democratic accountability across time. First, our finding of a reciprocal relationship between economic volatility and ruling party duration underscores previous work on retrospective voting. Voters monitor macroeconomic outcomes and will discipline ruling parties at the polls for their inability to dampen economic volatility. Second, outside of mass voting constituencies, market participants monitor the policy behavior of ruling parties over time to develop expectations about future policy behavior. We find that declared party ideology serves as less of a reliable cue for markets than is predicted by RPT, as the learning effects on volatility take place across an extended range of time after elections.

Appendix 1: Countries included in the analysis

Argentina	Japan
Australia	Mauritius
Belgium	Mexico
Bolivia	Mongolia
Botswana	Netherlands
Brazil	New Zealand
Canada	Norway
Chile	Panama
Colombia	Paraguay
Costa Rica	Peru
Denmark	Philippines
Ecuador	Poland
Finland	Portugal
France	Senegal
Germany	South Korea
Greece	Spain
Hungary	Sweden
India	Switzerland
Indonesia	Thailand
Ireland	Turkey
Italy	United Kingdom
Jamaica	United States

Appendix 2: Descriptive statistics

Variable	Obs	Mean	SD	Min	Max
Volatility	8561	1.576448	1.72572	0	20.0306
Ruling party duration	8561	73.97045	109.4226	2	780
GDP per cap	8561	15121	10424.08	442.7891	40707
Terms of trade shock	8561	.0366697	.0489351	0	.448129
Trade	8561	65.0704	32.81974	13.75305	184.7421
Sectoral concentration	8561	5114.447	612.5613	3467.82	6612.57
Log population	8561	16.9708	1.358898	13.99773	20.86767
Private credit	8561	81.98991	52.43642	.5384467	231.6298
Democracy	8561	.3624577	1.019912	− 3	1
Ethnic fractionalization	8561	1.94e−07	.9999998	− 1.19101	2.107643

Variable	Obs	Mean	SD	Min	Max
Election	8561	.0801308	.2795671	0	2
EU member	8561	.3846513	.4865412	0	1
Veto players	8561	− .0145584	1.045472	1	17
Left	8561	.3949305	.4888643	0	1
Majoritarian	8561	.5853288	.492694	0	1

Appendix 3: Growth volatility with FE estimates (monthly)

	Model 1	Model 2	Model 3	Model 4	Model 5
Volatility$_{t-12}$	0.3456**	0.2498**	0.2474**	0.2302**	0.2264**
	(0.0344)	(0.0342)	(0.0361)	(0.0379)	(0.0403)
Ruling party duration$^{-.42}$	11.9408*	22.7900**	23.1425**	25.6555**	26.2225**
	(4.4374)	(5.3355)	(5.5048)	(5.5402)	(5.7499)
GDP per capita	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Terms of trade shock	0.4108	− 0.9764	− 1.0264	− 1.3507	− 1.4302
	(0.9253)	(0.8053)	(0.7971)	(0.8289)	(0.8265)
Trade	− 0.0010	− 0.0045	− 0.0046	− 0.0042	− 0.0044
	(0.0058)	(0.0057)	(0.0057)	(0.0056)	(0.0056)
Sectoral concentration	0.0006*	0.0006*	0.0007*	0.0007**	0.0007**
	(0.0003)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
Log population	− 3.3597	− 2.2387	− 2.2551	− 2.0397	− 2.0559
	(1.8622)	(1.5344)	(1.5413)	(1.5503)	(1.5602)
Private credit	− 0.0003	− 0.0012	− 0.0012	− 0.0015	− 0.0015
	(0.0014)	(0.0016)	(0.0016)	(0.0016)	(0.0016)
Democracy		− 0.2964*	− 0.2947*	− 0.2922*	− 0.2898*
		(0.1340)	(0.1339)	(0.1372)	(0.1373)
Ethnic fractionalization		0.0000	0.0000	0.0000	0.0000
		(.)	(.)	(.)	(.)
Democracy * ethnic fractionalization		− 0.0915	− 0.0799	− 0.0594	− 0.0427
		(0.1541)	(0.1495)	(0.1575)	(0.1532)
EU member		0.2419	0.2539	0.2478	0.2643
		(0.1446)	(0.1446)	(0.1474)	(0.1460)
Log(Veto players)		− 0.4234**	− 0.4293**	− 0.4688**	− 0.4782**
		(0.1140)	(0.1162)	(0.1149)	(0.1175)

	Model 1	Model 2	Model 3	Model 4	Model 5
Majoritarian		0.2859	0.3137	0.3348	0.3741
		(0.1735)	(0.1821)	(0.1995)	(0.2055)
Left party			0.0614		0.0835
			(0.0920)		(0.0957)
Competitive Election year				− 0.3594*	− 0.3703*
				(0.1566)	(0.1587)
Constant	53.1510	32.3727	32.5499	28.3742	28.4933
	(30.0616)	(25.4984)	(25.6126)	(25.8465)	(26.0179)
R squared					
Within	.2274	.2608	.2611	.2655	.2661
Between	.1063	.1333	.1319	.1366	.1345
Overall	.0621	.1034	.1022	.1108	.1092
Number of groups	44	44	44	44	44
N	8561	8561	8561	8561	8561

*$p < 0.05$; **$p < 0.01$

Appendix 4: Growth volatility with PCSE estimates (monthly)

	Model 1	Model 2	Model 3	Model 4	Model 5
Volatility$_{t-12}$	0.6062**	0.5486**	0.5480**	0.5468**	0.5463**
	(0.0209)	(0.0209)	(0.0210)	(0.0210)	(0.0210)
Ruling party duration$^{-.42}$	4.2145**	7.2749**	7.0475**	7.5309**	7.3041**
	(0.4310)	(0.5465)	(0.5682)	(0.5585)	(0.5838)
GDP per capita	− 0.0000**	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Terms of trade shock	1.1384**	0.5119	0.5519	0.4660	0.5060
	(0.3577)	(0.3553)	(0.3577)	(0.3585)	(0.3613)
Trade	− 0.0017**	− 0.0008	− 0.0009	− 0.0008	− 0.0009
	(0.0006)	(0.0007)	(0.0007)	(0.0007)	(0.0007)
Sectoral concentration	0.0001	0.0002**	0.0002**	0.0002**	0.0002**
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Log population	− 0.0841**	− 0.1195**	− 0.1210**	− 0.1199**	− 0.1213**
	(0.0125)	(0.0150)	(0.0150)	(0.0150)	(0.0150)
Private credit	− 0.0016**	− 0.0018**	− 0.0018**	− 0.0018**	− 0.0018**
	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Democracy		− 0.2865**	− 0.2778**	− 0.2862**	− 0.2779**
		(0.0269)	(0.0272)	(0.0269)	(0.0273)

	Model 1	Model 2	Model 3	Model 4	Model 5
Ethnic fractionalization		0.0311	0.0307	0.0321	0.0316
		(0.0171)	(0.0172)	(0.0172)	(0.0172)
Democracy * ethnic fractionalization		0.0668**	0.0631**	0.0696**	0.0659**
		(0.0204)	(0.0202)	(0.0205)	(0.0203)
EU member		− 0.0395	− 0.0474	− 0.0402	− 0.0477
		(0.0308)	(0.0310)	(0.0307)	(0.0309)
Log(Veto players)		− 0.1278**	− 0.1258**	− 0.1304**	− 0.1284**
		(0.0164)	(0.0163)	(0.0164)	(0.0163)
Majoritarian		0.0139	0.0083	0.0142	0.0089
		(0.0385)	(0.0389)	(0.0386)	(0.0390)
Left party			− 0.0669*		− 0.0636*
			(0.0298)		(0.0300)
Competitive Election year				− 0.1205*	− 0.1155*
				(0.0505)	(0.0509)
Constant	1.4165**	0.9482**	1.0268**	0.8999*	0.9766**
	(0.3333)	(0.3566)	(0.3619)	(0.3551)	(0.3607)
R squared	.4283	.4492	.4495	.4496	.4496
Number of groups	44	44	44	44	44
N	8561	8561	8561	8561	8561

*$p < 0.05$; **$p < 0.01$

Appendix 5: Growth volatility quarterly estimates

	PCSE	RE	FE
Volatility$_{t-12}$	0.5307**	0.3000**	0.2145**
	(0.0360)	(0.0340)	(0.0446)
Ruling party duration$^{-.42}$	7.3337**	20.6579**	25.8944**
	(0.9987)	(5.0580)	(5.6049)
GDP per capita	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)
Terms of trade shock	0.5133	− 0.8930	− 1.4149
	(0.6266)	(0.8498)	(0.8341)
Trade	− 0.0008	− 0.0023	− 0.0048
	(0.0012)	(0.0037)	(0.0057)
Sectoral concentration	0.0002**	0.0004*	0.0007**
	(0.0001)	(0.0002)	(0.0002)
Log population	− 0.1267**	− 0.1666	− 2.0165
	(0.0257)	(0.1045)	(1.5790)

	PCSE	RE	FE
Private credit	− 0.0018**	− 0.0017	− 0.0014
	(0.0006)	(0.0015)	(0.0016)
Democracy	− 0.2767**	− 0.3264*	− 0.2903*
	(0.0471)	(0.1502)	(0.1427)
Ethnic fractionalization	0.0258	0.0096	–
	(0.0293)	(0.1078)	
Democracy * ethnic fractionalization	0.0735*	0.0645	− 0.0392
	(0.0345)	(0.1473)	(0.1636)
EU member	− 0.0500	0.1641	0.2791
	(0.0529)	(0.1288)	(0.1469)
Log(Veto players)	− 0.1244**	− 0.3849**	− 0.4758**
	(0.0275)	(0.0983)	(0.1150)
Majoritarian	0.0205	0.1878	0.3795
	(0.0665)	(0.1997)	(0.2040)
Left party	− 0.0625	0.0517	0.0909
	(0.0515)	(0.0960)	(0.0966)
Competitive election year	− 0.1384	− 0.3049	− 0.3816*
	(0.0973)	(0.1822)	(0.1878)
Constant	1.0624	− 1.2017	27.9508
	(0.6117)	(1.9286)	(26.3385)
R squared			
Within		.2500	.2600
Between		.4297	.1365
Overall	.4442	.3689	.1094
Number of groups	44	44	44
N	8561	8561	8561

*$p < 0.05$; **$p < 0.01$

Appendix 6: Growth volatility annual estimates

	PCSE	RE	FE
Volatility$_{t-12}$	0.6151**	0.4476**	0.2811**
	(0.0645)	(0.0512)	(0.0711)
Ruling party duration$^{-.42}$	7.1690**	15.1948**	25.4872**
	(1.5258)	(4.3614)	(5.6040)
GDP per capita	− 0.0000	− 0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)
Terms of trade shock	− 0.3697	− 0.8668	− 1.8549
	(1.1050)	(0.9921)	(0.9476)
Trade	− 0.0009	− 0.0012	− 0.0052
	(0.0016)	(0.0030)	(0.0057)
Sectoral concentration	0.0002	0.0004	0.0007**
	(0.0001)	(0.0002)	(0.0002)
Log population	− 0.1129**	− 0.1289	− 1.2331
	(0.0370)	(0.0874)	(1.6010)
Private credit	− 0.0014	− 0.0017	− 0.0020
	(0.0009)	(0.0014)	(0.0017)
Democracy	− 0.2125**	− 0.2419	− 0.1850
	(0.0733)	(0.1351)	(0.1451)
Ethnic fractionalization	− 0.0191	− 0.0136	–
	(0.0407)	(0.0790)	
Democracy * ethnic fractionalization	0.1130*	0.1630	0.1053
	(0.0523)	(0.1305)	(0.1963)
EU member	− 0.0686	0.0334	0.2550
	(0.0862)	(0.1378)	(0.1390)
Log(Veto players)	− 0.0775*	− 0.2447**	− 0.4368**
	(0.0364)	(0.0843)	(0.1092)
Majoritarian	0.0486	0.1019	0.4206*
	(0.0909)	(0.1694)	(0.2015)
Left party	0.0062	0.0746	0.1396
	(0.0732)	(0.1037)	(0.1057)
Competitive Election year	− 0.2740	− 0.2975	− 0.4162
	(0.2296)	(0.2288)	(0.2311)

	PCSE	RE	FE
Constant	0.7020	− 0.7988	14.5849
	(0.9167)	(1.6276)	(26.7918)
R squared			
Within		.3410	.3657
Between		.6262	.1904
Overall	.5671	.5365	.1979
Number of groups	44	44	44
N	747	747	747

$^{*}p < 0.05$; $^{**}p < 0.01$

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