WHEN IS A CENTRAL BANK GOVERNOR REPLACED? EVIDENCE BASED ON A NEW DATA SET

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Abstract

This paper uses a new data set on the term in office of central bank governors in 137 countries covering the period 1970-2004 to estimate a model for the chance that a central bank governor is replaced. We formulate a number of hypotheses based on the literature on the determinants of central bank independence that are tested using conditional logit models and the Extreme Bounds Analysis. We conclude that, apart from the share of the current term in office elapsed, high levels of political and regime instability, the occurrence of elections, and high inflation increase the probability of a turnover.

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1. Introduction

Under what circumstances will a central bank governor be replaced? The experience of some countries suggests that the actual term in office of the Chief Executive Officer (CEO) of the central bank is not necessarily in line with central bank legislation. A well known example is Argentina where the actual average term in office of the governor of the central bank during the 1980s was about a year, which deviates substantially from the period as foreseen in the central bank law in place at that time. In fact, whenever a new government – or even a new minister of finance – was appointed, the governor was replaced. In other countries the governor has remained in office for many years. For example, the CEO of the central bank of Guyana kept his office between 1976 and 1989. Likewise, Jóhannes Nordal has been governor of the central bank of Iceland for almost 30 years.

In this paper we examine which political and economic factors affect the likelihood that a central bank governor will lose his job. Our data set on central bank governors, which contains information on 137 countries covering the period 1970-2004, updates and substantially extends the database that has been used earlier by De Haan and Kooi (2000). We estimate panel models for the probability that a central bank governor is replaced in a particular year. Our explanatory variables are derived from the literature on the determinants of central bank independence (CBI), notably the work of Cukierman (1994) and Maxfield (1997).

We estimate conditional logit models of the likelihood that the CEO of the central bank is being replaced. Our database contains sufficient observations to allow studying different determinants of governor turnover rates for OECD and non-OECD countries. We test for the robustness of our results employing the so-called Extreme Bounds Analysis (EBA), which is a fairly neutral means to check robustness and compare the validity of conflicting findings in empirical research. We conclude that, apart from the share of the current term in office elapsed, high levels of political and regime instability, the occurrence of elections, and high inflation in the recent past increase the probability of a turnover.

The remainder of the paper is structured as follows. Section 2 summarizes the literature on the determinants of CBI in some more detail and formulates our hypotheses. Section 3 describes our data set and discusses the methodology used. Section 4 presents our results for the full sample of countries, while section 5 shows the outcomes for some sub samples. The final section offers some concluding comments.

2. Hypotheses

In this section we discuss various views that have been put forward to explain differences in CBI across time and countries. Based on this literature we derive our hypotheses concerning the likelihood of a change of the CEO of the central bank. We also briefly discuss the scant empirical evidence available.

Essentially, there are two different approaches explaining CBI. In the first approach CBI is determined by the preferences of a society and/or particular interest groups, in conjunction with the political decision process. According to Hayo (1998), societies differ, for whatever reason, with respect to their preference for inflation and this is reflected in monetary institutions. Similarly, the preferences of particular interest groups may be pivotal. For instance, Posen (1995) argues that both inflation and CBI are affected by the degree of financial sector opposition to inflation, and the effectiveness of the financial sector to mobilize – through the political system – its opposition to inflation.

In the second approach delegation of monetary authority by politicians is considered as a (partial) commitment device. By delegating monetary powers to an independent central bank that places a higher weight on inflation stabilization than the government, the inflationary bias may be reduced and the credibility of monetary policy increased. However, policy makers lose flexibility to employ monetary instruments for political or other purposes. So central bank independence entails both benefits (greater credibility) and costs (less flexibility) and in the first approach the balance between benefits and costs determines the optimal and the actual level of CBI (see Cukierman, 1994).

One of the potential benefits of CBI is that it signals increased creditworthiness to potential foreign investors. Maxfield (1997) argues that the more global financial markets become, the more politicians must concern themselves with this kind of signalling. According to Maxfield, the likelihood that governments will use CBI to try to signal creditworthiness is greater the larger the country's financial needs and the fewer restrictions the country concerned has on international financial transactions. This reasoning leads to the following hypotheses:

1. The higher the stock of external debt, the longer the term in office of the governor will be.

2. The higher the government budget deficit, the longer the term in office of the governor will be.

3. The fewer the restrictions on international financial transactions are, the longer the term in office of the governor will be.

The second hypothesis can also be motivated in a somewhat different way within the framework of Cukierman (1994). Countries with large government budget deficits suffer from an excessive inflationary bias, so that the benefits from commitment (i.e. a lower interest burden) will be larger. There is only scant empirical evidence on these hypotheses. Using the legal CBI index of Cukierman *et al*. (1992) for 55 countries over the period 1980-89, D'Amato *et al.* (2005) find that the budget deficit is not related to the independence of the central bank.

Maxfield (1997) points out that politicians' tenure security will also affect their policies to signal creditworthiness since "leaders insecure in their positions are likely to want to maintain policy flexibility because it provides greater potential for vote-buying and because the benefits of creditworthiness may accrue for the succeeding leadership." (p. 47).[1] Similarly, it may be argued that if inflation surprises are valuable in the short run, and if the chances for a politician to be thrown out of office are high, it will be attractive for politicians to be able to overrun the central bank or to appoint a new governor after they have come to power, be it after elections or otherwise. The short-run benefits of this flexibility may exceed the long-run costs of a higher inflation rate.

There is also an alternative line of reasoning based on using Cukierman's (1994) framework. Suppose that different political parties strongly disagree about the structure of government expenditures. By granting independence to the central bank, the political party in power may restrict the ability of the opposition to spend on its favoured public goods when it comes in office. The benefits of granting independence to the CB are higher than the costs in terms of economic policy flexibility foregone. In this set-up, the political party in office prefers a more independent central bank the smaller its re-election prospects, since the larger are the benefits of CBI in terms of restricting the other party's ability to spend like it prefers. This line of argument

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[1] There is some evidence for this. Farvaque (2002) finds for a sample of 21 OECD countries that average government duration is positively related to CBI (proxied by Cukierman's (1992) legal index). According to Farvaque, this reflects a country's attachment to stability: countries with low government turnout tend to delegate monetary policy more easily.

requires that there exists a minimum level of consensus in the society concerned. If this minimum level of consensus is lacking, the incumbent has an incentive to fortify its hold on power by reducing CBI (Cukierman, 1992). Frequent changes of political regime may indicate absence of this minimum level of consensus and will therefore lead to less CBI.

The foregoing analysis leads to the following hypotheses:

4. The higher the level of political instability (i.e. the lower the tenure security and/or the shorter the policy horizon), the shorter the term in office of the governor will be; alternatively:

5. The higher the level of political instability (i.e. the more often governments are being replaced), the longer the term in office of the governor will be.

6. A CB turnover is more likely after a national election and when the government has changed.

7. The higher the level of regime instability, the shorter the term in office of the governor will be.

The empirical evidence on the relationship between CBI and political instability is mixed. Regression analysis by Cukierman (1992) based on legal independence measures for fourteen middle-income countries over the 1970s and 1980s shows that the coefficients for the proxies of polical instability and regime instability (measured as the number of changes from an authoritarian regime to a democratic one, and vice versa) have positive and negative signs, respectively. This result may be questioned, however, as legal measures of central bank independence may not be a very good proxy for actual central bank independence in developing countries.

Two other studies have employed non-legal measures of central bank independence. Cukierman and Webb (1995) use a measure of political vulnerability, i.e. the fraction of times that political transition is followed by a replacement of the central bank governor, as a dependent variable and four types of political instability as explanatory variables for a mixture of developed and developing countries during the period 1950-1989. Only high-level political instability (i.e. changes in regime) proved to be significant. De Haan and Siermann (1996) have estimated the relationship between central bank independence and political instability using data on the turnover rate of central bank governors for 43 developing countries over four periods (1950-59,

1960-71, 1972-79 and 1980-89) as provided by Cukierman *et al.* (1992). They find that only 'coups' exert a significantly negative effect on central bank independence.

Cukierman (1992) argues that high inflation encourages processes that make it easier for the executive to influence monetary policy. Sufficiently high and sustained inflation leads to the evolution of automatic or semi-automatic accommodative mechanisms, like indexation of contracts in the labour and capital markets, that may undermine CBI (i.e. lead to a high turnover rate of central bank governors). Alternatively, it may be argued that a high inflation rate may cause the replacement of the central bank governor due to dissatisfaction with this policy outcome. Both arguments, although fundamentally different in their reasoning, lead to the following hypothesis:

8.   The higher the rate of inflation the shorter the term in office of the governor will be.[2]

Cukierman (1992) presents the outcomes of bivariate Granger causality tests in which the turnover rate of the central bank's governor is used as CBI indicator. His evidence supports the view that there is a two-way Granger causality between inflation and CBI. The lagged turnover rate affects current inflation, and a higher lagged inflation is associated with a current higher turnover of central bank governors.

There are also studies arguing that sectoral interests are crucial in explaining cross country variation in CBI. One particularly interesting hypothesis, put forward by Posen (1993, 1995) holds that central bank independence is largely determined by the degree of financial sector opposition to inflation, and the effectiveness of the financial sector to mobilize – through the political system – its opposition to inflation.[3] There are several reasons why commercial banks might fear inflation. As banks usually borrow short and lend long, they are vulnerable to changes in the spread of interest

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[2] An alternative hypothesis has been suggested by De Haan and van't Hag (1995) and Hayo (1998) who argue that countries that experience high levels of inflation may be more aware of its harmful consequences and may therefore develop greater inflation aversion (see also Scheve, 2004). This idea is frequently used to explain the low inflation rates recorded in Germany after the Second World War and the independence of the Bundesbank. De Haan and van't Hag (1995) and D'Amato *et al.* (2005) find that past inflation has a positive impact on CBI. This hypothesis cannot be tested in our annual panel data framework.
[3] The empirical evidence that the financial sector is inherently inflation averse is not compelling. Although Posen (1995) presents supportive evidence, other studies find less or no support (De Haan and van't Hag 1995, Campillo and Miron 1997, and Temple 1998).

rates. Moreover, inflation sooner or later leads to anti-inflationary policy and banks may then come under pressure, as higher real interest rates can lead to problems in recovering loans.[4] A central bank that is shielded from politics may make it easier for the financial sector interest groups to influence the central bank without going through the usual checks and balances of the political system. Further, flows of staff members between the CB and private banks increase the ease with which the financial sector can make its interests heard by the monetary authorities, and vice versa. The complementarity of interests can result in the financial sector and central bankers forming a coalition to support each others demands, with the result that inflation is kept low.

Unfortunately, it is impossible to test this line of reasoning similarly to Posen as the required indicators are not available. However, Scheve (2004) argues that a large financial sector may affect average levels of inflation aversion (and thus CBI) at the margin, both directly through individuals employed in the sector and indirectly through the sector's influence on the media. He also reports evidence in support of this view. We therefore have the following hypothesis:

9. The more developed a financial sector is, the longer the term in office of the governor will be.

The effectiveness of interest groups in influencing the set-up of monetary institutions depends on the political system. Various characteristics of the political system may be relevant. As pointed out by Hallerberg (2002), an increase in the number of veto players generally makes it harder for the government to unite to overturn a decision of the central bank. On the basis of a model in which there are two decision-making legislative bodies that both have veto power and that differ with regard to their inflation-output preferences, Moser (1999) argues that countries with strong checks and balances have more independent CBs compared to those with weak or no checks and balances. The empirical evidence presented by Moser (1999) and Farvaque (2002) offers support for this hypothesis.[5] Keefer and Stasavage (2000, 2002) put

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[4] Boyd *et al.* (2001) show that inflation has a negative impact on financial sector performance. Financial sectors in countries with an inflation rate higher than 15% experience significantly inferior performance compared to those in lower inflation countries.
[5] Moser (1999) uses dummies for different classes of the strength of checks and balances, while Farvaque (2002) only employs a dummy for the presence of strong checks and balances.

forward a similar argument, showing that checks and balances are likely to reduce expected inflation and that delegation of monetary policy to a central bank will only have the desired effect if checks and balances are a characteristic of the country's political system. Moreover, checks and balances should matter most when there is a high level of polarization between veto players.[6]

Bernhard (1998) codes countries with "strong bicameralism" and indicates that such states are more likely to have independent central banks. However, Farvaque (2002) provides support for the view that countries with a bicameral system may not have much need to delegate monetary policy and may thus have less independent CBs. He also finds that countries with more federal systems exhibit a high degree of CBI. This is in line with the hypothesis put forward by Hallerberg (2002) that under federalism, sub-national governments generally do not support a dependent central bank that gives more power to the federal government.[7] The foregoing analysis leads to the following hypotheses:

10. The more checks and balances are present in the political system, the longer the term in office of the governor will be.

11. In case of a high degree of political polarization, the more checks and balances are present in the political system, the longer the term in office of the governor will be.

12. In countries with a bi-cameral political system the term in office of the governor will be longer than in countries without such a system.

13. In countries with a federal political system the term in office of the governor will be longer than in countries without such a system.

According to the 'partisan theory', left and right-wing parties have different preferences with respect to inflation and unemployment. As left-wing parties are assumed to care less about inflation, we also have tested the following hypothesis:

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[6] If veto players do not share the same preferences, the central bank can successfully implement a policy that one veto player would prefer to override, as long as a second veto player would refuse to override. This leads to the prediction that CBI will be more effective in case of veto players with different preferences. Keefer and Stasavage (2002) provide support for this view.

[7] In a federal system there are additional subnational checks on changes from the status quo that are lacking in unitary ones. Lijphart (1999) and Hallerberg (2002) report that federalism is associated with CBI. See also Lohmann (1998).

14. Under left-wing governments the term in office of the governor will be shorter than under right-wing governments.

In his analysis of currency crises, Frankel (2005) examines whether the finance minister or central bank (CB) governor – whoever held the office of the country's governor of the IMF – lost his job after a currency crisis. He finds that in the year following a currency crash, the incumbent changed 58.3 percent of the time, while in other years during this period the rate of turnover was 35.8 percent. We therefore have the following hypotheses:

15. A large devaluation or currency crisis increases the likelihood that the CB governor will lose his job.

D' Amato *et al.* (2005) argue that if openness is relevant for understanding the inflationary bias as suggested by Romer (1993), it must be also relevant for the incentives for commitment. A larger degree of openness reduces the inflationary bias and therefore reduces the incentive to commitment for the government. However, Scheve (2004) argues that since inflation is more costly in open economies, individuals in more open economies will be more inflation-averse and therefore prefer a more independent central bank. The foregoing analysis leads to the following hypotheses:

16. The smaller the degree of a country's openness, the shorter the term in office of the governor will be.
17. The smaller the degree of a country's openness, the longer the term in office of the governor will be.

For a sample of 55 countries over the period 1980-89 D'Amato *et al.* (2005) find that openness increases the degree of central bank independence (measured on the basis of Cukierman's (1992) legal CBI index).[8]

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[8] D'Amato et al. also find that synchronization of business cycles and some measure of institutional transparency (average per capita newspapers) are related to CBI. These hypotheses are not tested in the present paper due to lack of sufficient observations.

3. Data and Method

Data

We have updated and substantially extended the database on central bank governors used earlier by De Haan and Kooi (2000). Our main data source is information received directly from central banks. Some central banks provide data on previous governors on their homepage, while for many other central banks we got the information by writing emails and letters. A second source is Morgan Stanley Dean Witter's *Central Bank Directory*.

Our database contains information on the moment at which a CEO of a central bank is replaced (month and year), as well as the official term in office according to the central bank law. We have data for 137 countries covering the period 1970-2004. We tried to get data going back as far as 1970, but did not always succeed either because data were not available for the entire period or because countries came into existence after 1970. According to our data, central bank governors remained in office for 3.6 years on average. On average, a turnover occurred in 22 percent of the country-years. Appendix A describes the set of countries and number of years for which we have information. As can be seen, our data cover all regions fairly well.[9] Figure 1 shows the yearly average turnover for our full sample. It is interesting that after 1995, when many countries increased the independence of their central bank, the average number of turnovers decreases. Figure 2 shows the average turnover for various regions, using the World Bank classification of regions. It becomes clear that there is quite some variation across regions. For instance, in Latin-America and Sub-Saharan Africa the turnover decreases at the end of the sample period, but there is no clear trend in some of the other regions, like Europe and Central Asia.

[insert Figures 1 and 2]

Our data set also includes information on the legal duration of the governors' term in office. The legal term in office ranges between 3 and 8 years. However, these data are not available for all countries or years for which we have data on turnover rates. In some cases, governors' terms are unlimited and the most likely reason for

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[9] All data are available on request.

turnovers is retirement due to age. In other cases limited terms exist, but term duration changes over time, and – for earlier years in particular – we lack the relevant information. Specifically, we obtained data on regular office terms for 91 countries, with an average of 31 years, ranging from a minimum of 8 to a maximum of 36 years. When replicating the analysis with this restricted sample, our main results are unchanged.[10]

Table 1 shows the data used to test the hypotheses formulated in the previous section and their sources, while Appendix B provides descriptive statistics.

[insert Table 1]

As follows from Table 1, most of our economic variables are from the World Bank's World Development Indicators (2005), while the political variables are mainly taken from Beck *et al.* (2001).

Most of the variables employed are straight forward, but some may need some explanation. We use an election variable that measures the post-election period by the share of the year which is within twelve months after a national (legislative or executive) election to test hypothesis 6. We employ three indicators of political instability to test hypothesis 7. First, a dummy that is one if the POLITY IV score changes by more than three points (in either direction). Alternatively, we measure political instability by the first principal component of the number of assassinations, strikes, guerilla warfare, major crises, riots, and revolutions in a particular country and year, and the number of successful coups d'etat. Our third indicator of political instability is the number of (attempted) coups as various studies found this variable to be significant. This variable includes both successful and unsuccessful attempts to overthrow the government in place.

The inflation rate π is transformed by the formula $(\pi/100)/(1+(\pi/100))$ to reduce the influence of extreme observations. Following Claessens and Laeven (2003), financial development is proxied by private credit as a percentage of GDP to test hypothesis 9. In order to test hypothesis 10, we proxy checks and balances by an index constructed in Beck *et al.* (2001) on a scale from 0-18. We also include this variable interacted with the country's degree of political polarization (hypothesis 11).

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[10] The results are available on request.

To test hypotheses 12-14 we employ various dummies: a dummy for the presence of two chambers, a dummy for the existence of autonomous regions, and a dummy for left-wing chief government executives. The final hypotheses are tested using the depreciation of a country's nominal exchange rate with respect to the US$ and an index of currency crises based on the rate of change of the nominal exchange rate and the level of international currency reserves (hypothesis 15) and the country's openness to trade (hypotheses 16/17).

The correlation matrix presented in Table 2 shows that the correlation between the CB governor turnover rate and all explanatory variables is low, never being above 0.09. Also the correlation of the explanatory variables is generally not high. The highest correlations are between the number of veto players that drop and new governments, new governments and changes in democracy, and inflation and capital controls/devaluation. The correlation between private credit and the interaction of polarization and checks is 0.63; the existence of two assemblies is highly correlated with checks.

[insert Table 2]

Method

Our dependent variable is binary, and takes the value one if the central bank governor was replaced in a particular year and country. We estimate our model employing conditional fixed effects Logit. In 98 percent of our country/year observations there is at most one turnover in a particular year. To check to what extent our results are driven by inclusion of observations with more than one change, we also estimate the model excluding these observations as part of our sensitivity analysis.

In case of binary choice variables with panel data we observe:

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\begin{aligned}
y_{it} &= 1 \quad if \quad y_{it}^{*} > 0 \\
y_{it} &= 0 \quad if \quad y_{it}^{*} \leq 0
\end{aligned}
\tag{1}
$$

where: $y_{it}^{*} = x'_{it}\,\beta + \alpha_i + \nu_{it}$. This function can be interpreted as the inclination of the government to replace the CEO of the central bank, which is dependent on observed

variables (x), unobserved individual (country) characteristics (α) and a random error term (v). The probability that we observe a replacement is:

$$P(y_{it} = 1) = P(y_{it}^* > 0) = P(v_{it} > -x'_{it}\beta - \alpha_i) = F(x'_{it}\beta + \alpha_i) \qquad (2)$$

In a fixed effects context, the number of parameters increases with the number of countries. This is known as the incidental parameters problem. Chamberlain (1980) shows that it is impossible to estimate the parameters of this binary choice model consistently and he therefore proposes a method to circumvent this problem, i.e. conditional Logit estimation. The idea of this approach is to condition the likelihood function on a minimal sufficient statistic for the fixed effects. Chamberlain argues that $\sum_{t=1}^{T} y_{it}$ is such a minimum sufficient statistic. The conditional likelihood function can now be written as:

$$L = \prod_{i=1}^{N} P(y_{i1}, \cdots, y_{iT} \mid \sum_{i=t}^{T} y_{it}) \qquad (3)$$

The probability of the observed replacement of the CEO of the central bank no longer depends on the fixed effects (by construction) and hence the coefficients of the variables of interest can be estimated consistently. In essence, the conditional fixed effects Logit estimator compares all observations within a given country when there is a replacement of the central bank governor with all the observations when there is no such change.

There is one obvious problem in employing the conditional fixed effects Logit model: we cannot include variables that do not vary over time. We therefore exclude those variables from the full model specification. However, given our interest in some of these variables, we also estimate Logit models without fixed effects but including the variables with no time series variation.

Since some of the data are not available for all countries or periods, the yearly panel data are unbalanced and the number of observations depends on the choice of explanatory variables. All explanatory economic variables are lagged by one year to avoid simultaneity.

To control for the probability of regular turnovers, we include in all regressions the share of the governors' term in office that has elapsed, which is based on the term in office as stipulated by the central bank law. For instance, if the legal term in office is 8 years, say, and the governor has been in office for 4 years this variable is 0.5. However, in case of an indefinite or unknown term in office it is not obvious how to construct this variable. We consider three alternatives to deal with this problem. First, we assume the term in office for countries with indefinite or unknown term in office to be equal to the average time in office in our sample, i.e. 3.6 years. Second, we take the average of those countries that have specified the term in office of the CB governor in their central bank law (5 years). Finally, we take the maximum legal term in office of 8 years. In the analysis below we focus on the third alternative but the results are robust to this particular choice.[11]

The regressions take the form:

$$tor_{it} = \alpha + \beta_1 shelap_{it-1} + \beta_2' X_{it-1} + \eta_i + \varepsilon_{it} , \qquad (4)$$

where *tor* is one when at least one change of governors occured; *shelap* is the share of the governors' term in office elapsed, and *X* is a vector of variables testing our hypotheses. η_i are the country dummies and ε_{it} is an i.i.d. disturbance.

We start testing each hypothesis separately by adding the corresponding variables one at the time to a model that only contains the share of the term in office elapsed. As important covariates are thus missing, these models are likely to be misspecified and can just be a starting point.

To test the robustness of our models, we employ the so-called Extreme Bounds Analysis (EBA) to examine to what extent our variables are robust determinants of the number of turnovers. The EBA has been widely used in the economic growth literature, but also for other purposes.[12] The use of the EBA can be motivated as follows. In research an important difficulty is that several models may all seem reasonable given the data, but yield different conclusions about the parameters of interest. The EBA aims to examine how sensitive the estimation results

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[11] Results are available on request.
[12] For instance, Durham (2004) employs the EBA to examine the relationship between institutions and economic growth, while Baxter and Kouparitsas (2005) use it to analyse which variables affect business cycle synchronization.

are for the inclusion of additional variables. We estimate equations of the following general form:

$$tor_{i,t} = \alpha M_{i,t} + \beta F_{i,t} + \gamma Z_{i,t} + u_{i,t} \tag{5}$$

where M is a vector of 'standard' explanatory variables; F is the variable of interest; Z is a vector of up to three (here we follow Levine and Renelt 1992) possible additional explanatory variables, which according to the literature may be related to the dependent variable; and u is an error term. The extreme bounds test as suggested by Leamer (1983) for variable F states that if the lower extreme bound for β – i.e. the lowest value for β minus two standard deviations – is negative, while the upper extreme bound for β – i.e. the highest value for β plus two standard deviations – is positive, the variable F is not robustly related to Y. In our case, the F variables follow from the hypotheses formulated in section 2. The variables in the Z vector follow from the other hypotheses formulated. There is a trade-off with regard to the choice of variables to be included in the M vector: the more variables are included in this vector, the smaller the likelihood that the models are misspecified. However, given the unbalanced nature of our sample, including more variables substantially reduces the number of observations on which the results are based. We therefore chose two specifications. In the first one the M vector only includes the remaining time in office, while in the second specification the M vector consists of variables selected on the basis of the general-to-specific approach as suggested by Temple (2000). Specifically, we test down from a general specification including all variables, and consecutively eliminating those with the smallest t-statistic until the model only contains variables that are significant at the ten percent level at least. The first approach guarantees that the results are based on the maximum number of observations available, but is likely to include many misspecified regressions, while the second approach is based on a properly specified model, but contains fewer observations.

It is rare in empirical research that we can say with certainty that some model dominates all others in all possible dimensions. In these circumstances, it makes sense to check how sensitive the findings are to alternative modelling choices. The EBA provides a relatively simple means of doing exactly this. Still, the EBA has been criticized. Sala-i-Martin (1997) rightly argues that the test applied is too strict. If the

distribution of β has some positive and some negative support, then one is bound to find at least one regression for which the estimated coefficient changes sign if enough regressions are run. Sala-i-Martin therefore suggests to analyse the entire distribution of the estimated β coefficients. We report the percentage of the regressions in which the coefficient of the variable F is significantly different from zero at the 5 percent level as well as the outcomes of the cumulative distribution function (CDF) test. The CDF test as proposed by Sala-i-Martin (1997) is based on the fraction of the cumulative distribution function lying on each side of zero. CDF(0) indicates the larger of the areas under the density function either above or below zero; in other words, regardless of whether this is CDF(0) or 1-CDF(0). So CDF(0) will always be a number between 0.5 and 1.0. Following Sala-i-Martin, a variable is considered to be robust if the CDF(0) test statistic > 0.90.[13]

4. Empirical results: full sample

Tables 3 presents the results when each variable is included one at the time in addition to the share of the current term in office already elapsed. In all regressions, the share of the current term in office already elapsed is significant at the one percent level, with the expected positive coefficient. Furthermore, the signs of the coefficients that are significant at the ten percent level or more are in line with the hypotheses as outlined in section 2.

[insert Table 3]

The results in Table 3 lend support to hypotheses 4, 6, 7, 8 and 14. The likelihood that a central bank governor will be changed is higher if a greater number of veto players drop from the government. This is in line with hypothesis 4. Also

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[13] Recently, Sala-i-Martin *et al.* (2004) proposed a so-called Bayesian Averaging of Classical Estimates (BACE) approach to check the robustness of different explanatory variables in growth regressions. This approach builds upon the approach as suggested by Sala-i-Martin (1997) in the sense that different specifications are estimated (by OLS) to check the sensitivity of the coefficient estimate of the variable of interest. The major innovation of BACE as compared to Sala-i-Martin's approach is that there is no set of fixed variables included and the number of explanatory variables in the specifications is flexible. The biggest disadvantages of the BACE approach are the need of having a balanced data set, i.e. an equal number of observations for all regressions (due to the chosen weighting scheme), the restriction of limiting the list of potential variables to be less than the number of observations and the computational burden.

hypothesis 6 on the impact of elections and new governments is supported: a new government in power and elections increase the likelihood that the CB governor will be replaced. There is evidence in favour of hypothesis 8 according to which political regime instability increases the probability of turnovers. The coefficients of all three indicators of regime instability are significantly different from zero. High inflation increases the likelihood that the CEO of the central bank will be replaced (hypothesis 8). Finally, when there is a left wing government in office the probability that a new governor will be appointed increases (hypothesis 14).

The results clearly show that most of our hypotheses are not supported by the data. Specifically, the variables debt and budget deficits, checks and balances, the index for currency crises, and openness to trade are not related to turnover rates.[14] Hypotheses 10-13 are also not supported by these simple regressions.

Table 4 shows the outcomes for the EBA in which the *M* vector only consists of the share of the current term in office elapsed. The results lend support to four hypotheses. First, the appointment of a new central bank governor is more likely with a greater percentage of veto players dropping. Second, turnovers are significantly more likely after an election. Third, the probability that the CEO of the central bank will be replaced increases with political regime instability (measured by the frequency of coups and by changes to and from democracy; the other indicator of regime instability is not robustly related to the likelihood that the central bank governor will be replaced). Finally, inflation appears robustly related to central bank governor changes. Whereas Table 3 suggests support for hypothesis 14, the EBA analysis as reported in Table 4 does not.

[insert Table 4]

As pointed out in section 3, we have two versions of the EBA. In Table 4 the only variable in the *M* vector is the share of the current term in office elapsed. Consequently, the estimated models may be misspecified. As an alternative, we have therefore followed the suggestion of Temple (2000) to identify the variables in the *M* vector by the general-to-specific approach. The results are presented in Table 5, using different estimation methods. Column (1) shows the conditional Logit model using all

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[14] The latter result contradicts the findings by D'Amato *et al.* (2005). However, these authors use legal indicators of CBI.

observations, while in Column 2 we omit country/years with more than one turnover to check whether the results are sensitive to the inclusion of county-years with more than one turnover. It turns out that the outcomes of both models are virtually the same. In columns (3) and (4) we exclude (conditional) fixed effects. While the results in column (3) are estimated by conditional Logit, column (4) shows Probit estimations for comparison. The coefficients in the regressions are of course different because different mathematical functions are being fitted. Still, the qualitative results are similar, increasing our confidence in their reliability.

[insert Table 5]

The estimation results as reported in Table 5 suggest that five variables should be included in the M vector: the share of the current term elapsed, the share of veto players who drop, the election dummy, the dummy for the occurrence of coups, and inflation. Table 6 shows the outcomes of the EBA when these variables are taken up in the M vector. The results show that the CDF(0) for all variables in the M vector exceeds 0.90. These results therefore confirm most of our previous findings. In addition, two variables also seem to be robustly related to the likelihood that a central bank governor will be replaced, i.e. the government budget deficit and private credit. Note, however, that the share of regressions in which the coefficients of these variables are significantly different from zero is very low.

[insert Table 6]

5. *Further analysis*

Our results suggest that apart from the share of the current term in office elapsed, high levels of political and regime instability, the occurrence of elections, and high inflation increase the probability that the CEO of the central bank will be replaced. The corresponding marginal effects are far from being negligible. Using the results as shown in column 1 of Table 5, one additional year in office increases the probability of a turnover by 17 percent. The corresponding percentages for the other variables are 7 (drop of veto players), 14 (elections), 22 (coups), and 21 (inflation).

How well does our model predict the probability that the central bank governor will be replaced in a particular country? To answer this question, we use the quadratic probability score (*QPS*) proposed by Diebold and Rudebusch (1989), which gives an indication of the average closeness of the predicted probabilities and the observed realizations, as measured by a dummy variable that is one when the central bank governor is replaced and zero otherwise.[15] Suppose we have a time series for each country of length T of probability forecasts P_t, where P_t is the predicted probability that the central bank governor will be replaced in period t. Similarly, let Z_t be the corresponding time series of realisations; Z_t equals one if the governor is replaced in period t and equals zero otherwise. The *QPS* is then given by:

$$QPS = \frac{1}{T}\sum_{t=1}^{T} 2(P_t - Z_t)^2 \qquad (6)$$

The *QPS* ranges from 0 to 2, with a score of 0 corresponding to perfect accuracy if the estimated probability is 1 and a turnover does occur for all t. A score of 2 shows that the model indicates a perfectly false signal in which the estimated probability is 1 and a change does not occur for all t. Table 7 reports the accuracy of the model, both for the full sample as well as for various subsamples. For comparison, a naïve model that always predicts no turnover has a QPS of 0.205 for our sample data. A model always predicting a turnover to occur has a score of 0.8.

[insert Table 7]

Table 7 shows that our model always outperforms the naïve predictions. However, the table also shows that there is substantial variation among our sub-samples. QPS is lowest for the time period after 1990 (0.15), and highest for non-OECD countries and democratic ones (0.20). In the overall sample, the QPS is 0.19.

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[15] Jacobs *et al.* (2005) use this method to examine their model on the likelihood of currency crisis in Asia.

As Table 7 suggests that the accuracy of the model is much better for some groups of countries than for others, we have redone our analysis for various sub samples distinguishing between:

- OECD vs. non-OECD countries,
- democratic vs. non-democratic countries, and
- observations before and after 1990.

The literature on CBI suggests that the relationship between CBI and inflation is different in industrial vs. non-industrial countries. For instance, legal indicators for CBI turn out to be related to inflation in OECD countries, but this relationship is not apparent for developing countries. We have therefore redone the EBA for the OECD countries and for the non-OECD countries. Table 8 shows that there are indeed some remarkable differences between these two groups of countries. The only variable in the base model that is robust for the OECD countries is the share of the current term in office elapsed. In addition, the presence of capital controls has a CDF(0) > 0.90, which lends some support to the views put forward by Maxfield (1997). For the non-OECD countries most of our previous results are confirmed except for the indicator of political instability (number of vero players who drop) which appears non-robust.

We distinguish between democratic and non-democratic countries as the incentives and possibilities for policy makers to replace the central bank governor are likely to be different across the regimes. As a cut-off point to differentiate between country/years we have taken the average value of the Polity IV democracy score among our sample of countries (=3.8). As the final columns in Table 8 show, there are indeed some differences between the results for both groups of countries. Inflation is no longer robust in the non-democratic countries. Not surprisingly, elections are no longer robust for these countries also. Interestingly, the presence of autonomous regions appears now robust in both sub samples.

Finally, we split the sample in observations before and after 1990. The term in office, elections and private credit are robust in both samples, but inflation is only robust in the second period, as are currency crises, lending support to Frankel's (2005) hypothesis. Also checks and balances and autonomous regions are robust in the second period.

[insert Table 8]

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6. Summary and concluding comments

We use a new data set on the term in office of central bank governors in 137 countries covering the period 1970-2004 to estimate a model for the chance that a central bank governor is replaced. Most hypotheses that we derive from the literature on the determinants of central bank independence and that have been tested using conditional logit models and the Extreme Bounds Analysis are rejected. We find that the share of the current term in office elapsed, high levels of political and regime instability, the occurrence of elections in democracies, and high inflation increase the probability of a turnover, although the latter result does not hold for non-democratic countries.

Our findings on the robust impact of inflation on the likelihood that a central bank governor will be replaced, is also relevant for the literature on central bank independence as the use of the turnover rate of central bank governors as a proxy for independence has been criticized for being endogenous. Our evidence that the likelihood that a central bank governor will be fired increases with higher inflation rates lends support to this critique.

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Figure 1. Average turnover rate over time
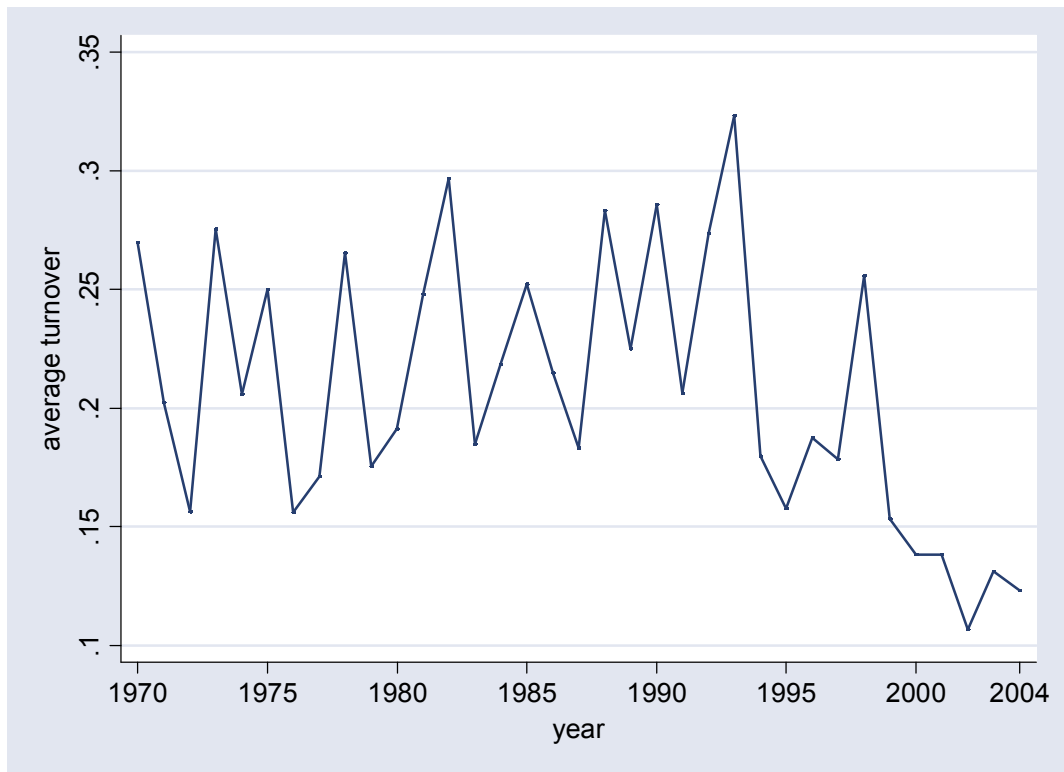
Figure 2. Average turnover rate across regions over time

Graphs by region
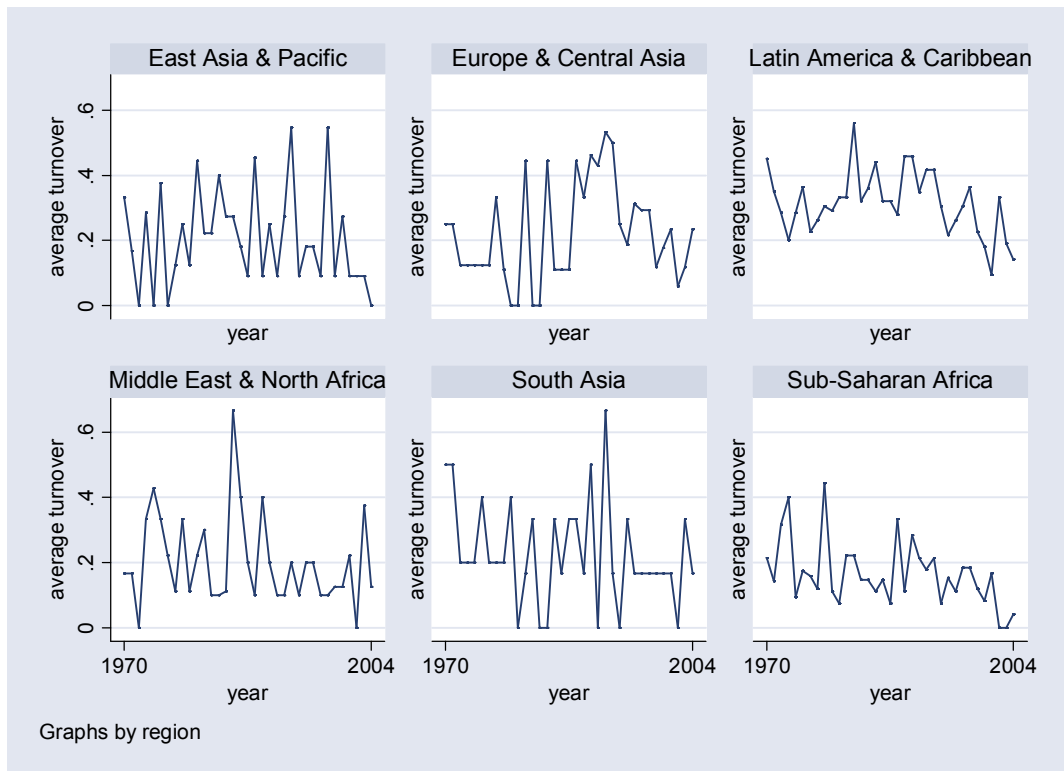
Table 1. Variables used to test the hypotheses

Hypothesis:	Variable used:	Source:
1. The higher the stock of external debt the longer the term in office of the governor will be	External debt of central government as % of GDP	World Bank, WDI (2005)
2. The higher the government budget deficit, the longer the term in office of the governor will be	Government budget balance as % of GDP	World Bank, WDI (2005)
3. The lower the restrictions on international financial transactions are, the longer the term in office of the governor will be	Average of 4 indicators (surrender of export proceeds, multiple exchange rate, capital account restictions, current account restrictions)	Grilli and Milesi-Ferretti (1995)
4/5. The higher the level of political instability, the shorter/longer the term in office of the governor will be	Percentage of veto players who drop	Beck *et al.* (2001)
6. A CB turnover is more likely after a national election and when the government has changed	Part of a year which is within 12 months after an executive or legislative election; Dummy for new chief executive party	Dreher and Vaubel (2005), Beck *et al.* (2001)
7. The higher the level of regime instability, the shorter the term in office of the governor will be	Dummy variable that is 1 if the change in the Polity democracy variable > 3; First principal component of various instablity indicators; coups	Marshall and Jaggers (2000), Banks (1999)
8. The higher the rate of inflation, the shorter the term in office of the governor will be	Transformed inflation	World Bank, WDI (2005)
9. The more developed a financial sector is, the longer the term in office of the governor will be	Private credit by deposit money banks and other financial institutions scaled to GDP	Beck *et al.* (1999)

Table 1 (continued).

Hypothesis:	Variable used:	Source:
10. The more checks and balances are present in the political system, the longer the term in office of the governor will be	Checks and balances	Beck *et al.* (2001)
11. In case of a high degree of political polarization, the more checks and balances are present in the political system, the longer the term in office of the governor will be	polarization*checks and balances	Beck *et al.* (2001)
12. In countries with a bi-cameral political system the term in office of the governor will be longer than in countries without such a system	Dummy that is one if there are two chambers	Beck *et al.* (2001)
13. In countries with a federal political system the term in office of the governor will be longer than in countries without such a system	Dummy indicating whether there are autonomous regions	Beck *et al.* (2001)
14. Under left-wing governments the term in office of the governor will be shorter than under right-wing governments	Party of chief executive is left-wing	Beck *et al.* (2001)
15. A large devaluation or currency crisis increases the likelihood that the CB governor will lose his job	Depreciation of the nominal exchange rate with respect to the US$; A country is defined as experiencing a currency crisis when index covering the rate of change of the exchange rate and international currency reserves is one standard deviation greater than the index mean	World Bank, WDI (2005), Dreher et al. (2006)
16/17. The smaller the degree of a country's openness, the shorter/longer the term in office of the governor will be	Sum of exports and imports of goods and services measured as a share of gross domestic product	World Bank, WDI (2005)

Table 2. Correlations and number of observations

	Turnover	Share elapsed	External debt	Budget deficit	Controls	Veto players drop	Elections	New governnment	Change in democracy	Instability	Coups	Inflation	Private credit	Checks	Polarization *checks	Two assemblies	Autonomous regions	Left	Depreciation	Currency crisis	Openness
Turnover, dummy	1.00 (4226)																				
Share of term elapsed	0.02 (4070)	1.00 (4153)																			
External debt (share of GDP), t-1	-0.02 (2438)	0.03 (2420)	1.00 (3568)																		
Budget deficit (share of GDP), t-1	0.02 (737)	-0.03 (751)	-0.22 (657)	1.00 (907)																	
Capital controls, t-1	0.06 (2921)	0.01 (2929)	0.08 (2373)	-0.03 (633)	1.00 (3618)																
Percentage of veto players who drop	0.07 (3003)	-0.06 (3044)	0.04 (2673)	-0.05 (672)	0.01 (2852)	1.00 (4887)															
Elections	0.08 (3649)	0.02 (3653)	0.01 (3171)	-0.02 (711)	-0.01 (3497)	0.25 (4887)	1.00 (4226)														
New governnment, dummy	0.05 (4226)	-0.06 (4153)	0.01 (3568)	-0.05 (907)	0.01 (3618)	0.63 (4887)	0.02 (4070)	1.00 (4153)													
Change in democracy, dummy	0.09 (4226)	-0.04 (4153)	0.02 (3568)	0.00 (907)	0.06 (3618)	0.05 (4887)	0.01 (4070)	0.89 (4153)	1.00 (4153)												
Instability	0.09 (3609)	-0.08 (3537)	0.03 (3130)	-0.02 (706)	0.10 (3392)	0.11 (4279)	-0.02 (2438)	0.03 (2420)	0.03 (2420)	1.00 (3568)											
Coups	0.09 (3348)	-0.01 (3270)	-0.01 (2880)	-0.01 (540)	0.04 (3133)	0.04 (3902)	0.02 (737)	-0.03 (751)	-0.03 (751)	-0.22 (657)	1.00 (907)										
Inflation, t-1	0.13 (3434)	-0.12 (3461)	0.21 (2969)	-0.07 (877)	0.31 (3208)	0.05 (3330)	0.06 (2921)	0.01 (2929)	0.06 (2929)	0.08 (2373)	-0.03 (633)	1.00 (3618)									
Private credit (percent of GDP), t-1	-0.07 (2872)	0.08 (2882)	-0.10 (2443)	0.20 (672)	-0.47 (2967)	0.00 (2984)	0.07 (3003)	-0.06 (3044)	-0.04 (3044)	0.04 (2673)	-0.05 (672)	0.01 (2852)	1.00 (4887)								
Checks and balances	0.02 (3077)	-0.01 (3111)	-0.10 (2697)	0.08 (665)	-0.17 (2921)	0.20 (4771)	0.08 (3649)	0.02 (3653)	0.01 (3653)	0.01 (3171)	-0.02 (711)	-0.01 (3497)	0.25 (4887)	1.00 (4991)							
Polarization*checks and balances	0.02 (2935)	0.02 (2969)	-0.06 (2556)	0.06 (597)	-0.21 (2798)	0.10 (4593)	0.05 (4226)	-0.06 (4153)	-0.04 (4153)	0.01 (3568)	-0.05 (907)	0.01 (3618)	0.63 (4887)	0.69 (4805)	1.00 (4805)						
Two assemblies, dummy	-0.01 (3013)	0.04 (3020)	-0.14 (2605)	0.05 (616)	-0.19 (2933)	0.04 (3725)	0.09 (4226)	-0.04 (4153)	-0.01 (4153)	0.02 (3568)	0.00 (907)	0.06 (3618)	0.05 (4887)	0.43 (3834)	0.32 (3660)	1.00 (4439)					
Autonomous regions, dummy	-0.01 (3031)	-0.02 (3063)	-0.02 (2672)	0.01 (654)	-0.03 (2908)	0.04 (4681)	0.09 (3609)	-0.08 (3537)	-0.06 (3537)	0.03 (3130)	-0.02 (706)	0.10 (3392)	0.11 (4279)	0.05 (4775)	0.05 (4600)	0.03 (3796)	1.00 (4955)				
Left governments, dummy	0.03 (3860)	-0.07 (3778)	0.11 (3303)	-0.02 (787)	0.08 (3617)	0.04 (4887)	0.09 (3348)	-0.01 (3270)	0.01 (3270)	-0.01 (2880)	-0.01 (540)	0.04 (3133)	0.04 (3902)	0.13 (4991)	0.04 (4805)	0.01 (4439)	0.08 (4955)	1.00 (6863)			
Currency Depreciation, t-1	0.04 (3726)	-0.04 (3750)	0.17 (3430)	-0.06 (898)	0.09 (3442)	0.03 (4300)	0.13 (3434)	-0.12 (3461)	-0.06 (3461)	0.21 (2969)	-0.07 (877)	0.31 (3208)	0.05 (3330)	0.02 (4379)	0.01 (4197)	-0.01 (3882)	-0.01 (4342)	0.03 (5313)	1.00 (5688)		
Currency crisis, dummy, t-1	0.01 (3484)	-0.03 (3497)	0.03 (3214)	-0.01 (857)	0.03 (3250)	0.03 (3617)	-0.07 (2872)	0.08 (2882)	0.06 (2882)	0.06 (2443)	-0.10 (672)	0.20 (2967)	-0.47 (2984)	0.08 (3682)	0.08 (3506)	0.04 (3484)	0.04 (3624)	0.05 (4357)	0.19 (4694)	1.00 (4694)	
Openness, t-1	-0.06 (3485)	0.03 (3505)	0.14 (3406)	0.00 (862)	-0.26 (3413)	-0.09 (3756)	0.02 (3077)	-0.01 (3111)	-0.01 (3111)	-0.10 (2697)	0.08 (665)	-0.17 (2921)	0.20 (4771)	-0.09 (3830)	-0.04 (3644)	-0.08 (3570)	-0.06 (3812)	-0.08 (4662)	-0.03 (4659)	0.00 (4273)	1.00 (4965)

Table 3. Central Bank Governor Turnovers, conditional Logit

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Share of term elapsed	0.519 (5.64***)	2.544 (7.04***)	0.686 (7.84***)	0.751 (8.42***)	0.638 (8.3***)	0.544 (7.94***)	0.541 (7.89***)	0.717 (8.93***)	0.787 (9.25***)	0.696 (8.63***)	0.683 (7.82***)	0.390 (4.89***)	0.770 (8.31***)	0.352 (4.55***)	0.410 (4.96***)	0.624 (8.36***)	0.652 (8.58***)	0.677 (8.59***)	0.669 (8.56***)
External debt (share of GDP), t-1	0.001 (0.49)																		
Budget deficit (share of GDP), t-1		0.009 (0.22)																	
Capital controls, t-1			0.262 (1.21)																
Percentage of veto players who drop				0.597 (3.91***)															
Elections					0.652 (4.88***)														
New governnment, dummy						0.490 (3.42***)													
Change in democracy, dummy							1.060 (3.94***)												
Instability								0.224 (2.89***)											
Coups									0.954 (3.73***)										
Inflation, t-1										1.270 (3.62***)									
Private credit (percent of GDP), t-1											0.276 (0.86)								
Checks and balances												0.037 (1.21)							
Polarization*checks and balances													0.022 (1.21)						
Two assemblies, dummy														-0.068 (0.49)					
Autonomous regions, dummy															-0.111 (0.47)				
Left governments, dummy																0.264 (2.07**)			
Currency Depreciation, t-1																	1.679 (1.19)		
Currency crisis, dummy, t-1																		0.218 (1.55)	
Openness, t-1																			0.002 (0.75)
Prob > Chi2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	no	yes	yes	yes	yes
Number of countries	93	59	102	128	130	132	132	129	128	123	115	133	128	129	127	130	130	127	125
Number of observations	2392	554	2869	2956	3563	4050	4050	3460	3194	3362	2814	3049	2882	2974	3003	3681	3655	3426	3403
Number of countries	93	59	102	128	130	132	132	129	128	123	115	133	128	129	127	130	130	127	125
Number of observations	2391	554	2869	2956	3563	4050	4050	3460	3194	3362	2815	3049	2882	2974	3003	3681	3655	3426	3403

Notes: * denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 4. Extreme Bounds Analysis, only share of term elapsed in *M* vector model

	beta (min)	beta (max)	beta (average)	beta (std)	percent significant	cdf
Base model						
Share of term elapsed	0.29	4.40	1.04	0.15	100.00	1.00
Variables with time series variation						
External debt (share of GDP), t-1	-0.02	0.01	0.00	0.00	0.00	0.70
Budget deficit (share of GDP), t-1	-0.12	0.23	0.03	0.05	0.00	0.73
Capital controls, t-1	-3.01	2.50	0.05	0.36	0.00	0.68
Percentage of veto players who drop	-1.32	2.11	0.60	0.23	89.46	0.98
Elections	-0.01	2.50	0.74	0.20	99.88	1.00
New governnment, dummy	-1.02	2.10	0.31	0.22	34.93	0.89
Change in democracy, dummy	-4.53	2.15	0.66	0.43	75.12	0.92
Instability	-0.24	0.95	0.17	0.12	19.49	0.89
Coups	-2.35	5.91	1.03	0.50	77.21	0.98
Inflation, t-1	-3.20	5.15	1.18	0.55	78.80	0.96
Private credit (percent of GDP), t-1	-9.67	9.95	0.94	0.66	20.96	0.86
Polarization*checks and balances	-0.15	0.19	0.02	0.03	7.84	0.82
Left governments, dummy	-1.78	2.14	0.16	0.24	1.96	0.79
Currency Depreciation, t-1	-18.77	18.01	0.88	1.95	0.00	0.73
Currency crisis, dummy, t-1	-1.08	1.86	0.24	0.21	4.53	0.86
Openness, t-1	-0.06	0.05	0.00	0.01	0.00	0.74
Variables with no time series variation						
Checks and balances	-0.13	0.23	0.04	0.03	8.82	0.86
Autonomous regions, dummy	-0.37	1.58	0.12	0.14	15.81	0.71
Two assemblies, dummy	-2.68	2.10	-0.11	0.26	0.00	0.75

Notes: the share of time in office elapsed is included in all regressions. Estimation with conditional fixed effects Logit and, when variables do not vary over time, Logit.

Table 5. Selection of the variables to be included in the *M* vector using the general-to-specific approach

	(1)	(2)[a]	(3)	(4)
Share of term elapsed	0.825	0.817	0.378	0.217
	(7.97***)	(7.87***)	(4.24***)	(4.28***)
Percentage of veto players who drop	0.340	0.370	0.340	0.190
	(1.92*)	(2.05**)	(1.98**)	(1.94*)
Election	0.650	0.610	0.730	0.420
	(3.93***)	(3.59***)	(4.56***)	(4.45***)
Coups	1.040	1.020	1.160	0.690
	(3.05***)	(2.93***)	(3.59***)	(3.55***)
Inflation, t-1	1.020	0.740	1.630	0.970
	(2.32**)	(1.56)	(4.92***)	(4.91***)
Method	Logit	Logit	Logit	Probit
Fixed effects	yes	yes	no	no
Prob > Chi2	0.00	0.00	0.00	0.00
Sample	all	all	all	all
Number of countries	119	119	124	124
Number of observations	2339	2300	2362	2362

Notes:

[a]: country/years with more than one turnover excluded

* denotes significant at 10% level; ** significant at 5% level; *** significant at 1% level.

Table 6. Extreme Bounds Analysis using an extended set of variables in the *M* vector

	beta (min)	beta (max)	beta (average)	beta (std)	percent significant	cdf
Base model						
Share of term elapsed	0.41	4.31	1.21	0.23	100.00	1.00
Percentage of veto players who drop	-2.41	1.62	0.35	0.31	32.73	0.90
Elections	-0.08	3.07	0.83	0.27	98.64	1.00
Coups	-1.75	5.76	1.28	0.61	76.82	0.98
Inflation, t-1	-3.04	5.67	1.05	0.72	57.27	0.91
Variables with time series variation						
External debt (share of GDP), t-1	-0.01	0.01	0.00	0.00	0.00	0.68
Budget deficit (share of GDP), t-1	-0.08	0.25	0.09	0.06	0.00	0.90
Capital controls, t-1	-2.99	2.79	-0.02	0.53	0.00	0.58
New governnment, dummy	-1.31	2.83	-0.03	0.38	1.82	0.85
Change in democracy, dummy	-5.25	1.73	0.16	0.58	5.45	0.92
Instability	-0.31	0.91	0.10	0.15	0.00	0.68
Private credit (percent of GDP), t-1	-13.95	10.02	1.71	1.11	36.97	0.92
Polarization*checks and balances	-0.12	0.19	0.03	0.04	6.06	0.83
Left governments, dummy	-2.07	2.01	0.11	0.34	0.00	0.77
Currency Depreciation, t-1	-33.29	19.59	-0.69	3.11	0.00	0.74
Currency crisis, dummy, t-1	-1.12	1.90	0.29	0.29	0.00	0.81
Openness, t-1	-0.07	0.05	0.00	0.01	0.00	0.64
Variables with no time series variation						
Checks and balances	-0.11	0.27	0.04	0.04	0.00	0.82
Autonomous regions, dummy	-2.79	3.13	-0.19	0.37	0.00	0.77
Two assemblies, dummy	-0.40	1.39	0.13	0.17	15.91	0.75

Notes: variables included in the *M* vector: the share of the current term elapsed, the share of veto players who drop, the election dummy, coups, and inflation. Estimation with conditional fixed effects Logit and, when variables do not vary over time, Logit.

Table 7. Quadratic Probability Scores

	QPS
All countries	0.19
Non OECD	0.20
OECD	0.16
Democratic	0.20
Non-democratic	0.16
>1990	0.15
<1991	0.19

Table 8: EBA (extended base model) for different sub samples

	Non OECD		OECD		Democratic		Non-democratic		>1990		<1991	
	% significant	cdf	% significant	cdf	% significant	cdf	% significant	cdf	% significant	cdf	% significant	cdf
Base model												
Share of term elapsed	100.00	1.00	80.45	0.99	100.00	1.00	82.27	0.95	100.00	1.00	75.00	1.00
Percentage of veto players who drop	31.82	0.88	8.64	0.69	0.45	0.82	7.88	0.88	14.55	0.88	2.73	0.80
Elections	99.55	1.00	41.82	0.87	100.00	1.00	0.00	0.78	70.91	0.98	66.82	0.99
Coups	76.82	0.98	n.a.	n.a.	24.55	0.91	62.27	0.97	47.73	0.91	0.00	0.87
Inflation, t-1	38.64	0.92	0.91	0.79	75.00	0.95	0.00	0.66	60.00	0.97	0.00	0.74
Variables with time series variation												
External debt (share of GDP), t-1	0.00	0.67	42.42	0.88	0.00	0.57	0.83	0.84	0.00	0.66	8.33	0.94
Budget deficit (share of GDP), t-1	1.21	0.93	0.00	0.78	0.00	0.92	n.a.	n.a.	0.00	0.90	n.a.	n.a.
Capital controls, t-1	0.00	0.66	32.12	0.91	0.00	0.57	0.00	0.68	0.00	0.62	0.00	0.60
New governnment, dummy	6.67	0.91	0.00	0.64	0.00	0.78	0.00	0.87	0.00	0.65	10.00	0.88
Change in democracy, dummy	0.00	0.91	0.00	0.69	37.58	0.91	0.00	0.69	0.00	0.85	100.00	1.00
Instability	27.27	0.78	0.00	0.72	0.00	0.63	0.00	0.60	0.00	0.81	0.00	0.59
Private credit (percent of GDP), t-1	72.73	0.97	0.00	0.77	20.00	0.83	59.17	0.97	29.09	0.92	100.00	1.00
Polarization*checks and balances	0.00	0.76	13.33	0.78	0.00	0.77	0.00	0.64	0.00	0.86	48.33	0.92
Left governments, dummy	0.00	0.79	0.00	0.62	0.00	0.74	0.00	0.65	0.00	0.73	0.00	0.62
Currency Depreciation, t-1	0.00	0.72	0.00	0.65	0.00	0.57	0.00	0.71	0.00	0.69	0.00	0.61
Currency crisis, dummy, t-1	0.00	0.70	0.00	0.80	3.03	0.84	0.00	0.63	36.97	0.94	0.00	0.75
Openness, t-1	0.00	0.72	6.06	0.79	0.00	0.77	0.00	0.66	0.00	0.68	0.00	0.64
Variables with no time series variation												
Checks and balances	5.00	0.87	0.45	0.71	0.00	0.61	0.00	0.79	55.00	0.95	0.00	0.78
Autonomous regions, dummy	23.64	0.89	9.55	0.86	53.94	0.92	29.70	0.97	31.36	0.95	0.00	0.81
Two assemblies, dummy	0.91	0.69	n.a.	n.a.	0.00	0.69	0.00	0.83	0.00	0.68	0.00	0.77

Appendix A. Countries and periods included in most extensive sample

country	number of years	country	number of years	country	number of years	country	number of years	country	number of years
Albania	13	Croatia	15	India	35	Namibia	15	Sri Lanka	35
Algeria	30	Cyprus	35	Indonesia	32	Nepal	35	Sudan	35
Argentina	35	Czech Republic	35	Iran, Islamic Rep.	35	Netherlands	35	Suriname	30
Australia	35	Denmark	35	Ireland	35	Netherlands Antilles	35	Swaziland	31
Austria	35	Djibouti	21	Israel	35	New Zealand	35	Sweden	35
Bahamas, The	31	Dominican Republic	35	Italy	35	Nicaragua	18	Switzerland	35
Bahrain	35	Ecuador	35	Jamaica	35	Nigeria	35	Syrian Arab Republic	24
Bangladesh	33	Egypt, Arab Rep.	35	Japan	35	Norway	35	Tanzania	35
Barbados	33	El Salvador	35	Jordan	35	Pakistan	35	Thailand	35
Belgium	35	Equatorial Guinea	33	Kazakhstan	35	Panama	18	Trinidad and Tobago	35
Belize	21	Estonia	15	Kenya	35	Paraguay	35	Tunisia	28
Bermuda	35	Ethiopia	35	Korea, Dem. Rep.	35	Peru	23	Turkey	35
Bhutan	23	Fiji	31	Kuwait	35	Philippines	35	Uganda	35
Bolivia	30	Finland	35	Latvia	14	Poland	35	United Kingdom	35
Bosnia and Herzegovina	8	France	35	Lebanon	35	Portugal	35	United States	35
Botswana	30	Gabon	33	Lesotho	27	Qatar	10	Uruguay	35
Brazil	35	Gambia, The	26	Libya	15	Romania	35	Vanuatu	25
Bulgaria	35	Georgia	28	Lithuania	15	Russian Federation	15	Venezuela, RB	35
Burundi	28	Germany	35	Luxembourg	7	Samoa	21	Zambia	35
Canada	35	Ghana	35	Madagascar	30	Saudi Arabia	35	Zimbabwe	23
Cape Verde	22	Greece	35	Malawi	35	Serbia and Montenegro, Fed. Rep.	35		
Central African Republic	35	Guatemala	35	Malaysia	35	Seychelles	27		
Chad	33	Guinea	23	Malta	35	Singapore	35		
Chile	35	Guyana	35	Mauritius	35	Slovak Republic	12		
China	35	Haiti	31	Mexico	35	Slovenia	14		
Colombia	35	Honduras	30	Mongolia	35	Solomon Islands	22		
Congo, Dem. Rep.	33	Hungary	35	Morocco	35	South Africa	35		
Costa Rica	35	Iceland	35	Mozambique	30	Spain	35		

Appendix B. Descriptive Statistics

Variable	Source	Obs.	Mean	Std.Dev.	Min	Max
Turnover dummy	various	4226	0.20	0.40	0.00	1.00
Share of term elapsed	various	4278	0.64	0.74	0.00	5.67
External debt of central government scaled to GDP (%)	World Bank, WDI (2005)	3568	68.09	87.96	0.00	1598.22
Government budget balance as % of GDP	World Bank, WDI (2005)	907	2.23	8.70	-21.25	203.72
Average of 4 indicators (surrender of export proceeds, multiple exchange rate, capital account restrictions, current account restrictions)	Grilli and Milesi-Ferretti (1995), Dreher and Siemers (2005)	3618	0.54	0.33	0.00	1.00
Percentage of veto players who drop	Beck *et al.* (2001)	4887	0.10	0.27	0.00	1.00
Part of a year which is within 12 months after an executive or legislative election	Dreher and Vaubel (2005)	6448	0.14	0.28	0.00	1.00
Dummy for new chief executive party	Beck et al. (2001)	7488	0.05	0.22	0.00	1.00
Dummy variable that is 1 if the change in the Polity democracy variable > 3	Marshall and Jaggers (2000)	7488	0.01	0.11	0.00	1.00
First principal component of various instablity indicators	Banks (1999)	5296	0.00	0.67	-0.52	17.84
coups	Banks (1999)	4916	0.03	0.17	0.00	2.00
Transformed inflation	World Bank, WDI (2005)	4436	0.11	0.15	-0.28	1.00
Private credit by deposit money banks and other financial institutions scaled to GDP	Beck *et al.* (1999)	3614	0.37	0.32	0.00	1.79
Checks and balances	Beck *et al.* (2001)	4991	1.92	1.80	0.00	18.00
polarization*checks and balances	Beck *et al.* (2001)	4805	1.21	3.14	0.00	32.00
Dummy that is one if there are two chambers	Beck *et al.* (2001)	4439	0.25	0.43	0.00	1.00
Dummy indicating whether there are autonomous regions	Beck et al. (2001)	4955	0.06	0.25	0.00	1.00
Party of chief executive is left-wing	Beck *et al.* (2001)	6863	0.21	0.41	0.00	1.00
Depreciation of the nominal exchange rate with respect to the US$	World Bank, WDI (2005)	5688	0.00	0.03	-0.01	0.96
A country is defined as experiencing a currency crisis when index covering the rate of change of the exchange rate and international currency reserves is one standard deviation greater than the index mean	Dreher et al. (2006)	4694.00	0.10	0.30	0.00	1.00
Sum of exports and imports of goods and services measured as a share of gross domestic product	World Bank, WDI (2005)	4965.00	76.01	44.23	1.53	330.60