Political monetary cycles and a *de facto* ranking of central bank independence*

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Abstract
Political monetary cycles are less likely to occur in countries with independent central banks. Independent central banks can withstand political pressure to stimulate the economy before elections or finance election-related increases in government spending. Based on this logic and supporting evidence, we construct a *de facto* ranking of central bank independence derived from the extent to which monetary policy varies with the electoral cycle. The ranking avoids well-known problems with existing measures of central bank independence and provides independent information about average inflation and inflation volatility differences across countries.

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Keyword(s): Political monetary cycles; central bank independence

1. Introduction

There is a growing consensus on the importance of central bank independence (CBI) in ensuring low and stable inflation rates. Existing measures of CBI have been shown to predict variation in both the level and the volatility of inflation across countries (c.f. Cukierman, et al. 1992; Alesina and Summers, 1993). There are, however, well-known problems with these measures. For example, many of the rankings are based on measures of legal independence from the fiscal authorities (c.f. Arnone, et al., 2007, Bade and Parkin, 1977, Cukierman, et al., 1992, Eijffinger and Schaling, 1993, Grilli, et al., 1991, Jácome and Vázquez, 2005).[1] These rankings may be problematic because what is written down in law can be vastly different from actual practice (c.f. Mishkin, 2004). In light of this problem, the literature has also considered *de facto* measures of independence. For example, Cukierman, et al. (1992) and Sturm and de Haan (2001) rank independence using the average turnover rate of central bank governors. One problem with this measure, however, is that central banks that are not independent could still display little turnover if the central bank governor acts subserviently to the fiscal authority to avoid being forced to resign. Subservient governors will therefore exhibit lower turnover.[2]

Measuring CBI based on actual monetary policy decisions is also problematic. Specifically, it is difficult to infer the effect that politicians have on monetary policy because many other factors, not necessarily related to CBI, determine policy. Some of these factors are observable and can be controlled for, such as the output gap; countries that grow faster relative to trend might have greater inflation concerns and therefore lower money growth rates. Other factors, however, are unobservable (or difficult to measure) and can therefore be confounded

[1] For a thorough review of the literature on measures of CBI, see Arnone, et al. (2006), Berger, et al. (2001), Cargill (2009), Crowe and Meade (2007), and Eijffinger and de Haan (1996).

[2] Cukierman, et al. (1992) also introduce a second *de facto* measure based on responses from central banks to a questionnaire focusing on central bank practices. The main drawbacks of this measure are that the responses may be biased and the sample size is quite limited.

with CBI. For example, countries with dependent central banks could conceivably experience lower average inflation rates than those with independent central banks if there is a cultural aversion to inflation (Hayo and Hefeker, 2002). Measuring relative CBI based on cross-country differences in average inflation or money growth rates would therefore be problematic, even though cross-country differences in average inflation rates are partly due to differences in CBI.[3]

We search instead for *within*-country variation in monetary policy that reflects CBI and then rank CBI accordingly. We propose election cycles as a source of this variation. Before elections, politicians may place extra pressure on the central bank to expand the economy by loosening monetary policy, creating a political monetary cycle.[4] This is the first channel through which political manipulation of monetary policy might operate before or during election years, which we refer to as the Phillips curve channel. Second, political monetary cycles might be caused by political *budget* cycles, in which governments use expansionary fiscal policy to expand the economy and/or increase government handouts and transfers to certain constituencies.[5] These fiscal expansions can in principle be financed through borrowing. In cases where the government's borrowing capacity is limited, however, central banks may be called in to monetize instead. We refer to this as the fiscal-financing channel.[6]

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[3] Similarly, using a cross-country regression to estimate the effect of existing measures of CBI on average inflation does not control for unobservable country-specific factors (Walsh, 1997).

[4] In the political business cycle model of Nordhaus (1975), politicians attempt to lower the unemployment rate before elections to raise their chances of reelection. Implicit in this idea is first, that macroeconomic policy is not neutral (at least in the short-run) and therefore can alter economic outcomes; second, voters reward politicians for higher growth during election years; third, voters value growth more than other economic objectives such as low inflation; and fourth, politicians are willing and able to manipulate policy in order to exploit this short-run non-neutrality for their own benefit. In this paper, we concentrate on the last issue, in particular the presence of political monetary cycles as an indicator of CBI.

[5] Implicit in this idea is that voters reward politicians for higher overall spending during election years, as opposed to the composition of spending (Drazen and Eslava, 2007), and that they value the fiscal expansion more than low inflation or fiscal discipline. Brender and Drazen (2005) find evidence for political budget cycles, but only in new democracies where voters are inexperienced with electoral politics. De Haan and Zelhorst (1990) find that there is a link between budget deficits and money growth in high inflation years.

[6] In Alpanda and Honig (2009), we do not find evidence for the fiscal-financing channel and conclude that political monetary cycles are most likely caused by attempts to stimulate the economy by exploiting the Phillips curve. Note

Both channels are less likely to exist, and therefore political monetary cycles are less likely to occur, in countries with independent central banks. Independent central banks can withstand political pressure to stimulate the economy before elections or finance election-related increases in government spending (or tax cuts). Figure 1 plots the ratio of average money growth during election periods to non-election periods vs. central bank governor turnover for the 52 countries in our ranking.[7] The graph indicates that countries with high turnover (low CBI) tend to experience larger changes in money growth during election periods. The regression results in Alpanda and Honig (2009) tell a similar story. In particular, after controlling for other factors and using existing CBI rankings, we find that the level of CBI affects the severity of political monetary cycles.

Based on this evidence, we rank CBI by the magnitude of political monetary cycles, i.e. by election-induced, within-country differences in monetary policy. One potential problem with this approach is that a central bank that always suffers from political influence and thus has high average money growth rates will be classified as independent if that political pressure does not increase during elections. While this can occur, the evidence discussed above indicates that on average countries with low CBI do experience larger changes in money growth during elections.

Our ranking strategy is closest to Eijffinger, et al. (1996) who construct a ranking only for OECD countries based on the coefficient of inflation in the central banks' (Taylor rule type) reaction function. As argued before, differences in coefficients could partially be due to unobserved country-specific factors, which may confound the interpretation for differences in CBI. We instead construct our ranking based on the coefficient of the election cycle variable.

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that the absence of a fiscal-financing channel is still consistent with the presence of political budget cycles since election-related fiscal expansions may be financed through other means rather than monetization.

[7] The sample of countries and the data including the definition of election periods are discussed in Section 2.

Using our ranking, we confirm previous results that countries with more independent central banks have lower average inflation rates over both election and non-election years (Cukierman, et al., 1992, Alesina and Summers, 1993, and Grilli, et al., 1991).[8] A likely explanation for this result is that independent central banks are more immune from political pressure to finance government spending or to stimulate the economy. They can therefore build a reputation for credibility, thereby reducing the time-inconsistency problem.[9] Our results thus add support to claims of the importance of CBI.

Our ranking complements the existing literature on ranking CBI. However, the ranking also represents an alternative way to measure CBI based on within country changes in monetary policy at a time when these changes are likely to reflect CBI or lack thereof. This information adds insight into the effects of CBI, and we find empirically that the ranking provides independent information about average inflation rates and inflation volatility across countries beyond that explained by existing rankings.

The rest of the paper is organized as follows: Section 2 introduces the benchmark regression equation that we use to derive the election cycle-based ranking of CBI. Section 3 presents the ranking and discusses robustness checks. Section 4 explores its effect on economic outcomes. Section 5 concludes.

2. Ranking Methodology

Suppose first that CBI is a time-varying observable variable. To estimate the impact of CBI on political monetary cycles, consider a regression of a monetary policy indicator, *M*, on its

[8] Cargill (2009) provides evidence that the negative correlation between CBI and inflation obtained using existing measures of CBI is not robust.

[9] See Kydland and Prescott (1977), Calvo (1978) and Barro and Gordon (1983) on the time-inconsistency problem and Blinder (1998) and Mishkin and Westelius (2006) on the importance of CBI in reducing this problem.

own lag, an election-cycle variable, *EC*, *CBI*, their interaction term *EC***CBI*, and control variables.

$$M_{i,t} = \alpha_i + \beta_1 \cdot EC_{i,t} + \beta_2 \cdot CBI_{i,t} + \beta_3 \cdot \left(EC_{i,t} * CBI_{i,t}\right) + \beta_4 \cdot M_{i,t-1} + \beta_5 \cdot CONTROLS_{i,t} + \varepsilon_{it} \quad (1)$$

where *i* indexes country and *t* indexes time.[10] α_i is a country-specific fixed effect. The interaction term captures the idea that more independent central banks are less likely to face and, if they do, more able to withstand political pressure during elections. The controls include some interaction terms with *EC* but do not include interactions with *CBI*. Rearranging the *CBI* terms, we obtain

$$M_{i,t} = \left(\alpha_i + \beta_2 \cdot CBI_{i,t}\right) + \left(\beta_1 + \beta_3 \cdot CBI_{i,t}\right) \cdot EC_{i,t} + \beta_4 \cdot M_{i,t-1} + \beta_5 \cdot CONTROLS_{i,t} + \varepsilon_{it} \quad (2)$$

If we treat *CBI* as an unobservable variable, equation (2) becomes a panel regression with interacted fixed country and time-effects, where the election cycle variable is interacted with each of the country and time dummies. It is impossible to estimate the above regression with year dummies since there would be more coefficients to estimate than the number of observations.[11] If we assume that the level of CBI in each country is time-invariant for the whole sample period, however, we can obtain a unique coefficient estimate on the election cycle variable, *EC*, for each country. These coefficients depend linearly on the CBI level of each country for that time period. Therefore, they can be ordered to reveal a ranking of CBI.[12]

[10] In Alpanda and Honig (2009), we use existing rankings of CBI and estimate this model to test for political monetary cycles and the role of CBI. This model is similar to those estimated in Alesina and Roubini (1992), Beck (1987), Golden and Poterba (1980), Leertouwer and Maier (2001), Boschen and Weise (2003), Grier (1987), Haynes and Stone (1989), and Abrams and Iossifov (2005).

[11] Note that time dummies are interacted with each of the country dummies.

[12] If the effect of CBI on money growth is nonlinear, equation (1) would also contain, for example, a quadratic term for *CBI* and the interaction of this quadratic term with *EC*. When CBI is unobservable, the coefficients of *EC* in equation (2) depend non-linearly but monotonically on CBI; therefore they can still be ordered to reveal a ranking of

More generally, if we assume that CBI is constant over a given period of time, for example a decade, we can obtain unique estimates for each sub-period. As a robustness check, we split our sample into two periods and assume that CBI is constant within each sub-period but can differ across periods. For our benchmark ranking, however, we exclude the fixed time-effects altogether and assume that the level of CBI is constant throughout the sample period. By using the entire sample to estimate one ranking, we maximize the number of elections used to generate the ranking.

We therefore estimate the following regression where the coefficient of *EC* is country-specific and, according to our theory, is linearly dependent on the CBI level of each country:

$$M_{i,t} = \gamma_i + \delta_i \cdot EC_{i,t} + \beta_4 \cdot M_{i,t-1} + \beta_5 \cdot FIX_{i,t} + \beta_6 \cdot BORCAP_{i,t} + \beta_7 \cdot YGAP_{i,t}$$
$$+\beta_8 \cdot INFL_{i,t} + \beta_9 \cdot \left(EC_{i,t} * FIX_{i,t}\right) + \beta_{10} \cdot \left(EC_{i,t} * BORCAP_{i,t}\right) + \varepsilon_{it} \quad (3)$$

The control variables include a dummy variable indicating a fixed exchange rate regime, *FIX*, the output gap, *YGAP*, the inflation rate, *INFL*, and a measure of the government's borrowing capacity, *BORCAP*. We also interact *EC* with *FIX*, and *BORCAP*. In the section on robustness tests, we include additional control variables such as the budget surplus as a % of GDP, the government debt as a % of GDP, and trade openness measured by total trade as a % of GDP. We also include a number of additional interaction terms. In particular, we interact *EC* with the lagged output gap, a dummy variable indicating high past inflation, tax revenue as a % of GDP, a measure of political risk, and a measure of democracy.

Although the coefficient of *EC* differs by country, we impose common coefficients for the control variables. The reason is that *FIX* (and to a lesser extent *BORCAP*) has little, and for some countries, no within-country variation. If we were to estimate a country-by-country

CBI. Nevertheless, we did not find evidence of non-linearity using existing measures of CBI. In particular, we estimated equation (1) including a quadratic term for *CBI* and its interaction with *EC* and found these two terms to be insignificant.

regression, the coefficients of *EC*FIX* and *EC*BORCAP* would drop out for countries with no within-country variation, and their effects would be captured by the coefficient of *EC*. As we will see when we discuss the regressors, controlling for these effects is necessary to avoid confounding the interpretation of the election cycle coefficient as an indicator of CBI.[13] We therefore proceed not with a country-by-country interaction effect but with an effect that is common for all countries. For simplicity and to parallel our method for *FIX* and *BORCAP*, we use common coefficients for all control variables including the lags of money growth.[14]

In order to obtain reliable estimates, we limit the ranking to countries with at least 15 years of data and three elections between 1972 and 2001, which yields 52 countries, 27 of which are developing economies.[15] The results in Alpanda and Honig (2009) indicate that advanced economies and developing nations with high levels of CBI do not experience political monetary cycles *on average*. We still include these countries in equation (3), however, since there can still be individual cases of countries where politicians exploit monetary policy for political purposes. We use annual data for the years 1972 to 2001. The starting point, 1972, coincides with the earliest year for which there is data available on the Freedom House democracy indicators that were used to filter elections. The fixed exchange rate regime indicator is available until 2001, which defines the end point of the sample period.

[13] Eijffinger, et al. (1996) use a country-by-country regression when they rank CBI for OECD countries based on the coefficient of inflation in a regression similar to ours.

[14] One problem with using common factors, however, is that the ranking can change depending on the sample of countries.

[15] See the appendix for a list of countries and data sources. Note that data on money growth for individual countries in the European Monetary Union do not exist after the formal adoption of the Euro.

Because of the dynamic panel bias caused by the presence of the lagged dependent variable, we estimate the model using the GMM systems estimator developed in Arellano and Bover (1995) and Blundell and Bond (1998).[16]

2.1 Monetary Policy Variable

We use the annual percentage growth rate of M1 as the monetary policy indicator. The data are from the IMF's *International Financial Statistics* (*IFS*). We do not use inflation as our monetary indicator since it is not a policy instrument *per se* and is less directly controlled by the central bank. While the monetary base and the short term interest rate are under more direct control, data for most countries were unavailable.

For the benchmark regression (equation (3)), we restrict our sample to observations with annual money growth rate and inflation of less than 100%. First, high inflation periods are usually accompanied by political turmoil in the affected countries and may lead to early elections. Sachs (1987), for example, cites the hyperinflation in Bolivia as the cause of early elections in 1985. By excluding these episodes, we hope to mitigate the possibility of reverse causality. Second, during high inflationary episodes, it is unlikely that politicians can achieve political gain by further increasing the rate of money growth; the Phillips curve channel most likely is not present.[17] Finally, if hyperinflations happen to occur during election years, these outliers could produce a significant coefficient on the election cycle variable, even though

[16] This estimator improves on the GMM difference estimator developed in Arellano and Bond (1991). The implementation of this procedure in STATA using the xtabond2 command is outlined in Roodman (2006). We use the "collapse" option of xtabond2 to collapse the instrument set. Otherwise, the instrument count is quadratic in the number of periods, T, which is problematic with a sample period of 30 years.

[17] The fiscal-financing channel, on the other hand, can still exist during hyperinflations; any election-related increase in government spending is most likely monetized.

political monetary cycles are absent in most countries. We discuss the implications of including high money growth observations in the results section.

In our benchmark specification, we include the lag of the dependent variable as a regressor to account for possible smoothing in monetary policy.

2.2 Election Cycle Variable

We constructed a large database of election dates for the national leader (the president in a presidential system and the prime-minister in a parliamentary system). Our primary source is the International Institute for Democracy and Electoral Assistance (International IDEA).

The main criterion for including an election in their sample is that "there was a degree of competitiveness"; that is, "more than one party contested the election, or one party and independents contested the elections, or the election was only contested by independent candidates". These elections are further categorized as free, partially free and not free based on the Political Rights and Civil Liberties indicators of Freedom House (range 1-7 with lower scores representing greater freedom) during these election years. Specifically, the IDEA database treats elections as free or partly free if the average of these two indices is less than or equal to 5. We exclude elections designated as "not free" from our sample since political monetary cycles are not likely to be observed in countries with autocratic regimes. Autocratic regimes might control the central bank while not feeling the need to influence monetary policy before elections because the outcome is fairly certain. The lack of pressure from an autocrat is not a sign of CBI. [18]

[18] Even in democratic regimes, if the outcome of an election is fairly certain, there may not be an incentive to engage in expansionary fiscal or monetary policy. We lack data on how close the outcomes of these elections are or were expected to be beforehand. One possibility, however, is that election margins reflect the level of democracy. In Section 3.1 on robustness tests, we include the interaction *EC*DEM*, where *DEM* is the average of the political rights and civil liberties variables mentioned above. The intuition is that elections tend to be closer in more democratic countries.

Our election cycle indicator variable, *EC*, takes on a value between 0 and 1 for each year, depending on what fraction of that year is within an election cycle (Franzese, 2000). We consider the two years prior to an election day as the election cycle period associated with that election. The choice of two years accounts for the lag with which monetary policy affects the economy. For example, if an election is held on January 31st of 2003, then *EC* is equal to 31/365 in 2003 (or 31/366 if 2003 were a leap year), equal to 1 in 2002, and equal to 1 – (31/365) in 2001.

If there are multiple elections in a given year (including run-off elections), then the period in-between the elections is also counted as part of the election cycle period, along with the two years prior to the *first* election of that year. Similarly, if there are overlaps between election cycles because of elections occurring within 2 years of each other, the whole period in-between is included in the election cycle.[19]

2.3 Fixed Exchange Rate Regimes

We include a dummy variable, *FIX*, which takes on the value of one when there is a fixed exchange rate and zero otherwise. The determination of the fixed exchange rate regime is based on the Reinhart and Rogoff (2004) *de facto* exchange rate regime indicator. A fixed exchange rate regime restricts the scope for independent monetary policy. We therefore expect fixed exchange rates to reduce overall money growth.

[19] Continuing our example, if there were another election on January 20th of 2005, then *EC* would be equal to one in 2003, since the election in 2003 occurred within two years of the next election. Therefore all of 2003 would be part of an election cycle. If on the other hand, the election in 2005 were held on February 20th, then *EC* in 2003 would be equal to (31/365) + (1-(51/366)), the first term reflecting the fraction from the election cycle associated with the election in 2003, and the second term reflecting the fraction from the election cycle associated with the election in 2005.

Moreover, a country with a fixed exchange rate regime may experience weaker political monetary cycles, not necessarily because its central bank is independent, but because the fixed exchange rate regime limits the effect of political meddling on monetary policy. This country would receive a better CBI score than it should because of similar money growth during elections vs. non-election periods. We therefore include the interaction term *EC*FIX* (Clark, et al., 1998, and Leertouwer, et al., 2001).

2.4 The Role of Fiscal Policy and Borrowing Capacity

As mentioned above, there are two main channels through which political manipulation of monetary policy may operate during elections: the Phillips curve channel and the fiscal-financing channel. In our benchmark regression, we do not control for the level of fiscal policy. Therefore, the coefficients on our election cycle variables capture the effects of both channels. The fiscal-financing channel should only be relevant for countries whose governments have limited ability to borrow. We therefore interact our election cycle variable, *EC*, with a measure of borrowing capacity, *BORCAP*, to capture this effect. Including this interaction term is necessary to avoid confounding the interpretation of the election cycle coefficient as an indicator of CBI. In particular, a country with a high level of borrowing capacity may experience weaker political monetary cycles because the government feels less of a need to manipulate monetary policy during elections, not because the central bank is independent. Without controlling for borrowing capacity, this country would receive a higher CBI score than it should.[20]

We proxy borrowing capacity with the development of the financial sector, measured by the ratio of domestic credit to GDP. The data are from the World Bank's World Development

[20] As a robustness test in Section 3.1, we also control for the ability to tax, proxied by tax revenue as a % of GDP, although the inclusion of this variable reduces the sample size by 11 countries.

Indicators (*WDI*) dataset. We also include *BORCAP* separately in the regression, apart from its interaction term with *EC*. Borrowing capacity affects the amount of pressure central banks may face from politicians during both election and non-election periods.

2.5 Output Gap and Inflation

We use the World Bank's *WDI* to construct the output gap and inflation variables, *YGAP* and *INFL*. *YGAP* is the log difference between real GDP and its HP-filtered trend. Including these variables in the regression introduces a simultaneity problem as money growth affects output and inflation. In our GMM estimation, *YGAP* and *INFL*, along with the lag of the dependent variable, are instrumented using lags of differences and levels of these variables.

These variables are primarily included to control for Taylor rule-type monetary policies that central banks may follow.[21] In addition, omitting *YGAP* can bias the coefficient of *EC* since the timing of elections is not necessarily exogenous. In most parliamentary democracies, elections can be called at any time prior to the usual schedule, and it is plausible that this is more likely to occur when the economy is doing well. To test whether election dates are in fact related to economic performance, we regressed a dummy variable indicating an election year on the lagged output gap and lagged inflation. We found little evidence, however, that these variables determine the timing of elections, confirming the results of Alesina and Roubini (1997) and Botchen and Weiss (2003).

2.6 Existing measures of CBI

[21] Note that including *YGAP* in our regression does not shut off the Phillips curve channel since elections affect money growth which in turn affects output. In contrast, we exclude the budget balance variable since including it would shut off the fiscal-channel. The reason is that in this case, elections affect money growth through their effect on the budget balance.

In section 4, we show that our measure of CBI provides independent information about average inflation beyond that explained by existing rankings. For the existing rankings, we consider the CBI indices in Cukierman, et al. (1992), which are based on legal aspects of independence (*LEGAL*) and the turnover rate of central bank governors (*TURNOVER*). They range from 0 to 1, with higher values indicating greater CBI for the legal index and lower CBI for the turnover index.

The indices are generally available until 1989 for both advanced and developing economies and assume one value per decade. The legal index was extended through 2002 for 24 Latin American and Caribbean countries by Jácome and Vázquez (2005), who also added a few new countries to the sample, and through 1999 for advanced countries by Siklos (2008). The turnover index was supplemented with data for 1995 through 2004 by Crowe and Meade (2007).

2.7 Summary Statistics

Summary statistics for all observations, advanced countries, and developing countries are provided in Table 1. The sample period is 1972-2001 and includes 52 countries; 25 are advanced economies, and 27 are developing countries. Advanced countries comprise 48% of all observations. There are 385 elections in the sample, 200 of which took place in advanced economies. These numbers include multiple elections in the same year. Both advanced and developing economies had a fixed exchange rate regime roughly 20% of the time. Developing countries have higher central bank governor turnover rates, although surprisingly they have slightly higher average levels of legal CBI. This highlights the fact that the legal measure is unlikely to accurately reflect CBI in developing economies, as Cukierman, et al. (1992) point out. Developing economies have higher median money growth rates, inflation rates, and output

growth rates. They have also experienced hyperinflationary episodes as the maximum values of money growth and inflation reveal. Domestic credit as a percent of GDP, *BORCAP*, is much higher in advanced countries, reflecting more developed financial markets. Finally, developing countries have slightly larger government budget deficits on average.

In Alpanda and Honig (2009), we show that for developing countries with high values of *TURNOVER*, mean (median) money growth rates are approximately 3.56 (2.6) percentage points higher during election years than non-election years. In the table, both inflation and money growth are restricted to less than 100% to match the sample in the regression.

3. The Ranking

Table 2 presents the regression results from the estimation of equation (3). The coefficient of *EC*FIX* is insignificant. The coefficient of *EC*BORCAP* has the predicted negative sign but is insignificant. The coefficient of *OUTPUTGAP* has the predicted negative sign and is significant, while the coefficient of *INFL* is unexpectedly positive and significant. The latter result holds even after excluding *FIX*, or *M(-1)*. This is most likely due to the fact that both money growth and inflation are fairly persistent and highly correlated with each other. If we exclude *INFL* from the regression, the results are virtually identical. The coefficient of *BORCAP* has the predicted negative and significant effect. Finally, the coefficients of the interaction terms of the country dummies with *EC* are used to generate the ranking of CBI.

Table 3 ranks the countries in our sample based on the coefficient of *EC* from equation (3).[22] Smaller coefficients for *EC* imply higher levels of CBI. The average ranking for advanced

[22] This ranking is solely based on the coefficient estimates of *EC*, and does not take into account coefficient uncertainty. To address this issue, we simulated one million different rankings of the 52 countries' CBI, based on random drawings from normal distributions with means at the estimated coefficients and standard deviations equal to the standard errors of the estimated coefficients. We then generated a new ranking based on the averages of these

countries is 7.2 spots higher than for developing countries. 7 out of the 10 most highly ranked countries are advanced countries. The top half of the ranking, the first 26 countries, has 15 advanced and 11 developing countries. Developing nations constitute 65% of the bottom half of the ranking, and 11 of the lowest 15 scores are from developing countries. Thus, the top developing countries have CBI scores that match those of the top advanced nations, but the worst scores belong predominantly to developing economies.

Some countries' places in the ranking do not conform to expectations. Germany is ranked fairly low, although if we remove the year of re-unification, a year of 29.3% money growth which also happened to be an election year, it moves up 13 spots in the ranking. Switzerland also does not do well in the ranking as a result of 24% money growth in 1978, the year before an election, and 14% money growth in 1987, the year of an election, both well above the country's average. Peru, a country that experienced hyperinflation, is ranked near the middle. While we discount legal measures of CBI for developing economies, it is noteworthy that during the 1990s, Peru's value for *LEGAL* is the highest recorded in the sample, including all the advanced countries. In addition, its hyperinflation from 1988-1990 is omitted from the regression as a result of the money growth restriction. It is possible, therefore, that the ranking is accurately capturing a period of fairly high CBI.

The coefficients of closely ranked countries are not significantly different from each other. However, the average coefficient for the countries in the top half of the ranking is significantly different than that for the bottom half at the 1% significance level. Furthermore, if we divide the ranking into either three or four parts, then the average coefficient for each part is statistically different from each other at the 1% level. In Section 4, we show that the point

simulations. This modified ranking was virtually identical to our benchmark ranking (with an average difference of 0.5, and maximum difference of three spots).

estimates provide independent information about inflation differentials across countries. In addition, we also use alternative rankings that place countries into either three or four categories based on their coefficient estimates. These two alternative rankings are also significant in predicting average inflation.

3.1 Robustness Tests

As a first robustness test to control for changing CBI, we divide our sample into two periods, generating separate rankings for the 1972-1986 and 1987-2001 periods. The correlation coefficient of the 1972-1986 ranking and the default ranking is 0.67, and the average difference between the two ordinal rankings is 10.0. For the 1987-2001 ranking and the default ranking, the correlation coefficient is 0.76, and the average difference is 7.8. The correlation coefficient of the 1972-1986 ranking and the 1987-2001 ranking is 0.10, and the average difference is 16.6. Thus, there is a substantial difference between the two sub-periods. However, each ranking relies on essentially half of the elections to generate the election cycle coefficients, and so there is concern about the reliability of the sub-sample estimates. We also did the above robustness test imposing common coefficients for the other regressors in the two sample periods, as opposed to running separate regressions for the two sub-periods. The results were very similar.

Second, we break up the sample according to the central bank reforms listed in Acemoglu, et al. (2008). In particular, we created a dummy variable that takes on the value of one after the reform was implemented and interacted this dummy variable with *EC*. Using this variable, we generated rankings for the pre-reform and post-reform periods.[23] The correlation coefficient of the pre-reform ranking and the default ranking is 0.91, and the average difference between the two ordinal rankings is 2.7. The reason why these rankings are so similar is that

[23] We only included countries that enacted central bank reforms during the sample period.

almost all of the reforms were enacted in the 1990s. Therefore there is considerable overlap in the sample period used to generate the default and pre-reform rankings. For the post-reform ranking and the default ranking, the correlation coefficient is 0.54, and the average difference is 7.8. The correlation coefficient of the pre-reform ranking and the post-reform ranking is 0.27, and the average difference is 8.6. Thus, there is a substantial difference between the two sub-periods, similar to what we found in the first robustness test. While the post-reform ranking might differ because CBI changed after the reforms, it could also differ because very few elections were used to generate the ranking, resulting in unreliable estimates.

Third, we use the growth rate of M2 as the dependent variable as opposed to growth in M1. The correlation coefficient of the ranking generated using this variable and the default ranking is 0.55, and the average difference between the two ordinal rankings is 9.2. However, the inclusion of this variable shrinks the sample size from 52 countries to 39 countries. Finally, when we use this ranking to predict average inflation, the results are very similar to when we use the default ranking. The coefficient of both rankings are similar in magnitude, have the predicted sign, and are highly significant.

Fourth, we include a number of additional variables in equation (3) that could also impact money growth. We control for fiscal policy since expansionary fiscal policy might require debt monetization and therefore higher rates of money growth. We use two variables to capture fiscal policy. When we include government debt as a % of GDP, the correlation between the new ranking and the default ranking is 0.89, and the average difference between two ordinal rankings is 4.1. When we include the budget surplus as a % of GDP, the correlation between the new ranking and the default ranking is 0.99, and the average difference between two ordinal rankings is 0.94.

We also include the ratio of trade to GDP to capture trade openness. Higher rates of money growth should lead to a depreciation of the real exchange rate, which has a more adverse effect when the economy is more open (Romer, 1993). Therefore countries that are more open should have lower rates of money growth. When we include the ratio of trade to GDP, the correlation between the new ranking and the default ranking is 0.99, and the average difference between two ordinal rankings is 1.3.

Fifth, we include a number of additional variables in equation (3) whose omission could confound the interpretation of the election variable coefficient as an indicator of CBI. The addition of these variables has little impact on the ranking. We include $EC_{i,t}*YGAP_{i,t-1}$ since politicians may not feel the need to pressure the central bank to expand output or monetize a fiscal expansion if the economy is already doing well; this lack of pressure is not a sign of CBI. The correlation coefficient of the ranking generated using this variable and the default ranking is 0.98, and the average difference between the two ordinal rankings is 2.4.

It is possible that politicians do not force central banks to exploit the Phillips curve when there is little tradeoff between inflation and unemployment (although pressure can still be applied to monetize debt). This is likely to be the case during periods of very high inflation. A lack of political pressure in this case, and therefore a small election cycle coefficient, does not necessarily point to an independent central bank. Similarly, after periods of high inflation, politicians might put more weight on lowering inflation than increasing output, resulting in pressure on the central bank to *reduce* money growth. Limiting money growth and inflation to less than 100% does not necessarily solve this problem. The reason is that the impact of these episodes can still affect the calculations of politicians after they have ended. To address these concerns, we interact *EC* with a dummy variable that assumes the value one if inflation exceeded

100% in the previous five years. Including this variable had little impact on the ranking. The correlation between the new ranking and the default ranking is 0.97, and the average difference between the two ordinal rankings is 1.5.

We include government tax revenue as a % of GDP and its interaction with *EC*. A dependent central bank might not be pressured to monetize debt during election years if there is a developed tax collection system that lowers the need for seigniorage revenue. The correlation between the new ranking and the default ranking is 0.84, and the average difference between the two ordinal rankings is 3.4.

Elections could cause a rise in political risk in some countries. Even a dependent central bank could respond by raising interest rates to prevent capital flight. We therefore interact *EC* with the measure of political risk mentioned before so that we do not give credit to a dependent central bank that raises interest rates and limits money growth for this reason. The correlation between the new ranking and the default ranking is 0.95, and the average difference between the two ordinal rankings is 3.3. In addition, eliminating sudden stop episodes (listed in Honig, 2008) has little effect on the ranking.

Finally, politicians are less likely to manipulate the economy if the election outcome is certain (Golden and Poterba, 1980). Thus, a dependent central bank will receive a high CBI score if elections are not close. We do not have data on the margin of victory. One possibility, however, is that election margins on average reflect the level of democracy; close elections are more likely in more democratic countries. We already consider only free or partly free elections. In addition, we include the interaction *EC*DEM*, where *DEM* is the average of the political rights and civil liberties variables mentioned above. The correlation coefficient of the new

ranking and the default ranking is 0.77, and the average difference between the two ordinal rankings is 7.8.

4. Central Bank Independence and Economic Outcomes

Following Alesina and Summers (1993) and Cukierman, et al. (1992), we investigate the relationship between CBI and economic outcomes. Moreover, we test whether our ranking provides independent information beyond that given by the *LEGAL* and *TURNOVER* variables.

Figure 2 shows the scatter-plot of each country's average inflation rate between 1972 and 2001 and its CBI score, *CBIS*, which is the coefficient of each country's election cycle variable estimated in equation (3). We put no restrictions on inflation before the average is taken. The graph illustrates a strong positive relationship.[24] We obtain a similar graph if we restrict inflation to less than 100%.

Table 4 presents regression results for the full sample, advanced countries, and developing countries. The regression is analogous to that presented in Cukierman, et al. (1992). For the full sample in specification (1), *CBIS* is positive as expected and significant at the 1% level in predicting average inflation. In specification (2), we look at the effect of the existing measures of CBI, averaged over the sample period, without including *CBIS*. Both the legal measure and the turnover measure are insignificant. In column (3), *CBIS* remains significant after controlling for *LEGAL* and *TURNOVER*. The large coefficients for all three measures are driven by inflation outliers.

In columns (4)-(6), we remove the high inflation episodes by restricting annual inflation observations to less than 500% before the average for the sample period is taken. A coefficient

[24] Figure 1a in Alesina and Summers (1993) presents a similar qualitative relationship for advanced countries using a legal measure of CBI.

for *CBIS* of 1.01 in specification (4) and a standard deviation of 4.2 implies that a one standard deviation increase in a country's CBI score leads to a 4.2 percentage point increase in average inflation. In specification (4), we obtain similar results to Cukierman, et al. (1992), who find that the legal measure is insignificant while turnover is positive as expected and significant. When we include all three measures in specification (6), both *CBIS* and *TURNOVER* lose some significance, although *CBIS* remains significant at the 10% level.[25] This implies that there is independent information provided by this variable. The results in columns (7)-(9) are very similar when we restrict inflation to less than 100%.

For advanced countries, *CBIS* is less predictive of inflation variation in specifications (1) and (3) (p-value=0.21) than for the full sample. The coefficient of *LEGAL* has the correct sign in specification (2) but is insignificant. As in Cukierman, et al. (1992), *TURNOVER* is not significant for advanced countries.

For developing countries, *CBIS* is the only significant variable in specifications (1)-(3). When we restrict inflation to less than 500% or 100%, *CBIS* is less predictive of inflation in developing countries than for the full sample. The fact that *CBIS* is more significant for the full sample than either sub-sample suggests that it captures the inflation difference between the average advanced and developing country.[26]

The results in Table 4 therefore indicate that *CBIS* partially explains differences in average inflation across countries, and that it contains independent information about inflation on top of that given by existing measures of CBI. In addition, we created two alternative rankings

[25] The correlation between *CBIS* and *TURNOVER* is 0.11 in the full sample, -0.11 (wrong sign) for advanced countries, and .07 for developing countries. The correlation between *CBIS* and *LEGAL* is 0.17 (wrong sign) in the full sample, -0.05 in for advanced countries, and 0.30 for developing countries. As discussed in Cukierman, et al. (1992), *LEGAL* is not a good measure of CBI for developing countries, while *TURNOVER* is not a good measure for advanced countries.

[26] Cukierman, et al. (1992) find a similar result for *TURNOVER*.

in which we place the countries into either three or four categories based on their *CBIS* value. These two alternative rankings are also significant in predicting average inflation.

In Table 5, we include a number of additional control variables, following Dreher, et al. (2008). In particular, we include the log of GDP per capita at the beginning of the sample period, the ratio of trade to GDP, a dummy variable indicating a fixed exchange rate regime, and an indicator political instability. The inclusion of these variables has little impact on the coefficients of the measures of CBI.

In Table 5 we also provide 2SLS estimates since *TURNOVER* may be endogenous. The reason is that high inflation could lead to the replacement of the central bank governor. Following, Dreher, et al. (2008), we instrument *TURNOVER* with the average share of the legal term in office that has elapsed, percentage of veto players who drop (see Beck, et al., 2001), elections, and number of coups. The coefficient and significance of *CBIS* under 2SLS estimation are quite similar to the OLS results.

Figure 3 plots the standard deviation of inflation on *CBIS*. The graph looks very similar to Figure 2 with the same positive relationship. In Table 6, we regress the standard deviation of inflation on *CBIS*. As in Table 4, there is a positive and significant effect of *CBIS* on inflation volatility in the full sample that is robust to the inclusion of both *LEGAL* and *TURNOVER*. This result matches that in Alesina and Summers (1993) who use existing rankings to show that CBI affects inflation volatility. Results were similar when we included the additional control variables from Table 5 and when we performed 2SLS estimation.

In unreported regressions, we do not find evidence of a relationship between *CBIS* and average growth or growth volatility. This also matches the findings of Alesina and Summers

(1993). In total, therefore, these results suggest that inflation can be lowered without an increase in growth volatility.

5. Conclusion

This paper contributes to the empirical literature exploring the role of CBI by constructing a ranking that does not rely on legal measures of independence or turnover rates of central bank governors. We argue that one of the main explanations for cross-country variation in the severity of political monetary cycles is the degree of CBI. Based on this intuition, we estimate the impact of election cycles on M1 growth in each country and use cross-country variation in the election cycle coefficients to generate a *de facto* ranking of CBI. Our ranking is therefore derived from the behavior of central banks during election cycles when their independence is likely to be challenged or their lack of independence is likely to be revealed. Using the ranking, we confirm that CBI is negatively correlated with average inflation over election and non-election years. Moreover, our ranking provides independent information about average inflation and inflation volatility beyond that explained by existing rankings.

References

Abrams, B. A., and P. Iossifov, 2006, "Does the Fed Contribute to a Political Business Cycle?" *Public Choice*, 129:3, 249-262.

Acemoglu, D, Johnson, S., Querubin, P., Robinson, J., 2008. When does policy reform work? The case of central bank independence. NBER Working paper 14033, Cambridge MA.

Alesina, A., and N. Roubini, 1992, "Political Cycles in OECD Economies," *Review of Economic Studies*, 59:4, 663-88.

Alesina, A., Roubini, N., Cohen, G., 1997. Political cycles and the macroeconomy. MIT Press, Cambridge, MA.

Alesina, A., and L.H. Summers, 1993, "Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence," *Journal of Money, Credit, and Banking*, Vol. 25 No. 2, pp. 151–62.

Alpanda, S., and A. Honig, 2009, "The impact of central bank independence on political monetary cycles in advanced and developing nations," *Journal of Money, Credit, and Banking*, forthcoming.

Arellano, M., Bond, S., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies 58, 277–297.

Arellano, M. and O. Bover. 1995. Another look at the instrumental variable estimation of error-components models. Journal of Econometrics 68: 29-51.

Arnone, M., B. J. Laurens, and J.-F. Segalotto. 2006. "The Measurement of Central Bank Autonomy: Survey of Models, Indicators, and Empirical Evidence." IMF Working Paper 227.

Arnone, M., B. J. Laurens, J.-F. Segalotto. And M. Sommer, 2007. "Central Bank Autonomy: Lessons from Global Trends." IMF Working Paper 88.

Bade, R., and M. Parkin, 1977, "Central Bank Laws and Monetary Policies: A Preliminary Investigation," (London, Ontario, Canada: University of Western Ontario).

Barro, Robert J., and David B. Gordon (1983). "A Positive Theory of Monetary Policy in a Natural Rate Model," *Journal of Political Economy*, 91(4), 589-610.

Beck, Nathaniel, 1987, "Elections and the Fed: Is there a Political Business Cycle," *American Journal of Political Science*, 31(1), pp. 194–216.

Beck, T., Clarke, G., Groff, A., Keefer, P., 2001, "New tools in comparative political economy: The Database of Political Institutions." World Bank Economic Review 15, 1: 165-176.

Berger, H., Eijffinger, S., and J. de Haan. 2001. "Central Bank Independence: An Update of Theory and Evidence," *Journal of Economic Surveys*, 15:1, 3-40.

Blinder, Alan (1998). Central Banking in Theory and Practice, The MIT Press, Cambridge.

Blundell, R., and S. Bond. 1998. Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics 87: 115-43.

Boschen, J. and C. Weise. 2003. "What Starts Inflation: Evidence from the OECD Countries." *Journal of Money, Credit and Banking*. 35(3): 323-349.

Brender, A. and A. Drazen. 2005. "Political budget cycles in new versus established democracies," *Journal of Monetary Economics* 52: 1271–1295.

Calvo, Guillermo (1978). "On the Time Consistency of Optimal Policy in the Monetary Economy," *Econometrica*, 46(6):1411-1428.

Calvo, G., and C. Reinhart, 2002, Fear of Floating, *The Quarterly Journal of Economics* 117, 379-408.

Cargill, T. 2009. "In Search of the Holy Grail – Measuring Central Bank Independence" University of Nevada, Reno, manuscript.

Chinn, M., Ito, H., 2007. A New Measure of Financial Openness. La Follette School Working Paper No. 2007-033

Clark, W.R., U.N. Reichert, S.L. Lomas and K.L. Parker. 1998. "International and domestic constraints on political business cycles in OECD economies," *International Organization* 51, pp. 87–120.

Crowe, C., and E. Meade. 2007. "The Evolution of Central Bank Governance around the World," *Journal of Economic Perspectives*, 21:4, 69-90.

Cukierman, A. and A. H. Meltzer (1986). "A Theory of Ambiguity, Credibility, and Inflation under Discretion and Asymmetric Information," Econometrica, 54(5), pp. 1099-1128.

Cukierman, A., S. Webb, and B. Neyapti. 1992. "Measuring The Independence of Central Banks and Its Effect on Policy Outcomes." *World Bank Economic* Review, 6(3): 353–98.

Jakob De Haan, J, and D. Zelhorst. 1990. "The impact of government deficits on money growth in developing countries," *Journal of International Money and Finance*, 9(4): 455-469.
Drazen, A. and M. Eslava (2007), "Electoral Manipulation via Voter-Friendly Spending: Theory and Evidence," working paper. (Earlier version circulated as NBER Working Paper 11085).
Dreher, A., Sturm, J-E., De Haan, J., 2008, Does high inflation cause central bankers to lose their job? Evidence based on a new data set. European Journal of Political Economy, 24, 778-787.
Eijffinger, S.C.W., and E. Schaling, 1993, "CB Autonomy in Twelve Industrial Countries," *Banca Nazionale del Lavoro Quarterly Review*, Vol. 184, pp. 49–89.
Eijffinger, S.C.W., M. Van Rooij, and E. Schaling, 1996, "CB Autonomy: A Panel data Approach," *Public Choice*, Vol. 89, pp. 163–82.
Eijffinger, S.C.W. and J. de Haan, (1996), "The political economy of central bank independence", *Princeton Special Papers in International Economics*, 19.
Franzese, R., 2000. Electoral and Partisan Manipulation of Public Debt in Developed Democracies, 1956-1990. In R. Strauch and J. von Hagen (eds), *Institutions and Fiscal Policy*, pp. 61-83. Dordrecht: Kluwer academic press.
Golden, D. G. and J. M. Poterba, 1980, "The Price of Popularity: The Political Business Cycle Re-examined," *American Journal of Political Science*, 24: 696-714.
Grier, K. B., 1987, "Presidential Elections and Federal Reserve Policy: An Empirical Test," *Southern Economic Journal*, 54: 475-96.
Grilli, V., D. Masciandaro, and G. Tabellini. 1991. "Political and Monetary Institutions and Public Financial Policies in The Industrial Countries." *Economic Policy* 13: 341–92.
Haynes, S. E., and J. A. Stone, 1989. "An Integrated Test for Electoral Cycles in the U.S. Economy," *Review of Economics and Statistics*, 71:3, 426-34.
Hayo, B. and C. Hefeker, 2002, Reconsidering Central Bank Independence. *European Journal of Political Economy*, 18: 653–674.
Honig, A. 2008. "Do Improvements in Government Quality Necessarily Reduce the Incidence of Costly Sudden Stops?" *Journal of Banking & Finance*, 32:3, 360-373.
Jácome, L. I., and F. Vázquez. 2005. "Any Link between Legal Central Bank Independence and Inflation? Evidence from Latin America and the Caribbean." IMF Working paper 75.
Kydland, Finn., and Edward Prescott (1977). "Rules Rather than Discretion: The Inconsistency of Optimal Plans," *Journal of Political Economy*, 85 (3): 473-492.
Leertouwer, Erik, and Maier, Philipp, 2001, "Who Creates Political Business Cycles: Should Central Banks Be Blamed?" *European Journal of Political Economy*, 17(3), pp. 445-463.
Mishkin, F. (2004), "Can Inflation Targeting Work for Emerging Market Countries?" NBER Working Paper 10646.
Mishkin, F. and N. Westelius, 2006, "Inflation Band Targeting and Optimal Inflation Contracts," NBER Working Paper 12384.
Nordhaus, W.D., 1975, The political business cycle. *Review of Economic Studies* 42, 169–190.
Persson, T., Tabellini, G., 2003. The Economic Effect of Constitutions: What do the Data Say? MIT Press,Cambridge, MA.
Reinhart, C. and K. Rogoff, 2004, The Modern History of Exchange Rate Arrangements: A Reinterpretation?, *Quarterly Journal of Economics* 119, 1-48.
Romer, D. 1993, Openness and Inflation: Theory and Evidence, Quarterly Journal of Economics, CVII(4), 869-904.
Roodman, D. 2006. How to Do xtabond2: An Introduction to "Difference" and "System" GMM in Stata. Working Paper 103. Center for Global Development, Washington.

Siklos, P., 2008. No Single Definition of Central Bank Independence is Right for All Countries. Paolo Baffi Centre Research Paper No. 2008-02

Sturm, J., De Haan, J., 2001. Inflation in Developing Countries: Does Central Bank Independence Matter? New Evidence Based on a New Data Set. *Ifo Studien*, 47 (4), 389-403.

Walsh, C.E., 1997. Inflation and Central Bank Independence: Is Japan Really an Outlier?, Bank of Japan Monetary and Economic Studies 14, 89-117.

Table 1: Summary Statistics

All Observations - 52 countries	obs.	mean	median	s.d.	min.	max.
M	1,371	47.68	13.61	441.34	-29.62	11,673.40
# elections	1,371	0.28	0	0.50	0	2
EC	1,371	0.50	1	0.42	0	1
LEGAL	1,067	0.41	0.39	0.17	0.09	0.86
TURNOVER	1,008	0.20	0.20	0.15	0.00	0.88
FIX	1,371	0.21	0	0.40	0	1
YGAP	1,371	0.05	-0.09	3.57	-18.59	17.81
GROWTH	1,371	3.62	3.58	3.85	-26.48	19.56
INFL	1,370	52.93	8.22	539.34	-7.63	11,749.64
BORCAP	1,371	71.66	61.18	48.94	-72.99	311.42
Advanced Countries - 25 countries						
M	664	11.76	10.03	9.62	-15.93	78.17
# elections	664	0.30	0	0.49	0	2
EC	664	0.55	1	0.40	0	1
LEGAL	593	0.39	0.34	0.16	0.09	0.73
TURNOVER	527	0.16	0.13	0.12	0.00	0.60
FIX	664	0.21	0	0.41	0	1
YGAP	664	0.03	-0.08	2.56	-8.11	8.66
GROWTH	664	3.21	3.08	2.81	-7.28	13.44
INFL	663	7.49	5.08	7.96	-1.84	84.22
BORCAP	664	91.74	87.13	47.44	14.91	311.42
Developing Countries - 27 countries						
M	707	81.41	18.56	612.80	-29.62	11,673.40
# elections	707	0.26	0	0.51	0	2
EC	707	0.45	0	0.43	0	1
LEGAL	474	0.43	0.43	0.18	0.14	0.86
TURNOVER	481	0.25	0.20	0.16	0.00	0.88
FIX	707	0.20	0	0.40	0	1
YGAP	707	0.08	-0.12	4.30	-18.59	17.81
GROWTH	707	4.01	4.39	4.58	-26.48	19.56
INFL	707	95.55	11.51	748.50	-7.63	11,749.64
BORCAP	707	52.81	41.90	42.41	-72.99	264.17

NOTES:

1. Unless otherwise noted, all data are annual. Growth rates and ratios are expressed in percentage terms. The sample period is 1972 to 2001.

2. Variable definitions: *M* = % growth in M1, # elections = the number of election days in a given year (1 for one election day and 2 for 2 election days, i.e. multiple elections). The total number of elections is equal to the mean multiplied by the number of observations, *EC1* = the default two-year election cycle indicator. *LEGAL* = legal measure of CBI (one number per decade with higher numbers indicating greater independence), *TURNOVER* = turnover rate of central bank governors (one number per decade with higher numbers indicating less CBI), *FIX* = 1 for fixed exchange rate regime and 0 otherwise (*de facto* measure), *YGAP* = log difference between real GDP and its HP-filtered trend. *GROWTH* = % growth in real GDP. *INFL* = CPI inflation rate, *BORCAP* = borrowing capacity of the government measured by domestic credit to the private sector as a % of GDP.

Table 2: Equation (3) - GMM Estimation

Dependent variable: *M* = M1 Growth (%)					
	coefficient	s.e.			
M(-1)	0.041	(0.870)			
FIX	-0.681	(0.530)			
BORCAP	-0.032	(2.64)***			
YGAP	-0.461	(4.24)***			
INFL	0.553	(7.26)***			
*EC*FIX*	0.558	(0.240)			
*EC*BORCAP*	-0.028	(0.790)			
country interactions with *EC*:	coefficient	s.e.	country interactions with *EC*:	coefficient	s.e.
Australia	-1.599	(0.760)	Luxembourg	-0.475	(0.180)
Austria	-0.945	(0.330)	Malaysia	6.428	(1.630)
Belgium	-2.766	(1.250)	Malta	-0.100	(0.040)
Bolivia	8.606	(5.07)***	Mexico	4.114	(1.89)*
Botswana	3.386	(2.58)***	Morocco	-0.434	(0.140)
Canada	0.998	(0.300)	Nepal	1.089	(0.710)
Chile	6.067	(1.85)*	Netherlands	3.197	(0.980)
Colombia	1.296	(0.870)	New Zealand	-0.244	(0.110)
Costa Rica	5.377	(3.36)***	Nicaragua	19.633	(6.61)***
Denmark	-1.006	(0.440)	Norway	5.773	(2.20)**
Dominican Republic	-0.828	(0.550)	Pakistan	0.849	(0.480)
Finland	0.806	(0.410)	Panama	0.846	(0.350)
France	-2.598	(0.890)	Paraguay	-3.307	(1.72)*
Germany	2.481	(0.780)	Peru	1.453	(0.680)
Greece	3.984	(1.73)*	Portugal	1.085	(0.410)
Guatemala	9.017	(8.36)***	Singapore	3.564	(1.340)
Honduras	-3.122	(2.41)**	Spain	0.173	(0.060)
Hungary	2.257	(0.860)	Suriname	-4.624	(1.65)*
Iceland	7.568	(4.40)***	Sweden	-1.446	(0.480)
India	4.790	(2.73)***	Switzerland	3.211	(0.700)
Ireland	-4.816	(2.69)***	Thailand	5.883	(2.13)**
Israel	2.977	(1.170)	Turkey	12.362	(6.86)***
Italy	1.217	(0.400)	United Kingdom	5.356	(1.93)*
Jamaica	4.312	(2.58)***	United States	1.093	(0.230)
Japan	9.473	(1.330)	Uruguay	3.333	(1.330)
Korea	1.671	(0.640)	Venezuela	2.168	(1.630)
Observations	1,320				
Countries	52				
AR(2) test p-value	0.40				
Hansen J-test p-value	1.00				

NOTES:

1. See the notes in Table 1.
2. * significant at 10%; ** significant at 5%; *** significant at 1%.
3. Panel regression, 1972-2001, estimated by GMM. Robust standard errors in parentheses.
4. *M* and *INFL* restricted to <100%.

Table 3: CBI Ranking

Rank	Country	β_{EC}	s.e. (β_{EC})	Developing	Rank	Country	β_{EC}	s.e. (β_{EC})	Developing
1	Ireland	-4.8	1.8	0	27	Korea	1.7	2.6	0
2	Suriname	-4.6	2.8	1	28	Venezuela	2.2	1.3	1
3	Paraguay	-3.3	1.9	1	29	Hungary	2.3	2.6	1
4	Honduras	-3.1	1.3	1	30	Germany	2.5	3.2	0
5	Belgium	-2.8	2.2	0	31	Israel	3.0	2.5	1
6	France	-2.6	2.9	0	32	Netherlands	3.2	3.3	0
7	Australia	-1.6	2.1	0	33	Switzerland	3.2	4.6	0
8	Sweden	-1.4	3.0	0	34	Uruguay	3.3	2.5	1
9	Denmark	-1.0	2.3	0	35	Botswana	3.4	1.3	1
10	Austria	-0.9	2.8	0	36	Singapore	3.6	2.7	0
11	Dominican Republic	-0.8	1.5	1	37	Greece	4.0	2.3	0
12	Luxembourg	-0.5	2.6	0	38	Mexico	4.1	2.2	1
13	Morocco	-0.4	3.1	1	39	Jamaica	4.3	1.7	1
14	New Zealand	-0.2	2.3	0	40	India	4.8	1.8	1
15	Malta	-0.1	2.7	1	41	United Kingdom	5.4	2.8	0
16	Spain	0.2	3.1	0	42	Costa Rica	5.4	1.6	1
17	Finland	0.8	1.9	0	43	Norway	5.8	2.6	0
18	Panama	0.8	2.4	1	44	Thailand	5.9	2.8	1
19	Pakistan	0.8	1.8	1	45	Chile	6.1	3.3	1
20	Canada	1.0	3.4	0	46	Malaysia	6.4	3.9	1
21	Portugal	1.1	2.7	0	47	Iceland	7.6	1.7	0
22	Nepal	1.1	1.5	1	48	Bolivia	8.6	1.7	1
23	United States	1.1	4.8	0	49	Guatemala	9.0	1.1	1
24	Italy	1.2	3.0	0	50	Japan	9.5	7.1	0
25	Colombia	1.3	1.5	1	51	Turkey	12.4	1.8	1
26	Peru	1.5	2.1	1	52	Nicaragua	19.6	3.0	1

Table 4: Central Bank Independence and Average Inflation, 1972-2001

Dependent variable: average inflation (%)									
	All obs.			*INFL* <500%[5]			*INFL* <100%		
All Countries	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CBIS	19.575		13.047	1.010		0.924	0.723		0.613
	(4.73)***		(4.53)***	(2.05)**		(1.71)*	(2.22)**		(1.85)*
LEGAL		78.116	13.380		10.109	5.368		4.162	1.146
		(0.770)	(0.150)		(0.620)	(0.330)		(0.420)	(0.110)
TURNOVER		80.578	97.776		29.003	29.531		22.143	17.027
		(0.870)	(1.020)		(1.97)*	(1.650)		(2.42)**	(1.550)
Countries	52	52	51	52	52	51	52	52	51
R^2	0.31	0.04	0.34	0.08	0.10	0.14	0.09	0.13	0.13
Advanced Countries									
CBIS	0.351		0.552	restriction not binding			restriction not binding		
	(1.280)		(1.290)						
LEGAL		-4.590	-3.559						
		(0.430)	(0.340)						
TURNOVER		-11.408	-10.127						
		(0.720)	(0.650)						
Countries	25	25	25						
R^2	0.07	0.03	0.10						
Developing Countries									
CBIS	25.678		18.999	0.700		0.690	0.513		0.403
	(3.95)***		(3.89)***	(0.970)		(0.740)	(1.090)		(0.770)
LEGAL		129.316	-62.542		15.039	7.618		5.483	2.045
		(0.660)	(0.380)		(0.530)	(0.250)		(0.340)	(0.120)
TURNOVER		29.437	134.965		21.300	27.318		20.535	17.639
		(0.180)	(0.810)		(0.910)	(0.870)		(1.560)	(1.000)
Countries	27	27	26	27	27	26	27	27	26
R^2	0.38	0.03	0.43	0.04	0.07	0.08	0.05	0.13	0.09

NOTES:

1. See the notes in Table 1.
2. * significant at 10%; ** significant at 5%; *** significant at 1%.
3. Cross-sectional regression, data averaged over 1972-2001, estimated by OLS. t-statistics in parentheses.
4. *CBIS* - CBI score, higher values indicate less independence.
5. *INFL* is restricted to less than 500% before the average is taken.

Table 5: Central Bank Independence and Average Inflation, 1972-2001 - with control variables

Dependent variable: average inflation (%)										
	All obs.					*INFL* <500%				
All Countries	(1) OLS	(2) OLS	(2) 2SLS	(3) OLS	(3) 2SLS	(4) OLS	(5) OLS	(5) 2SLS	(6) OLS	(6) 2SLS
CBIS	19.741			13.939	28.590	0.864			0.865	1.188
	(4.34)***			(4.45)***	(3.97)***	(1.93)*			(1.640)	(1.75)*
LEGAL		80.284	58.571	11.772	-164.946		-9.105	1.230	-15.515	-11.501
		(0.680)	(0.190)	(0.120)	(0.660)		(0.540)	(0.050)	(0.930)	(0.490)
TURNOVER		58.285	111.345	134.951	541.713		34.502	-20.775	50.410	0.522
		(0.530)	(0.200)	(1.160)	(1.100)		(2.15)**	(0.420)	(2.57)**	(0.010)
log GDP per capita	-3.114	-1.720	-10.611	8.706	23.819	3.247	6.145	5.987	7.532	7.477
1972	(0.150)	(0.090)	(0.230)	(0.550)	(0.590)	(1.580)	(2.34)**	(1.510)	(2.80)***	(1.95)*
trade % of GDP	-0.039	-0.101	-0.223	0.194	0.445	-0.016	0.009	0.042	0.033	0.068
	(0.110)	(0.220)	(0.200)	(0.490)	(0.450)	(0.450)	(0.140)	(0.430)	(0.490)	(0.740)
fixed exchange rate	10.208	10.789	-74.756	35.905	-3.390	-11.089	-8.113	-12.992	-7.058	-9.854
	(0.140)	(0.180)	(0.560)	(0.690)	(0.030)	(1.590)	(0.910)	(1.130)	(0.810)	(0.900)
political stability	(17.93)	(8.27)	(6.31)	(10.25)	(16.90)	(10.14)	(10.54)	(16.10)	(11.59)	(15.78)
	(0.53)	(0.31)	(0.11)	(0.44)	(0.32)	(3.06)***	(2.73)***	(3.18)***	(2.97)***	(3.21)***
Countries	51	51	49	50	48	51	51	49	50	48
R^2	0.34	0.05		0.36		0.36	0.27		0.32	

NOTES:

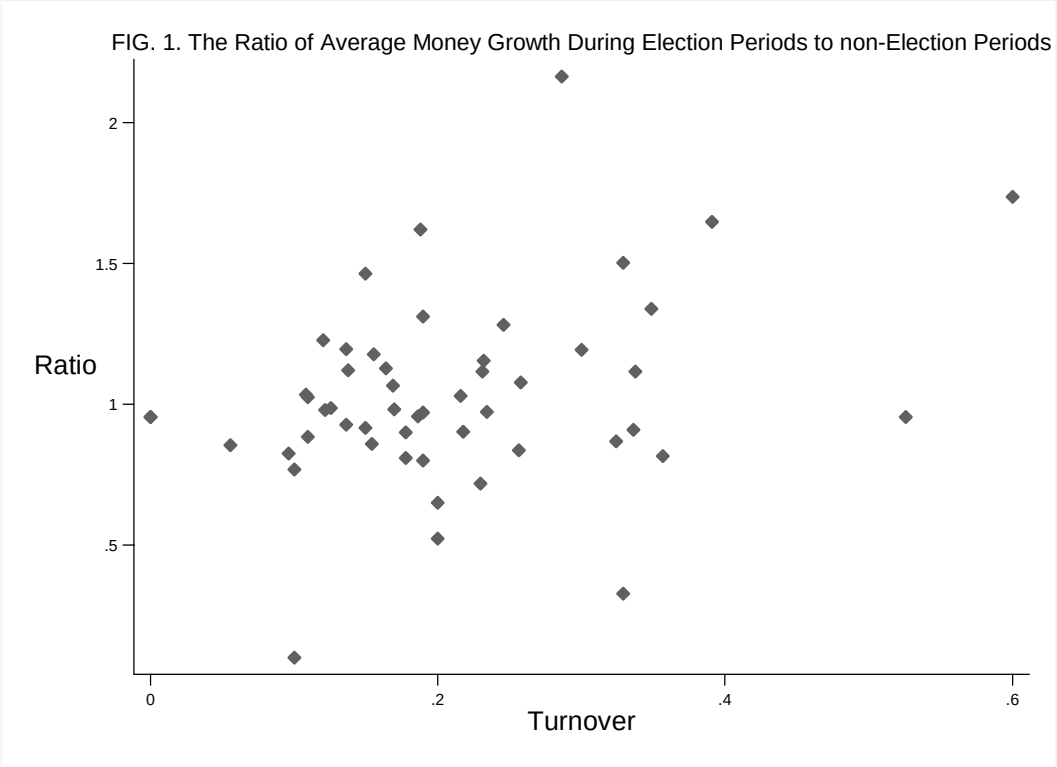
1. See the notes in Table
2. * significant at 10%; ** significant at 5%; *** significant at 1%.
3. Cross-sectional regression, data averaged over 1972-2001, estimated by OLS. t-statistics in parentheses.
4. *CBIS* - CBI score, higher values indicate less independence.

Table 6: Central Bank Independence and Inflation Volatility, 1972-2001

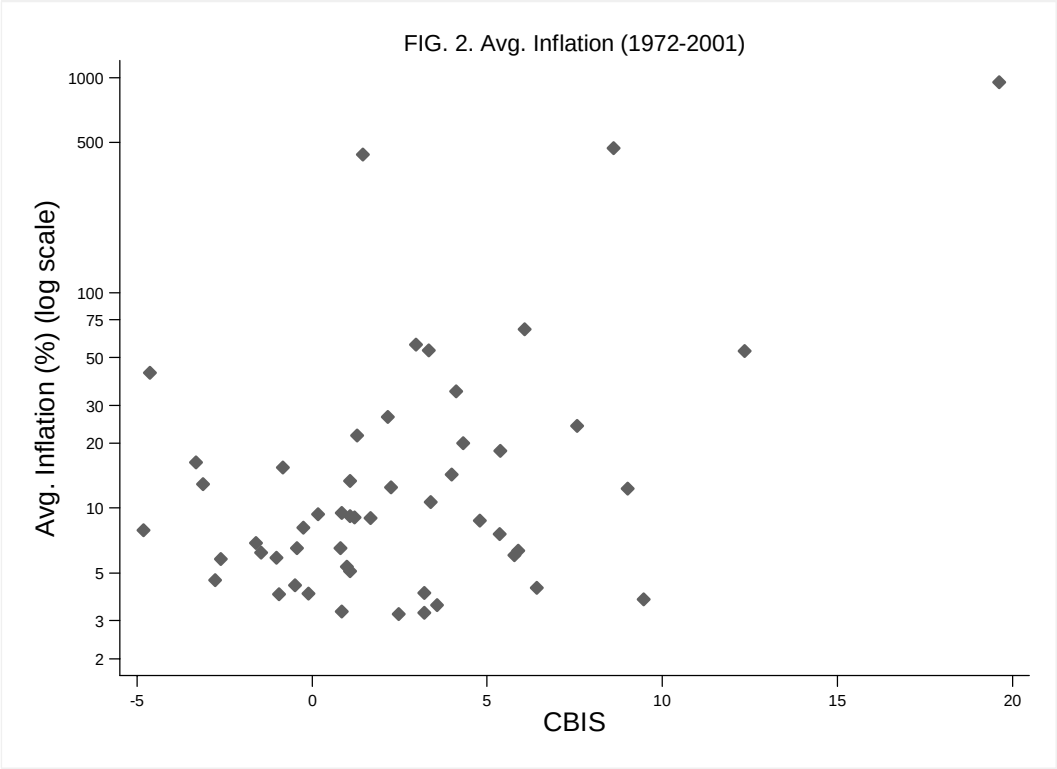
Dependent variable: standard deviation of inflation (%)									
	All obs.			*INFL* <500%[5]			*INFL* <100%		
All Countries	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
CBIS	54.784		55.358	1.226		1.502	0.411		0.443
	(1.92)*		(1.87)*	(1.68)*		(2.98)***	(1.93)*		(2.05)**
LEGAL		679.206	401.654		41.686	34.154		11.675	9.454
		(1.660)	(0.990)		(2.02)**	(1.610)		(1.73)*	(1.330)
TURNOVER		102.155	-27.111		35.346	31.838		14.207	13.172
		(0.190)	(0.060)		(1.060)	(1.040)		(1.600)	(1.69)*
Countries	52	51	51	52	51	51	52	51	51
R^2	0.25	0.04	0.27	0.05	0.13	0.21	0.06	0.14	0.21
Advanced Countries									
CBIS	0.405		0.378	restriction not binding			restriction not binding		
	(1.110)		(1.130)						
LEGAL		-5.630	-5.051						
		(1.330)	(1.180)						
TURNOVER		-7.982	-6.247						
		(0.470)	(0.440)						
Countries	25	25	25						
R^2	0.13	0.07	0.17						
Developing Countries									
CBIS	71.645		72.256	0.827		0.962	0.155		0.056
	(2.16)**		(1.88)*	(0.840)		(1.380)	(0.630)		(0.200)
LEGAL		1644.321	727.782		98.605	86.401		30.890	30.182
		(1.560)	(0.650)		(2.06)*	(1.700)		(2.35)**	(2.10)**
TURNOVER		-885.141	-583.268		-14.063	-10.043		-0.972	-0.739
		(0.850)	(0.580)		(0.260)	(0.190)		(0.080)	(0.060)
Countries	27	26	26	27	26	26	27	26	26
R^2	0.30	0.09	0.34	0.02	0.20	0.22	0.01	0.28	0.28

NOTES:

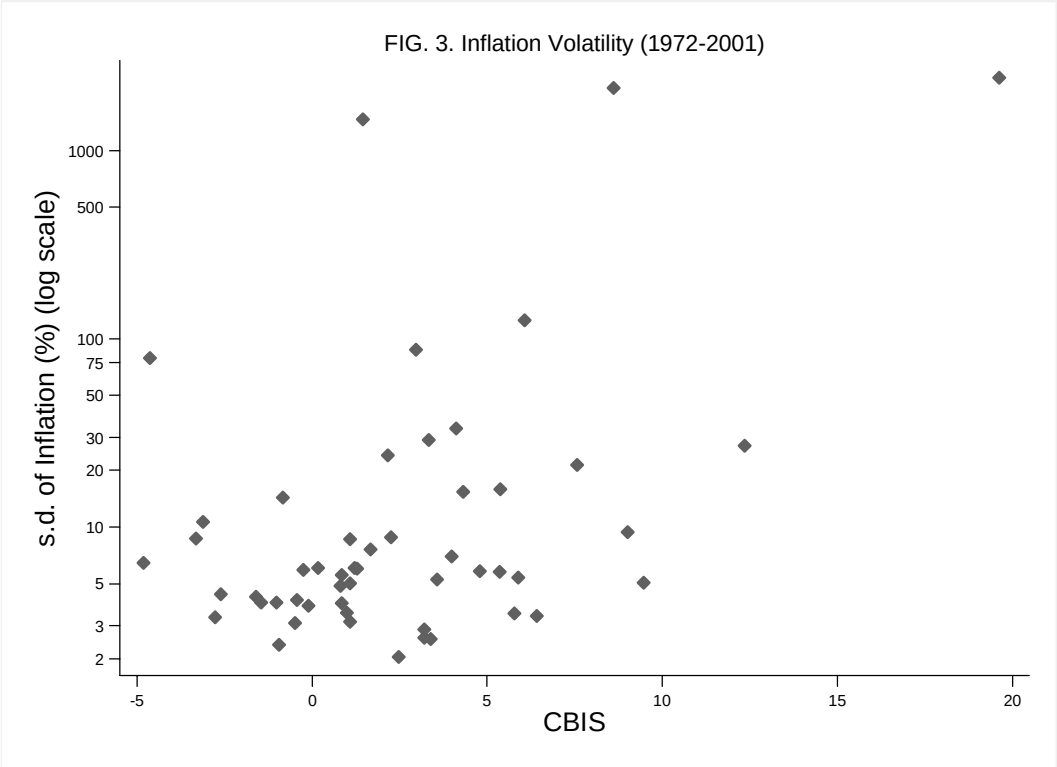
1. See the notes in Table 1.
2. * significant at 10%; ** significant at 5%; *** significant at 1%.
3. Cross-sectional regression, data averaged over 1972-2001, estimated by OLS. Robust t-statistics in parentheses.
4. *CBIS* - CBI score, higher values indicate less independence.
5. *INFL* is restricted to less than 500% before the average is taken.



NOTES. Turnover – turnover of central bank governors. One number per decade with higher values indicating lower CBI.



NOTES. CBIS - CBI score, higher values indicate less independence.



NOTES. CBIS - CBI score, higher values indicate less independence.

Table A1: Variables and Data Sources

Variable	Description and Source
M	Annual % change in M1. Source: IFS variable 34x.
M2	Annual % change in M2. Source: WDI. FM.LBL.MQMY.ZG
EC	The two-year election cycle indicator. Main source - IDEA database. Additional data sources were used to obtain exact election dates and whether the country has a presidential or parliamentary system. These sources are available upon request.
OUTPUTGAP	The log difference between real GDP and its (country specific) trend, estimated using a Hodrick-Prescott filter. GDP is in constant local currency units (WDI).
INFL	Annual percent change in consumer price index. Source: WDI.
FIX	1 for fixed exchange rate regime and 0 otherwise based on Reinhart and Rogoff (2004) course classification.
BUDGET	Central government budget surplus (% of GDP). Source: IFS v80.
GROWTH	GDP growth (annual %). Source: WDI. NY.GDP.MKTP.KD.ZG
BORCAP	Domestic credit to private sector (% of GDP): refers to financial resources provided to the private sector, such as through loans, purchases of nonequity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises. Source: WDI.
GOVT DEBT	Central government debt (% of GDP). Source: WDI. VGCDODTOTLGDZS
TAX	Tax revenue as a % of GDP. Source: WDI. GCTAXTOTLGDZS
GDP per capita	Log of GDP per capita (constant 2000 US$). Source: WDI.
TRADE (% of GDP)	Exports plus Imports divided by GDP. Source: IFS and WDI.
TURNOVER	One observation per decade (1950's to 1980's). Source: Cukierman, et al., (1992). Data from 1995 to 2004 obtained from Crowe and Meade (2007).
LEGAL	One observation per decade (1950's to 1980's). Source: Cukierman, et al., (1992). Data updated by Jácome and Vázquez (2005) and Siklos (2008).
DEV	0 for advanced, 1 for developing or emerging economy based on the classification in Arnone, et al. (2007).
Political Rights	1 low 7 high. 1972-2005. Source: Freedom House.
Civil Liberties	1 low 7 high. 1972-2005. Source: Freedom House.
DEM	Average of Political Rights and Civil Liberties. Source: Freedom House.
Political Risk Variables	
Government Stability	Source: ICRG published by the PRS group.
Ethnic Tensions	Source: ICRG published by the PRS group.
Internal Conflict	Source: ICRG published by the PRS group.
External Conflict	Source: ICRG published by the PRS group.