

**Price stability and central bank independence:  
Discipline, credibility and democratic institutions.**

Cristina Bodea and Raymond Hicks

Forthcoming *International Organization*

**Acknowledgments**

An earlier version of this paper was presented at IPES 2012. We would like to thank Lawrence Broz, Meredith Wilf, and Joanne Gowa for helpful comments. Two anonymous reviewers and the IO editor made comments that helped us bring the paper to its final form. Errors remain ours.

**Affiliations**

Cristina Bodea is assistant professor at Michigan State University. She can be reached at [bodeaana@msu.edu](mailto:bodeaana@msu.edu).

Raymond Hicks is statistical programmer at the Niehaus Center for Globalization and Governance at Princeton University. He can be reached at [rhicks@princeton.edu](mailto:rhicks@princeton.edu).

**Price stability and central bank independence:  
Discipline, credibility and democratic institutions.**

Cristina Bodea and Raymond Hicks

**Abstract**

In the past two decades central bank independence (CBI) has been on the rise under the assumption that it ensures price stability, despite mixed empirical evidence. Using a more encompassing theoretical approach and new yearly data for de-jure CBI (78 countries, 1973-2008), we re-examine this relationship, distinguishing the role of printing less money (discipline) from the public's beliefs about the central bank's likely actions (credibility). We argue that democracies and dictatorships differ in the likelihood of political interference and changes to the law, due to the presence of political opposition and the freedom to expose government actions. CBI in democracies should be directly reflected in lower money supply growth and, besides being more disciplinarian, it also ensures a more robust money demand by reducing inflation expectations and, therefore, inflation. Empirical results are robust and support a discipline effect conditioned by political institutions, as well as a credibility effect.

## Introduction

Since the 2007 economic crisis, central bank independence (CBI) has again become a topical issue. Jens Weidmann, the president of the Bundesbank, defended the European Union's lack of reflationary policy by stressing the need for central bank credibility: "Delivering on its primary goal to maintain price stability is the prerequisite for safeguarding the most precious resource a central bank can command: credibility."<sup>1</sup> The European Union also denied a bailout package to Hungary until the government restored the central bank's independence to Community standards. On the other hand, after decades of moderate deflation, Japan's politicians are questioning the Bank of Japan's independence, debating whether politicians need to be more active in monetary policy. The underlying assumption is that central bank independence effectively ensures price stability.

Historically, such stable prices have not been easy to accomplish. Across time periods, developed and developing nations alike have struggled to restore confidence in their currencies. Examples stretch from the US and Western Europe in the 1970s, Latin America in the 1970s and 1980s, and post-communist countries in the 1990s. Delegating monetary policy to an independent central bank has been a key institutional mechanism argued to help achieve low inflation<sup>2</sup> and bank independence saw a worldwide increase starting in the 1990s.<sup>3</sup>

Despite this trend, few studies examine whether reforms contribute to price stability and, if so, how. Existing research focuses on a single region<sup>4</sup> or two points in time.<sup>5</sup> In this paper we update the Cukierman et al. (1992) index of central bank independence for 78 countries from the end of

---

<sup>1</sup> *Financial Times* May 8, 2012, p. 11.

<sup>2</sup> Rogoff 1985.

<sup>3</sup> Arnone et al. 2007, Crowe and Meade 2008.

<sup>4</sup> Cukierman et al. 2002, Arnone et al. 2007, Jacome and Vasquez 2008, Author 2013.

<sup>5</sup> Arnone et al. 2007, Crowe and Meade 2008.

the Bretton Woods system until the present. The result is an original data set that codes independence annually and covers legislation changes in the last twenty-five years. We also take the opportunity provided by the central bank reforms over the last decades to reevaluate and extend the political economy literature on CBI. Specifically, we investigate the mechanisms through which bank independence affects price stability, and explore whether CBI's effect on monetary outcomes is conditional on a country's political institutions.

From inception, the CBI literature has been concerned with the divergence of de facto independence from legal provisions.<sup>6</sup> In some countries, governments circumvent the legal delegation of monetary policy because they can easily replace bank governors or credibly threaten to change the central bank law. As measures of de facto independence, the economics literature looks at turnover rates of bank governors or central bank surveys. Because long governor tenures can suggest either independence or subservience, and surveys cover few countries and periods, much of the political economy literature has focused instead on the conditions that allow legal central bank independence de facto bite.<sup>7</sup>

The political economy work has, however, yielded theoretical approaches and empirical results that speak to each other little. Broz argues that in political systems where decision making is transparent (i.e. democracies), independent central banks can contribute to low inflation.<sup>8</sup> The empirical evidence strongly supports this hypothesis, yet the likely mechanisms that contribute to the democratic transparency—“the attentive public or the political opposition” – remain

---

<sup>6</sup> Cukierman et al. 1992.

<sup>7</sup> Alpana and Honig 2010 derive de facto CBI from monetary aggregates' behavior during elections.

<sup>8</sup> Broz 2002.

unaddressed.<sup>9</sup> Keefer and Stasavage, on the other hand, focus solely on the narrower role of meaningful political opposition in enhancing the credibility of legally independent central banks.<sup>10</sup> Their evidence shows that legal independence reduces inflation only in the presence of multiple constitutional checks and balances.<sup>11</sup>

Our paper provides a unifying approach to previous political economy research. Democracies and dictatorships differ significantly in their application of the rule of law and the process of law change. The strong constitutional constraints and greater transparency prevailing in democracies enhance the de facto enforcement of the law and make threats and actual legislative amendments more difficult and less reflective of short-term interests. We argue that the process of law implementation and amendment in democracies has implications for the binding effect of central bank legislation both on *government behavior* and on *public expectations*. First, delegation of monetary policy to an independent central bank in democracies allows the bank to actually behave in a conservative fashion which is reflected directly in lower rates of money supply growth. That is, the central bank can increase interest rates, target the exchange rate or money supply to ensure, most prominently, price stability, regardless of short-term government pressure. Moreover, with multiple veto players and a press that can report freely on the position of the government, the opposition, the central bank and other key constituencies, the central bank is likely to be more credible. This will ensure a more robust money demand by reducing public inflation expectations, leading to lower inflation above and beyond the decline in money supply.

---

<sup>9</sup> Broz 2002, p. 861. Consistent with Broz, Stasavage (2003) shows that central banks vary in the transparency of their operations and transparent banks have an easier time lowering inflation.

<sup>10</sup> Keefer and Stasavage 2002, 2003.

<sup>11</sup> Keefer and Stasavage (2003) find that multiple constitutional checks and balances reduce the bank governor's risk of being fired. Treisman (2000) shows that federal states preserve to a larger degree the existing pattern of central bank executive turnover. See also Lohmann (1998a).

We test our argument on a sample of 78 democracies, mixed regimes and dictatorships from 1973 to 2008. The empirical results are robust to different estimation techniques and specifications, and broadly conform to expectations. There is a strong interactive effect between CBI and democracy and its mechanisms: In democracies, in countries with constitutional checks and balances and a free media, CBI has a strong negative effect on money supply growth rates. Inflation results support our theory as well: CBI has a strong, stand-alone, negative effect on inflation beyond the central bank's control of the money supply and, unlike previous work, this effect is not driven by OECD countries. The marginal effect of independence is, however, negative and statistically significant only for democracies and countries with constraints on the government and a press that can report freely.

Our paper makes several contributions. Theoretically we have a unifying framework linking CBI to price stability across political regimes. Also, more than earlier research, our theory accurately reflects the sources of inflation and distinguishes the role of simply printing less money (discipline) from the public belief about what the monetary authority is likely to do (credibility). We are most innovative in theorizing and evaluating the interactive effect of CBI and domestic political institutions on rates of money growth – the discipline effect. While parts of our credibility hypothesis have been derived in earlier work (Broz 2002, Keefer and Stasavage 2002, 2003), we test such hypotheses accounting for the theoretical sources of inflation, thus getting closer to capturing the notion of credibility. Very importantly, we test our hypotheses with new author-coded data on yearly central bank independence. This data identifies more precisely the relationship between price stability and the central bank than the period averages prevalent in previous research.

The paper proceeds as follows: Section 2 reviews the literature and presents our theory. Section 3 discusses data and variables. Section 4 shows the results. Section 5 concludes.

### **Background and theory**

In the last twenty years, countries have reformed the legislation governing their central bank, delegating monetary policy to a greater extent. This trend coincides with the publication of studies showing a correlation between CBI and lower inflation in developed countries. Figure 1 compares central bank independence in 1980 and 2008, using a score on the Cukierman et al. (1992) CBI index of 0.4 or above as the independence cutoff. As shown, while governments in a few large countries, notably, Brazil, India, and Australia, have retained control over their central banks, countries in most regions have made their banks more independent. The only region lagging behind is Africa.

[Figure 1 about here]

Theoretically CBI keeps inflation in check because it reduces the risk of time inconsistency in monetary policy.<sup>12</sup> Time inconsistency emerges because governments have incentives to generate economic growth through surprise inflation. Therefore, government announcements about monetary policy and its commitment to price stability have little credibility. Independent central bankers, on the other hand, are much less sensitive to the political electoral cycle, and are, on average, more concerned about risks to price stability than elected politicians.<sup>13</sup>

The time-inconsistency approach has been critiqued in developed countries, because, presumably, in these countries monetary policy has been delegated to the central bank and the

---

<sup>12</sup> Kydland and Prescott 1977, Barro and Gordon 1983.

<sup>13</sup> Rogoff 1985.

bank has no incentives to create surprise inflation.<sup>14</sup> Also, more recent explanations for monetary policy delegation to independent central banks focus on information asymmetries between ministers and backbench legislators and coalition partners;<sup>15</sup> diverse political coalitions;<sup>16</sup> more checks and balances;<sup>17</sup> federal systems and party veto players;<sup>18</sup> the presence of powerful coalitions in favor of price stability;<sup>19</sup> or a more transparent political system.<sup>20</sup>

Reflecting the potentially multiple causal arguments for delegation of monetary policy, the evidence for an association between CBI and inflation has been mixed with a particularly weak relationship in developing countries.<sup>21</sup> The early work on the topic shows a strong negative relationship between inflation and CBI in developed countries.<sup>22</sup> This relationship lacks robustness in some of the later work.<sup>23</sup> On the other hand, Crowe and Meade, using data as recent as 2003, account for country heterogeneity and potential endogeneity of CBI and find a robust negative relationship across developed and developing countries.<sup>24</sup>

The political economy literature suggests that political institutions influence significantly the extent to which an independent bank will reduce inflation. In addition to the Broz and Keefer and Stasavage research cited above,<sup>25</sup> Franzese shows that the effect of central bank independence on inflation depends on features of the political environment in which banks operate, including

---

<sup>14</sup> Blinder 1998.

<sup>15</sup> Bernhard 1998.

<sup>16</sup> Crowe 2008.

<sup>17</sup> Moser 1999.

<sup>18</sup> Treisman 2000, Hallerberg 2002.

<sup>19</sup> Goodman 1991, Treisman 1998.

<sup>20</sup> Broz 2002.

<sup>21</sup> For a recent survey see Arnone et al. 2007.

<sup>22</sup> Grilli et al. 1991, Cukierman et al. 1992, Alesina and Summers 1993.

<sup>23</sup> de Haan and Kooi 2000, Daunfeldt and de Luna 2008, Jacome and Vasquez 2008.

<sup>24</sup> Crowe and Meade 2008.

<sup>25</sup> Broz 2002; Keefer and Stasavage 2002, 2003.

government partisanship and labor market organization.<sup>26</sup> Similarly, other work shows that strong institutional checks and balances<sup>27</sup> or the quality of political institutions<sup>28</sup> affect the ability of independent central banks to keep inflation low.

While these explanations all point to the importance of political institutions, they highlight different aspects that make it difficult to distinguish their inter-relatedness. Our argument provides a unifying approach to previous research by explicitly focusing on the role of political interference. Because monetary policy has distributional effects, politicians can use it to influence the economy in the short-run. Therefore, delegation is costly and will be continuously contested in the political arena. Early on in the CBI literature, Cukierman et al. write that “first, the laws are incomplete in that they cannot specify explicitly the limits of authority between the central bank and the political authorities under all contingencies. These voids are filled by tradition at best and by power politics at worst. Second, even when the law is quite explicit, actual practice may deviate from it.”<sup>29</sup> Political interference has been an issue even for the Bundesbank, the most acclaimed independent central bank after the Second World War. For example, Lohmann notes that the “behavioral independence of the German central bank fluctuates over time with the party control of federalist veto points.”<sup>30</sup> Also, after the 1957 central bank law reform, the Bundesbank undertook an active role in the political system, trying to consolidate its conservative reputation and publicly debating the government on the sources of inflation.<sup>31</sup>

---

<sup>26</sup> Franzese 1999.

<sup>27</sup> Moser 1999, Hayo and Voigt 2008.

<sup>28</sup> Hielscher and Markwardt 2012.

<sup>29</sup> Cukierman et al. 1992, p. 355.

<sup>30</sup> Lohmann 1998, p. 401.

<sup>31</sup> Berger 1997.

We argue that democracies and dictatorships differ significantly in their enforcement of the rule of law and the process of law amendment, with implications for the effect of the central bank law on restraining government behavior and anchoring public expectations. Specifically, the broad rule of law is stronger in democracies than in other states because of ex-post constraints and greater transparency regarding the actions of the government. These distinctive characteristics of democracies are likely to have two effects. First, delegation of monetary policy to an independent central bank in democracies allows the bank to be more conservative which is reflected directly in lower rates of growth for the money supply. In addition to being directly more disciplinarian, a central bank whose credibility is enhanced by institutions that limit political interference is also likely to ensure a more robust money demand via lower inflation expectations, leading to stable prices.

At the most basic level, in democracies the prevalence of the rule of law generates confidence in contract enforcement broadly and, especially, when the government is a party to the contract, as is the case with central bank legislation.<sup>32</sup> In democracies, the government realizes that its tenure in office depends partly on the perception that it is playing by the rules and excessive violations may lead to removal from office. The political opposition, or “leading rivals of the administration in power,”<sup>33</sup> has an interest in the enforcement of the law granting independence to the central bank as it denies the incumbent the opportunistic use of monetary policy. Indeed, in a system with two or more veto players there is a low probability that the central bank will be overridden on any of its decisions.<sup>34</sup> In addition, government coalition partners, back-bench

---

<sup>32</sup> Olson 1993.

<sup>33</sup> Olson 1993, p. 572.

<sup>34</sup> Keefer and Stasavage 2003.

legislators and the opposition have an interest in the enforcement of the law and a de facto independent bank because such an institution provides balanced information, solving the problem of asymmetric information.<sup>35</sup> Thus, the presence of a strong opposition will allow the central bank greater leeway in conducting policy and we would expect a stronger relationship between CBI and control of the money supply and price stability.<sup>36</sup>

Second, enforcement of the central bank law is helped by the fact that in democracies individuals as well as the key contenders to power have significant freedom of speech and the press is free to report on the government's actions. Central banks often lack a high degree of transparency with respect to internal decision making and it is difficult to determine directly their "true" independence.<sup>37</sup> However, freedom of speech allows the opposition to blow the whistle on government interference in central bank decisions. It also allows the bank to use the media to publicize conflicts with the government, attribute the sources of the inflationary phenomenon to expansionary fiscal policy<sup>38</sup> and consolidate and expand constituencies favorable to price

---

<sup>35</sup> Bernhard 1998.

<sup>36</sup> The constraints argument should work even for conservative governments facing a weak left-wing opposition. Lohmann (1998b) argues that CBI can be expected to reduce inflation even if governments have low inflation preferences. Even for such right-leaning governments, election periods may increase temptation to increase money supply and CBI ensures consistency between ex-ante and ex-post inflation preferences. While partisanship is a key component for defining meaningful political constraints, partisanship by itself need not be systematically related to the process of law enforcement and change. As such, it is not crucial to our theory to address how partisanship may directly relate to CBI. For example, in post-communist countries the early transition saw few actors with an appetite for conservative monetary and fiscal policies. For us, this translates in few constraints on government. Still, partisanship may affect price stability on its own and, therefore, empirically, we test whether our results are robust to accounting directly for partisanship.

<sup>37</sup> Broz 2002, Bodea 2010.

<sup>38</sup> Treisman (2001) shows that fiscal deficits lead to high inflation in the absence of independent central banks. Bodea and Higashijima (2013) find that CBI in democracies has a deterrent effect on fiscal overspending, mediated by partisanship and the electoral cycle.

stability.<sup>39</sup> Ultimately, freedom of speech allows voters to be better informed and eventually punish at the ballot box government transgressions against the law, including central bank law.<sup>40</sup> Both the presence of an opposition and a free press, therefore, make the central bank law more enforceable by making it more difficult for a government to interfere with the central bank.

The direct consequence of a central bank law that has a de facto bite is that the bank can be disciplinarian and use the instruments of monetary policy to achieve the legal mandate in the delegation contract, most prominently low inflation. This may mean an independent setting of the interest rates at which the central bank lends directly to financial institutions or an independent determination of the quantity of government securities to be sold or bought on secondary markets. Changes in monetary policy instruments affect directly the amount of liquidity available in the financial system and the supply of money. Therefore, countries with independent central banks and institutional configurations that guarantee the rule of law will have lower rates of growth of the money supply, reflecting the preference of the central bank for price stability.<sup>41</sup> Following, we derive a first hypothesis:<sup>42</sup>

*H1 (discipline): Money growth rates are lower when the central bank is independent and the country is a democracy, there are multiple veto players and the press is free.*

---

<sup>39</sup> Goodman 1991, Berger 1997, Bernhard 1998.

<sup>40</sup> Leeson 2008 shows that media freedom is linked to citizen political knowledge and involvement in politics.

<sup>41</sup> Clark and Hallerberg (2000) use money supply growth rates to test for electoral cycles in monetary policy.

<sup>42</sup> We bring most value added by deriving and testing H1. Based on our framework we are however able to derive hypotheses similar to earlier work on the behavior of inflation (H2 below). From a normal science perspective, we find it reassuring to have predictions conforming to previous work as well as novel implications and test them in a research design matching our theory and using our new data.

While central bank actions have a relatively direct effect on the money supply, the bank has only imperfect control of inflation.<sup>43</sup> Inflation is a result of money supply increases which in the longer run exceed demand for cash balances. An independent central bank that is credibly conservative ensures a more robust money demand which reduces the inflationary effects of a monetary expansion.<sup>44</sup> This moderates broad public inflation expectations, in particular inflationary expectations negotiated in wage contracts. Thus, workers are likely to renounce frequent renegotiation of contracts and forego demands of indexation to past inflation and the public will want to hold relatively more of the money controlled by a trusted central bank. How much the public trusts the central bank depends not only on the government interfering directly in central bank decisions as discussed above, but also on the likelihood that the central bank law will be changed randomly, within short time spans and without proper public debate.

Again, the institutional mechanisms that ensure application of the rule of law will limit changes to the law. The veto player literature argues that a larger number of relevant veto points (with distinct preferences) increases policy stability.<sup>45</sup> Central bank independence which is granted through regular legislation cannot be amended in a sweeping manner when the political system

---

<sup>43</sup> This applies particularly to developing countries, where there is an imperfect understanding of monetary policy transmission mechanisms, money demand functions are unstable and inflation forecasting remains inaccurate (IMF 2006). Fiscal policy also drives inflation expectations (Ardagna et al. 2004, Treisman 2000).

<sup>44</sup> Stockman 1996, Ghosh et al. 1997 and Levy-Yeyaty and Sturzenegger 2001. Other research suggests that adoption of specific (optimal) contracts like inflation targets can generate credibility and improve inflation performance (Walsh 1995). In practice inflation targeting (IT) may not be a silver bullet because targeting has a medium-term horizon and some of the developing countries with IT have problems reliably forecasting inflation (Svensson 1997, IMF 2006). Other work also argues that an independent central bank is a precondition for successful IT (Eichengreen et al. 1999; Agénor 2001). Empirically, the Cukierman et al. index includes a component looking at the central bank's objective, giving maximum scores to those banks pursuing exclusively price stability and having final word in resolution of conflict with the government.

<sup>45</sup> Tsebelis 1995.

has many different actors who can veto a policy proposal. Keefer and Stasavage show that in the presence of multiple veto players, central bank independence always lowers inflation expectations.<sup>46</sup> Related, Treisman finds that fiscal decentralization and implicitly federal veto points perpetuate either low or high inflation in part by preserving existing institutions.<sup>47</sup>

Freedom of speech and a free media is also likely to contribute to higher legislative predictability. A free media is likely to present competing views of any proposed changes to the central bank law. Even in countries with legislative majorities for the executive, due process is likely longer when differing views on the central bank can be expressed and different public constituencies need to be convinced that law changes act in their favor. Thus, even if law changes pass the legislature, free speech and press freedom can at least postpone or prevent changes driven by short-term interests. In addition, as mentioned earlier, the central bank itself can use the public arena to make the case for its independence, as can the political opposition and conservative circles, including the banking industry or the financial press.

The role of both veto players and freedom of the media is illustrated in the 1957 change in the Bundesbank law, the central bank of the Federal Republic of Germany. Although “many members of the CDU government were intent upon making the Bundesbank more responsive to government preferences, and after the 1957 elections they arguably had the votes to do so,”<sup>48</sup> two key factors contributed to the preservation (in large part) of the Bundesbank's independence.

---

<sup>46</sup> Keefer and Stasavage 2003. In their model inflation results only from changes in public expectations about the interaction between an independent central bank and one agenda setting veto player and a second non-agenda setting veto player. Walsh (1998) has a more complex model showing that inflation results both from money growth rates and inflation expectations used in negotiated wage contracts. Empirical work has found a long-run relationship between money and inflation in the U.S. (Lucas 1980) and globally (McCandless and Weber 2005, Treisman 2000).

<sup>47</sup> Treisman 2000.

<sup>48</sup> Goodman 1991, p. 338.

A first was German federalism and the veto power of the upper chamber of parliament, the Bundesrat, representing the states.<sup>49</sup> Because the Social Democratic Party controlled several of the state governments and the CDU was split internally on the issue of making the central bank more dependent on the federal government, negotiations for the passage of the 1957 law lasted for several years. This prolonged negotiation allowed the central bank to utilize the media to forge its position on price stability and explain the contribution of government policies to inflation.<sup>50</sup> In the run-up to the 1957 elections, for example, the Bundesbank raised interest rates several times linking publicly their actions to the threat of inflation posed by election-related fiscal overspending. Also, Goodman cites a German central banker as saying that “we have established such credibility that anytime there is a conflict with the government, at least 70 percent of the financial writers in the country would be on our side.”<sup>51</sup> Moreover, the central bank forged alliances with conservative government ministers and contributed actively to plans for a federal level stabilization program.

Following, we derive a second hypothesis:<sup>52</sup>

*H2 (credibility): Inflation (controlling for money supply growth) is lower when the central bank is independent and the country is a democracy, there are multiple veto players and the press is free.*

## **Data, operationalization and methods**

---

<sup>49</sup> Lohmann 1998a.

<sup>50</sup> Berger 1997.

<sup>51</sup> Goodman 1991, p. 339.

<sup>52</sup> Similar to our empirical approach, Levy-Yeyaty and Sturzenegger 2001 and Ghosh et al. 1997 attempt to capture a credibility effect on inflation (in their case of fixed exchange rates) by controlling for changes in money supply (M2). While this is a reasonable approach, a more complete analysis of credibility involves looking at output sacrifice ratios during disinflation periods (Stasavage 2003) and this can be done in future research.

Despite the popularity of CBI measures, there have been few attempts to code independence annually, directly identify reform years, or even, beyond a handful of countries, to code the reforms of the last twenty-five years. Our data does exactly this. Cukierman et al.'s (1992) original data cover 72 countries for 4 decades (1950-59, 1960-72, 1973-79, and 1980-1989). The annual coverage of CBI has been extended to the central banks of post-communist countries from 1990 to 2002<sup>53</sup> and to 24 Latin American and Caribbean countries for 1989 to 2002.<sup>54</sup> We update the CBI scores for 78 countries for years 1973 to 2008. The Appendix lists the countries and reform years.

The core dependent variables are the change in money supply (M2) and the inflation rate. M2 is an intermediate monetary aggregate (currency in circulation and very short term deposits);<sup>55</sup> data are from the International Monetary Fund's International Financial Statistics (IFS), supplemented with the World Bank's World Development Indicators (WDI). We use the log of M2 growth rates, taking the log of one plus the absolute value. For the 81 negative values of M2 change, we then add a minus sign to the logged value.<sup>56</sup> The inflation measure is the yearly change in the consumer price index (WDI, OECD statistics, IFS). We use the logged inflation rate as the dependent variable, and, for consistency we treat negative values (25 observations) similar to negative M2 changes.<sup>57</sup>

---

<sup>53</sup> Cukierman et al. 2002, Bodea 2013.

<sup>54</sup> Jacome and Vazquez 2008.

<sup>55</sup> The central bank has more direct control of narrow money or M1, but such data suffer severely from missing values.

<sup>56</sup> Results hold when dismissing the 81 negative value observations, however, for our discipline argument, it is important to retain negative growth rates. Results also hold when we dismiss the 25 negative inflation values.

<sup>57</sup> Because expectations about monetary policy become unanchored in high inflation environments (Ghosh et al. 1997, Levy-Yeyaty and Sturzenegger 2001), we discuss robustness to restricting the sample to M2 changes and inflation rates of less than 150%, losing 74 and 82 observations.

The key explanatory variables operationalize the independence of the central bank and features of countries' political regime. We code the level of central bank independence based on the Cukierman et al. (1992) original index. The CBI scores are based on a weighted aggregated calculation of 16 indicators in 4 categories: the Chief Executive Officer, Policy Formation, Objectives, and Limitations on Lending to the Government (see Appendix for more detail). The CBI index ranges from 0 to 1, with 1 representing the most independent central bank. A bank has more legal independence when the governor's term in office is longer; the appointment and dismissal procedures are insulated from the government; the bank's mandate is focused on price stability; when the formulation of monetary policy is in the hands of the central bank; and when the terms on central bank lending to the government are more restrictive.

Our main measure for democracy is the Polity2 score from the Polity IV database (0 to 20 range). We supplement the Polity2 score with Freedom House data. This measure is the average of a country's political rights and civil liberties score. Originally, lower Freedom House scores indicated democracies. We reverse the scale so that a value of 7 is most democratic and a value of 1 is least democratic.

We use several variables to determine whether the presence of meaningful opposition or press freedom increases the effectiveness of legal CBI. While our key conditioning variable is democracy, testing the posited causal mechanisms strengthens the support for our theory and reduces concern that CBI is conditioned by other factors like economic development (which is highly correlated with democracy but less so with constraints). A first measure is executive constraints from Polity IV which measures "the extent of institutionalized constraints on the decision-making

powers of chief executives, whether individuals or collectivities.”<sup>58</sup> Scores on the variable range from 1 (no limits to an executive power) to 7 (other political actors are as equally strong or stronger than the executive). A second measure is the checks variable from the Database of Political Institutions (DPI) which measures the checks and balances in the political system. As with executive constraints, the more places in the political system where legislation can be blocked, the higher the value of the variable.<sup>59</sup> Our final measure of checks and balances is political constraints.<sup>60</sup> This ranges from 0 to 1 and quantifies the feasibility of policy change by tracking the number of independent veto players in the executive and legislative chambers. Again, a higher score represents stronger constraints. To measure media freedom, we use Freedom House's Freedom of the Press measure available since 1980, with values of 0 (not free), 1 (partially free), and 2 (fully free).

In addition, all models include: the lagged logged value of GDP (WDI); lagged trade openness (WDI); a dummy variable for a fixed exchange rate regime based on the IMF's official classification;<sup>61</sup> the lagged value of a country's fiscal budget deficit/surplus relative to GDP;<sup>62</sup> and indicator variables for presidential and legislative election years.<sup>63</sup>

For the main models, we use OLS regressions with country fixed effects and a lagged dependent variable.<sup>64</sup> The lagged dependent variable controls for the backwards indexation of

---

<sup>58</sup> Marshall, Jagers, and Gurr (<http://www.systemicpeace.org/inscr/p4manualv2010.pdf>) , p. 24.

<sup>59</sup> Following Keefer and Stasavage (2003) we use the log of *checks*.

<sup>60</sup> Henisz 2002.

<sup>61</sup> Ilzetzki, Reinhart, and Rogoff 2009. A fixed regime is coded if the observation is a 1 under the IMF's coarse coding.

<sup>62</sup> IMF IFS, EBRD transitional reports, OECD, Brender & Drazen 2005.

<sup>63</sup> Goemans (2011): <http://www.rochester.edu/college/faculty/hgoemans/data.htm>

<sup>64</sup> Hausman tests reject a random effects specification.

inflation and potentially serially correlated error terms.<sup>65</sup> For the inflation models, we also include the lag log of the change in M2, to control for the disciplinarian effect of central bank on inflation. This way, the CBI index coefficient more likely reflects an additional credibility effect via a robust money demand and anchored inflation expectations.<sup>66</sup> To control for time specific factors, we include decade dummies in the M2 models and the lagged change of the world GDP deflator in the inflation model<sup>67</sup>. The fixed effects estimation controls for time invariant country characteristics not captured by our regressors. Using country fixed effects in an OLS regression with lagged dependent variable may introduce bias<sup>68</sup>, a problem aggravated by the short time duration for some countries in the sample, which does not allow for shocks to fixed effects to diminish over time (Wooldridge 2002). Our robustness section presents therefore models with panel-corrected standard errors that include the lagged dependent variable and regional and decade dummies.

## **Results and discussion**

In Table 1, we examine whether CBI, democracy and democratic mechanisms affect a central bank's control of the money supply and inflation. The dependent variable is the logged rate of growth of money supply (Models 1-4), and the logged inflation rate (Models 5-8). In Model 1 we include a country's Polity score and the CBI index as stand-alone variables. The Polity score by itself does not significantly affect the growth rate of M2, while central bank independence does

---

<sup>65</sup> Beck and Katz 1995.

<sup>66</sup> Levy-Yeyaty and Sturzenegger (2001), Ghosh et al. 1997.

<sup>67</sup> The inter-connectedness of the global economy suggests that inflation rates may trend together so it is important to control for this eventuality. Using decade dummies instead, similar to the M2 models, does not alter the findings.

<sup>68</sup> Nickell (1981).

have a negative and statistically significant effect.<sup>69</sup> Across all models, the only other sometime significant factor is economic growth: positive growth decreases the growth rate of M2.

[Table 1 about here]

While CBI appears to have an independent effect on money growth rates, Models 2-4 test our first hypothesis by considering the conditional effect of the CBI index on money growth rates. Model 2 introduces the interaction between the CBI index and Polity. To facilitate interpretation, we transform the Polity score by subtracting 20 from each value. This does not change the substantive impact of the variables or the interaction;<sup>70</sup> it only changes the interpretation of the CBI coefficient. With the original Polity variable, the CBI coefficient is the effect of a one-unit change in CBI when Polity is equal to zero, or a dictatorship. With the transformed data, the coefficient is the effect when Polity is still at zero, but zero now represents full democracies.

Brambor et al. (2006) prescribe that for multiplicative interaction models like ours, inference be done with meaningful marginal effects and standard errors to determine the conditions when the key variables have a statistically significant effect. Consequently, we focus our discussion on the graphs in Figures 2-5, showing the marginal effect of the CBI index (and the 90% confidence interval) as the conditioning variables change. Figure 2 shows the marginal effect of CBI as Polity and Freedom House democracy vary.<sup>71</sup> The graphs confirm our expectations; the marginal effect of CBI is downward sloping but is only negative and statistically significant at high levels of democracy (Polity scores above 16). At low levels of Polity, the marginal effect of CBI is positive

---

<sup>69</sup> Surprisingly, CBI is negative and significant for non-OECD countries but insignificant for OECD countries.

<sup>70</sup> Brambor et al. 2005.

<sup>71</sup> The figures retain the original scale of Polity and Freedom House. Results with Freedom House scores are available in the appendix.

but statistically insignificant. Similarly, the marginal effect of CBI is negative and significant only when the Freedom House score is greater than about 5.

[Figure 2 about here]

Models 3 and 4 interact the CBI index with the different operationalizations of democratic mechanisms.<sup>72</sup> Model 3 includes Henisz's political constraints and Model 4 includes press freedom. The democratic mechanisms are recoded so that the highest values are converted to a zero, as with the democracy score transformations. Again, the results conform to expectations. The coefficient on the CBI index is negative and significant and the interaction is negative and significant for political constraints. For both models, CBI has a strong effect on changes in M2 at the highest values of the democratic mechanisms. The marginal effect of CBI at different levels of each of the democratic mechanisms is shown in Figure 3.

[Figure 3 about here]

For all the conditioning variables except the log of checks, the slope of the marginal effect is downward and, when significant, is negative. The CBI index has a significant effect on changes in M2 only at the highest levels of *executive constraints*, *political constraints*, and *press freedom*. *Checks* has a significant effect for logged values between 1 and 2, corresponding to values of about 3 to 7 of the non-logged measure, which represents most of the range of *checks*. Overall, then, legal CBI influences M2 changes when there are constraints on government's power and the press is free.

Next, we use the log of inflation as the dependent variable, showing the results in Models 5-8 and Figures 4-5. All models include the lagged inflation rate and the lagged change in M2, both

---

<sup>72</sup> Table 1 shows only the results using Political Constraints and Freedom of the Press. We show graphically all four mechanisms in Figures 3 and 5. The full results are available in the appendix.

logged. As shown in Model 5, CBI has an independent effect on inflation. Greater central bank independence leads to lower inflation, even controlling for the lagged change in M2 and political institutions. When we run the analysis separately for OECD and non-OECD countries, we find a significant and negative effect in both samples. Also, the results continue to hold if instead of the consumer price inflation we use the GDP deflator to measure overall price changes. With regards to the control variables, only fiscal deficits are shown to consistently contribute to domestic inflation.

Unlike the M2 models, with inflation we are concerned about the possible reverse causality between inflation and central bank independence. In countries like Bulgaria (1997) or Argentina (1992) the central bank was given more legal independence during larger stabilization efforts aimed at controlling rampant inflation. We perform several tests to ameliorate such concerns. First we use lagged values of the CBI index up to the third lag and our results do not change.

Unsurprisingly, the size of the effect is smaller the farther we go with the lags, but the effect remains negative and statistically significant.<sup>73</sup> Additionally, we exclude from the estimation observations for the two years preceding the reform of the central bank law, or the reform year and the following two years and the results remain similar. We also ran a seemingly unrelated regression for the inflation and M2 change models and findings do not change.

Models 6-8 test the effect of CBI conditional on democracy and democratic mechanisms. Again, the coefficient of the CBI index is negative and significant at the highest levels of democracy. The interaction effect of the CBI index with Polity (Model 6) is negative and statistically significant. Figure 4 shows, however, the marginal effect of CBI is significant only at high levels of

---

<sup>73</sup> Similar to our approach, Jacome and Vasquez (2008) use lagged values of the CBI index as instruments.

Polity and Freedom House. The marginal effect line is downward sloping, suggesting that only for Polity scores greater than about 14 (Freedom House scores greater than about 4.5) does CBI significantly reduce inflation. As with the M2 growth rates, there is evidence that the combination of democratic mechanisms and CBI has a strong effect on inflation, as illustrated in Figure 5. The marginal effect of CBI is negative and significant at higher levels for all 4 of the democratic mechanisms.

[Figure 4 about here]

[Figure 5 about here]

Based on extant work specifications<sup>74</sup> we attempt to capture empirically the credibility effect of CBI on inflation by controlling for changes in M2. We find that money supply changes significantly contribute to inflation, but that CBI has an additional important effect mediated by domestic political institutions. It is worth, however, mentioning that if we place our autoregressive distributed lag model in an error correction model framework, inflation has a relatively low speed of adjustment to equilibrium (one minus the coefficient on the lagged dependent variable).<sup>75</sup> Compared to inflation, for M2 changes the speed of adjustment is considerably faster, telling us, that inflation tends to react slowly to more discipline from the central bank, as well as to legal CBI and the domestic configuration of institutions.

Finally, we perform other analyses to determine the robustness of the findings. First we use panel corrected standard errors with region dummies instead of the country fixed effects. Second, we limit the sample to observations with money growth rates or inflation rates lower than 150%.

---

<sup>74</sup> Levy-Yeyaty and Sturzenegger (2001) and Ghosh et al. (1997).

<sup>75</sup> De Boef and Keele (2008). In the large number of inflation models that verify the robustness of the findings, the coefficient on the lagged dependent variable ranges around 0.5-0.6.

Our results (marginal effect of CBI when democracy scores vary) are shown in Figure 6 and are robust to both changes, for M2 changes and inflation.<sup>76</sup>

[Figure 6 about here]

Omitted variable bias is a valid concern, so we use additional controls in our models, including a dummy variable for membership in the European Union; dummy variables for countries with proportional representation electoral systems (DPI); dummy variables indicating government partisanship (DPI); a measure of polarization (DPI); and indicator variables for riots, anti-government demonstrations, and strikes (Cross-National Time-Series); and per-capita GDP. Our key findings do not change. We also include a measure for the direct targeting of inflation by the central bank<sup>77</sup> and our findings are robust. Furthermore, our model of inflation is based on a money demand function, so inflation should be a function of interest rates and parts of M2 should also respond interest rates. Including the deposit interest rate (WDI) makes us lose 16% of the sample, while the key results remain robust and the deposit rate is statistically significant both for M2 change and inflation models.

---

<sup>76</sup> Our findings may differ across time: Inflation has been substantially lower since 1990, and for this period the marginal effect of CBI continues to be negative and significant at higher levels of Polity. For the period 1973-1989, the marginal effect of CBI on inflation is insignificant and the effect has a slight upward slope. Limiting the sample to OECD countries and using panel-corrected standard errors (because CBI did not change much in this period), we find the expected negative slope significant only for democracies. This suggests that when inflation is high, political processes in democracies may have competing effects on inflation expectations. Many checks and balances lead to deadlock in areas other than monetary policy (stabilization policy or fiscal consolidation) which may increase inflation expectations.

<sup>77</sup> IT coding is based on Roger (2009). IT is not significant in the M2 change models but does have a significant negative effect on inflation.

Finally, democracy and economic development are highly correlated. It is possible that it is the latter and not the former driving the conditional results.<sup>78</sup> Additional tests bolster our confidence that it is democracy. First, while we see a similar marginal effect between GDP per capita and CBI on inflation, there is not one for change in M2. For M2 changes the marginal effect is significant only for the mid-range values of GDP per capita and upward sloping, contrary to expectations. Second, for both M2 changes and inflation our results hold for the sub-sample of non-OECD countries. That is, even for countries with lower levels of economic development where we have significant variance in Polity scores, we continue to obtain a downward sloping marginal effect of CBI that is statistically significant only for democracies. Finally, the checks and balances and press freedom mechanisms we use are more highly correlated with Polity than with economic development.<sup>79</sup> Because we find a similar effect with these democratic mechanisms, we have greater confidence that democracy drives the results. Nevertheless, we cannot completely rule out an economic development argument.

## **Conclusion**

We use new yearly data on de-jure central bank independence and examine whether CBI has a greater effect on price stability when a country has institutional mechanisms that limit political interference in central bank's activities. Institutions such as checks and balances or freedom of the press differ significantly across political regimes and allow the central bank to highlight and resist attempts by the government to influence it. This should have two consequences. First, by limiting interference, these institutions allow a central bank to be more disciplinarian, leading to lower

---

<sup>78</sup> We thank an anonymous reviewer for pushing us to think harder about this topic. Including interactions of the CBI index with both Polity scores and GDP/capita yields no results.

<sup>79</sup> The correlations between Polity and the executive constraints measures and press freedom are around 0.7 (except for xconst which is 0.95), while their correlation with the logged GDP per capita are between 0.4 and 0.5, with a high of 0.6 with freedom of the press.

rates of money growth. Second, if the public believes that the central bank is free from interference and that the law is unlikely to change swiftly and without debate, it will also lower inflationary expectations, leading to price stability above and beyond the control of the money supply. We use different estimation techniques, multiple operationalizations of the dependent variables and a large number of controls to test the empirical implications. The results show strong support for our argument.

Prompted by the IMF or the EU, but also driven by competition in international trade and investment,<sup>80</sup> countries have delegated monetary policy to independent bureaucrats. This trend has caught on not just in countries with rule of law, a free press and meaningful opposition. Non-democracies like Venezuela, Kazakhstan or Russia have also adopted legislation giving their central banks nominal independence. Our results show that for such countries, the central bank cannot be expected to discipline the government and have lower rates of money growth. This finding is novel and important, given the imperfect control that central banks have on inflation. Our results also strengthen and extend the findings of the political economy literature<sup>81</sup>: With new data and a research design reflecting the sources of inflation, we show that the effect of CBI on inflation expectations is unlikely to hold in non-democratic countries. Additional research is needed to understand the credibility effect of central banks, including through careful examination of the costs of disinflation. Moreover, as noted above, our results on either inflation or M2 changes are not driven by the OECD sample, extending our knowledge beyond that of CBI's effect on inflation in developed countries.

---

<sup>80</sup> Polillo and Guillén 2005.

<sup>81</sup> Broz 2002, Keefer and Stasavage 2002, 2003.

Future work needs to better understand whether there are other benefits for non-democracies from de-jure delegation to the central bank (access to credit and foreign direct investment<sup>82</sup>), or, whether, dictatorships enjoy political benefits from delegation (longer survival, less need to manipulate elections). Our research has additional implications for democracies that have delegated monetary policy only partially (Uruguay, South Africa, Mongolia, South Korea). For such countries further reform of the central bank law is likely to aid price stability with both a discipline and a credibility effect.

---

<sup>82</sup> For a more general treatment of the effects of reputation on investor perceptions, see Gray 2009, 2013.

## References

- Agénor, Pierre-Richard. 2001. Monetary Policy Under Flexible Exchange Rates: An Introduction to Inflation Targeting. Working Paper 124. Santiago: Central Bank of Chile.
- Alesina, Alberto, and Lawrence Summers. 1993. Central Bank Independence and Macroeconomic Performance: Some Comparative Evidence. *Journal of Money, Credit and Banking*, 25 (2): 151-162.
- Alpana, Sami and Adam Honig. 2010. Political monetary cycles and a *de facto* ranking of central bank independence. *Journal of International Money and Finance* 29 (6): 1003-1023.
- Ardagna, Silvia, Francesco Caselli and Timothy Lane. 2004. Fiscal Discipline and the Cost of Public Debt Service: Some Estimates for OECD Countries. *The B.E. Journal of Macroeconomics* vol. 7 (1).
- Arnone, Marco, Bernard Laurens, Jean-Francois Segalotto and Sommer Martin. 2007. Central bank autonomy: lessons from global trends. IMF Working Paper 07/88.
- Barro, Robert, and David Gordon. 1983. Rules, Discretion, and Reputation in a Model of Monetary Policy. *Journal of Monetary Economics* 12: 101-121.
- Beck, Nathan & Jonathan Katz, 1995. What to Do (and Not to Do) with Time-Series Cross Section Data. *American Political Science Review* 89: 634-647.
- Berger, Helge. 1997. The *Bundesbank's* path to independence: Evidence from the 1950s. *Public Choice* 93: 427-453.
- Bernhard, William. 1998. A Political Explanation of Variation in Central Bank Independence. *American Political Science Review* 92, 2: 311-327
- Blinder, Alan. 1998. *Central Banking in Theory and Practice*. Cambridge, Massachusetts: The MIT Press.
- Bodea, Cristina. 2010. Exchange Rate Regimes and Independent Central Banks: A Correlated Choice of Imperfectly Credible Institutions. *International Organization*, 64: 411-442.
- Bodea, Cristina. 2013. Independent Central Banks, Regime Type, and Fiscal performance: The Case of Post-Communist Countries. *Public Choice*, 155(1-2): 81-107.
- Bodea, Cristina and Masaaki Higashijima. 2013. Central Bank Independence and Fiscal Policy: Incentives to Spend and Constraints on the Executive. Working Paper.
- Brambor, Thomas, William Roberts Clark, and Matt Golder. 2005. Understanding Interaction Models: Improving Empirical Analysis. *Political Analysis* 14(1): 63-82.

- Brender, Adi, and Allan Drazen. 2005. Political Budget Cycles in New Versus Established Democracies. *Journal of Monetary Economics* 52(7): 1271-1295.
- Broz, Lawrence. 2002. Political System Transparency and Monetary Commitment Regimes. *International Organization*, 56(4): 861-877.
- Clark, William and Mark Hallerberg. 2000. Mobile Capital, Domestic Institutions, and Electorally Induced Monetary and Fiscal Policy. *American Political Science Review* 94 (June): 323-346.
- Crowe, Christopher. 2008. Goal independent central banks: Why politicians decide to delegate. *European Journal of Political Economy* 24 (4): 748-762.
- Crowe, Christopher and Meade, Ellen, 2008. Central bank independence and transparency: Evolution and effectiveness. *European Journal of Political Economy* 24(4): 763-777.
- Cukierman, Alex., Steven Webb, and Bilin Neyapti. 1992. Measuring the Independence of Central Banks and Its Effect on Policy Outcomes. *The World Bank Economic Review*, Vol. 5: 353-398.
- Cukierman, Alex, Geoffrey Miller, and Bilin Neyapti, 2002. Central Bank Reform, Liberalization and Inflation in Transition Economies - an International Perspective. *Journal of Monetary Economics* 49 (2): 237-264.
- Daunfeldt, Sven-Olov and Xavier de Luna. 2008. Central bank independence and price stability: evidence from OECD-countries. *Oxford Economics Papers* 64(3): 410-422.
- Eichengreen, Barry, Paul Robert Masson, Miguel Savastano, and Sunil Sharma. 1999. Transition Strategies and Nominal Anchors on the Road to Greater Exchange-Rate Flexibility. *Princeton Essays in International Finance* 213. Princeton, N.J.: Princeton University Press.
- De Boef, Suzanna and Luke Keele. 2008. Taking Time Seriously. *American Journal of Political Science* 52(1): 184-200.
- De Haan, Jakob and Willem Kooi. 2000. Does central bank independence really matter? New evidence for developing countries using a new indicator. *Journal of Banking & Finance* 24(4): 643-664.
- Franzese, Robert. 1999. Partially Independent Central Banks, Politically Responsive Governments, and Inflation. *American Journal of Political Science* 43 (3): 681-706.
- Ghosh, Atish, Anne-Marie Gulde, Jonathan Ostry, and Holger Wolf. 1997. Does the Nominal Exchange Rate Regime Matter? *NBER Working Paper No. 5874*.
- Goodman, John. 1991. The Politics of Central Bank Independence. *Comparative Politics* 23 (3): 329-349.
- Gray, Julia. 2009. "International Organization as a Seal of Approval: European Union Accession and Investor Risk." *American Journal of Political Science* 53(4): 931-949.

- Gray, Julia. 2013. *The Company States Keep: International Economic Organizations and Investor Perceptions*. New York: Cambridge University Press.
- Grilli, Vittorio, Donato Masciandaro, and Guido Tabellini. 1991. Political and Monetary Institutions and Public Finance Policies in the Industrial Countries. *Economic Policy* 13: 341-392.
- Hall, Peter and Robert Franzese 1998. Mixed Signals: Central Bank Independence, Coordinated Wage Bargaining, and European Monetary Union. *International Organization* 52 (3): 505-535.
- Hallerberg, Mark. 2002. Veto Players and the Choice of Monetary Institutions. *International Organization* 56(4): 775-802.
- Hallerberg, Mark, and Scott Basinger. 1998. Internationalization and Changes in Tax Policy in OECD Countries: The Importance of Domestic Veto Players. *Comparative Political Studies* 31 (3): 321-352.
- Hayo, Bernd and Stefan Voigt. 2008. Inflation, Central Bank Independence, and the Legal System. *Journal of Institutional and Theoretical Economics* 164(4): 751-777.
- Henisz, Witold. 2002. The Institutional Environment for Infrastructure Investment. *Industrial and Corporate Change* 11(2): 355-389.
- Hielscher, Kai and Gunther Markwardt. 2012. The role of political institutions for the effectiveness of central bank independence. *European Journal of Political Economy* 28 (3): 286-301.
- Ilzetzki, Ethan, Carmen Reinhart, and Kenneth Rogoff. 2009. Exchange Rate Arrangements Entering the 21<sup>st</sup> Century: Which anchor will hold? Working paper. Data available at: <http://www.carmenreinhart.com/research/publications-by-topic/exchange-rates-and-dollarization/>, (January 3, 2013).
- International Monetary Fund. 2006. Inflation Targeting and the IMF. Unpublished manuscript. Washington, D.C.: IMF.
- Iversen, Torben. 1998. Wage Bargaining, Central Bank Independence, and the Real Effects of Money. *International Organization* 52: 469-504.
- Jacome, Luis, and Francisco Vazquez. 2005. Any Link Between Legal Central Bank Independence and Inflation? Evidence from Latin America and the Caribbean. IMF Working Paper 05/75. Washington, D.C.: International Monetary Fund.
- Keefer, Philip, and David Stasavage. 2002. Checks and Balances, Private Information, and the Credibility of Monetary Commitments. *International Organization* 56 (4): 751-774.
- Keefer, Philip and David Stasavage. 2003. The Limits of Delegation: Veto Players, Central Bank Independence, and the Credibility of Monetary Policy. *American Political Science Review* 97 (3): 407-423.

- Kydland, Finn, and Edward Prescott. 1977. Rules Rather Than Discretion. *Journal of Political Economy* 85 (3): 473-491.
- Leeson, Peter. 2008. Media freedom, political knowledge, and participation" *Journal of Economic Perspectives* (22): 155--169.
- Levy-Yeyaty, Eduardo and Federico Sturzenegger 2001. Exchange Rate Regimes and Economic Performance. IMF Staff Papers, vol. 47.
- Lohmann, Susanne. 1998a. Federalism and Central Bank Independence: The Politics of German Monetary Policy, 1957-92. *World Politics* 50 (3): 401-446.
- Lohmann, Susanne. 1998b. "The Time Consistency Problem in Monetary Policy." Positive Political Economy: Theory and Evidence. Editors Eijffinger and Huizinga. Cambridge: Cambridge University Press.
- Lucas, Robert. 1980. Two illustrations of the quantity theory of money. *American Economic Review*, Vol. 70, 1005–14.
- McCandless, G. T. and Weber W.E. 2005. Some Monetary Facts. *Federal Reserve Bank of Minneapolis Quarterly Review* 19(3): 2–11
- Moser, Peter. 1999. Checks and balances, and the supply of central bank independence. *European Economic Review* 43: 1569-1593.
- Olson, Mancur. 1993. Dictatorship, Democracy and Development. *American Political Science Review* 87 (3): 567-576.
- Polillo, Simone, and Mauro Guillén. 2005. Globalization Pressures and the State: The Worldwide Spread of Central Bank Independence. *American Journal of Sociology* 110(6): 1764-1802.
- Roger, Scott. 2009. "Inflation Targeting at 20: Achievements and Challenges," IMF Working Paper WP/09/236.
- Rogoff, Kenneth. 1985. The Optimal Degree of Commitment to an Intermediate Monetary Target. *Quarterly Journal of Economics* 100: 1169-1189.
- Stasavage, David. 2003. Transparency, Democratic Accountability, and the Economic Consequences of Monetary Institutions. *American Journal of Political Science* 47(3): 389-402.
- Svensson, Lars. 1997. Exchange Rate Target or Inflation Target for Norway? In *Choosing a Monetary Policy Target*, edited by Anne Berit Christiansen and Jan Fredrik Qvigstad, 120–38. Oslo, Norway: Scandinavian University Press.
- Stockman, Allan. 1996. *Introduction to Economics*. Orlando, Florida: The Dryden Press.
- Treisman, Daniel. 1998. Fighting Inflation in a Transitional Regime: Russia's Anomalous Stabilization. *World Politics* 50(2): 235-265.

- Treisman, Daniel. 2000. "Decentralization and Inflation: Commitment, Collective Action and Continuity." *American Political Science Review* 94(4): 837-855.
- Tsebelis, George. 1995. Decision Making in Political Systems: Veto Players in Presidentialism, Parliamentarism, Multicameralism, and Multipartyism. *British Journal of Political Science* 25: 289-325.
- Walsh, Carl. 1995. "Optimal Contracts for Central Bankers." *American Economic Review* 85(1): 150-167.
- Walsh, Carl. 1998. *Monetary Theory and Policy*. Cambridge, MA: MIT Press.
- Wooldridge, Jeffrey, 2002. *Econometric Analysis of Cross Section and Panel Data*, Cambridge: MIT Press.

**Appendix 1: Central bank years covered and years of reform**

	CB years	Reforms
Albania	1992-2008	1997
Argentina	1972-2008	1975, 1992, 2002
Armenia	1993-2008	1996, 2001
Australia	1972-2008	--
Austria	1972-1998	1984
Azerbaijan	1992-2008	1996, 2004
Belarus	1992-2008	2001
Belgium	1972-1998	1993
Bolivia	1972-2008	1977, 1995
Botswana	1975-2008	--
Brazil	1972-2008	--
Bulgaria	1991-2008	1997, 2005
Canada	1972-2008	--
Chile	1972-2008	1975, 1989
Colombia	1972-2008	1993
Costa Rica	1972-2008	1996
Croatia	1992-2008	2001, 2002, 2008
Czech Republic	1992-2008	2001
Denmark	1972-2008	--
Dominican Republic	1990-2008	2002
El Salvador	1994-2008	--
Estonia	1993-2008	2006
European Union	1999-2008	
Finland	1972-1998	1998
France	1972-1998	1972, 1993
Georgia	1995-2008	
Germany	1972-1998	--
Greece	1972-2000	1995
Guatemala	1990-2008	2002
Guyana	1990-2008	1998
Honduras	1972-2008	1997
Hungary	1991-2008	2001
Iceland	1972-1998	--
India	1972-2008	--
Indonesia	1972-2008	1998
Ireland	1972-1998	--
Israel	1972-2008	--
Italy	1972-1998	1994
Jamaica	1993-2008	--
Japan	1972-2008	1998
Kazakhstan	1993-2008	1995, 1997, 2003, 2006

Kenya	1972-2008	1985, 1996
Korea, Rep.	1972-2008	1998
Kyrgyz Republic	1992-2008	1997
Latvia	1992-2008	1998, 2001, 2002
Lithuania	1991-2008	1996
Macedonia, FYR	1995-2008	2002
Malaysia	1972-2008	--
Mexico	1972-2008	1985, 1994
Moldova	1991-2008	1995, 2006
Mongolia	1991-2008	1996
Netherlands	1972-1998	--
New Zealand	1972-2008	1990
Nicaragua	1972-2008	1992, 1999
Norway	1972-2008	1972, 2003
Paraguay	1990-2008	1995, 2003
Peru	1972-2008	1993
Philippines	1972-2008	1993
Poland	1991-2008	1997
Portugal	1972-1998	1975, 1980, 1990, 1995, 1998
Romania	1991-2008	1998, 2004
Russian Federation	1993-2008	1995, 2002
Singapore	1972-2008	--
Slovak Republic	1992-2008	1999, 2002
Slovenia	1991-2007	2002, 2007
South Africa	1972-2008	1989, 1996
Spain	1972-1998	1980, 1994
Sweden	1972-2008	1998
Switzerland	1972-2008	1979, 2003
Tajikistan	1993-2008	1996
Thailand	1972-2008	2008
Trinidad and Tobago	1990-2008	--
Turkey	1972-2008	1990, 2001
Turkmenistan	1992-2008	1994
Ukraine	1991-2008	1999
United Kingdom	1972-2008	1997
United States	1972-2008	--
Uruguay	1972-2008	1995, 1997, 2008
Uzbekistan	1992-2008	1995
Venezuela, RB	1972-2008	1975, 1987, 1993, 2001
Zimbabwe	1972-2008	1984, 1999

---

## **Appendix 2: Components of the Cukierman, Webb, and Neyapti index**

### **Chief Executive Officer** (weight = .20)

- (a) Term of office (6 categories)
- (b) Who appoints CEO? (6 categories)
- (c) Dismissal (7 categories)
- (d) May CEO hold other offices in government (3 categories)

### **Policy Formation** (weight = .15)

- (a) Who formulates monetary policy? (4 categories)
- (b) Resolution of conflict (6 categories)
- (c) Role in government's budgetary process (2 categories)

### **Objectives** (weight = .15; 6 categories)

#### **Limitations on lending to the government**

##### *Part 1* (weight = .40)

- (a) Advances (weight = .15; 4 categories)
- (b) Securitized lending (weight = .10; 4 categories)
- (c) Terms of lending (weight = .10; 4 categories)
- (d) Potential borrowers from bank (weight = .05; 4 categories)

##### *Part 2* (weight = .10)

- (e) Limits on central bank lending determined by? (weight = .025; 4 categories)
- (f) Maturity of loans (weight = .025; 4 categories)
- (g) Interest rates on loans must be? (weight = .025; 5 categories)
- (h) Is central bank prohibited from buying or selling government securities in primary market? (weight = .025; 2 categories)

**Appendix 3: Summary Statistics**

	<b>N</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
Inflation	2370	15.530	33.954	-9.629	1076.000
Change in M2	2360	21.853	29.378	-55.170	829.310
CBI	2085	0.484	0.209	0.091	0.960
Lag log GDP	2341	24.618	2.008	19.907	30.088
Lag change in GDP	2339	0.037	0.045	-0.321	0.345
Lag openness	2325	75.443	50.389	7.829	438.902
Polity 2	2385	5.855	5.789	-9	10
Freedom House	2421	2.588	1.581	1	7
Xconst	2357	5.675	1.905	1	7
Log checks	2189	1.114	0.543	0	2.890
Polcon	2333	0.360	0.190	0	0.718
Freedom of Press	1968	1.385	0.745	0	2
De jure XR	2241	0.360	0.480	0	1
Fiscal balance	2251	-1.972	5.340	-60.975	26.132
Pres. Election	2426	0.056	0.231	0	1
Legis. Election	2426	0.175	0.380	0	1
Both elections	2426	0.056	0.230	0	1
Lag world inflation	2354	7.073	2.894	3.401	16.668

Note: Includes observations where inflation<150 or change in M2 <150.

#### Appendix 4: Additional results

##### Unit root tests

	Lags	Maddala and Wu	Pesaran
Log of inflation	0	333.39***	-6.087***
	1	318.743***	-5.524***
Log of change in M2	0	932.486***	-14.397***
	1	497.623***	-6.766***

Chi2 tests that a unit root is present.

**TABLES**

Table 1: Effect of CBI Contingent on Democratic Mechanisms

	Model 1 b/se	Model 2 b/se	Model 3 b/se	Model 4 b/se	Model 5 b/se	Model 6 b/se	Model 7 b/se	Model 8 b/se
CBI	-0.584** (0.279)	-0.832** (0.323)	-1.394*** (0.497)	-0.741** (0.339)	-0.465*** (0.143)	-0.612*** (0.150)	-0.690*** (0.251)	-0.646*** (0.149)
Polity2	0.002 (0.011)	0.036* (0.021)			-0.003 (0.004)	0.019* (0.011)		
CBI*Polity2		-0.090 (0.054)				-0.056* (0.029)		
Polcon			1.097* (0.566)				0.164 (0.285)	
CBI*Polcon			-2.615** (1.076)				-0.816 (0.559)	
Freedom of Press				0.082 (0.180)				0.145 (0.091)
CBI*Press				-0.332 (0.299)				-0.369** (0.145)
Lag log inflation					0.615*** (0.041)	0.609*** (0.042)	0.621*** (0.043)	0.614*** (0.043)
Lag log change in M2	0.297*** (0.056)	0.292*** (0.057)	0.292*** (0.057)	0.273*** (0.059)	0.125*** (0.024)	0.124*** (0.024)	0.127*** (0.025)	0.120*** (0.023)
Lag log GDP	0.010 (0.173)	-0.037 (0.171)	-0.012 (0.169)	0.397* (0.225)	-0.060 (0.074)	-0.075 (0.071)	-0.075 (0.070)	0.017 (0.107)
Lagged GDP growth	-1.199 (0.736)	-1.271* (0.716)	-1.229* (0.718)	-1.045 (0.811)	0.422 (0.506)	0.317 (0.510)	0.489 (0.519)	0.249 (0.480)
Lag openness	0.003 (0.002)	0.003 (0.002)	0.003 (0.002)	0.005* (0.003)	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.002)	0.001 (0.002)
De jure XR	-0.106 (0.119)	-0.103 (0.117)	-0.127 (0.109)	-0.009 (0.155)	-0.030 (0.079)	-0.030 (0.078)	-0.050 (0.076)	-0.000 (0.102)
Fiscal balance	-0.015 (0.010)	-0.015 (0.010)	-0.013 (0.010)	-0.017 (0.012)	-0.025** (0.010)	-0.024** (0.010)	-0.024** (0.010)	-0.027** (0.011)
Pres. election	-0.033 (0.122)	-0.032 (0.119)	-0.044 (0.114)	-0.047 (0.135)	-0.025 (0.075)	-0.024 (0.075)	-0.032 (0.072)	-0.030 (0.076)
Legis. election	-0.088 (0.072)	-0.086 (0.071)	-0.080 (0.071)	-0.105 (0.080)	0.018 (0.035)	0.018 (0.035)	0.019 (0.035)	0.030 (0.038)

Both elections	-0.208 (0.134)	-0.196 (0.135)	-0.198 (0.136)	-0.153 (0.132)	0.052 (0.051)	0.060 (0.052)	0.054 (0.052)	0.069 (0.051)
Lag world inflation					0.019** (0.008)	0.018** (0.008)	0.018** (0.008)	0.034*** (0.011)
_cons	1.637 (4.320)	2.946 (4.249)	2.524 (4.188)	-8.186 (5.544)	2.014 (1.786)	2.478 (1.715)	2.419 (1.703)	-0.010 (2.616)
N	1803	1803	1826	1536	1769	1769	1792	1520
Countries	78	78	79	79	78	78	79	79
R2	0.179	0.182	0.187	0.167	0.659	0.660	0.664	0.669

Notes: \*\* Significant at .05; \*\*\* Significant at .01. The dependent variable in models 1-4 is the log of the change in M2. In models 5-8 it is the log of inflation.

Decade dummies are included in models 1-4, but not shown.



Figure 2:

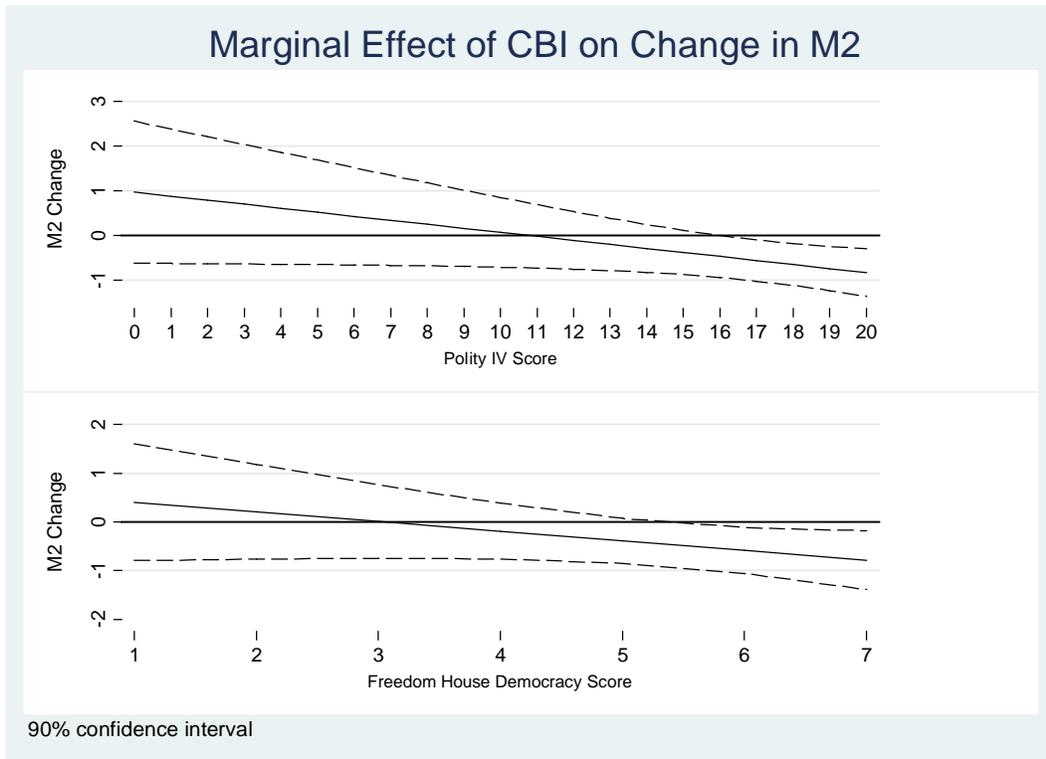


Figure 3:

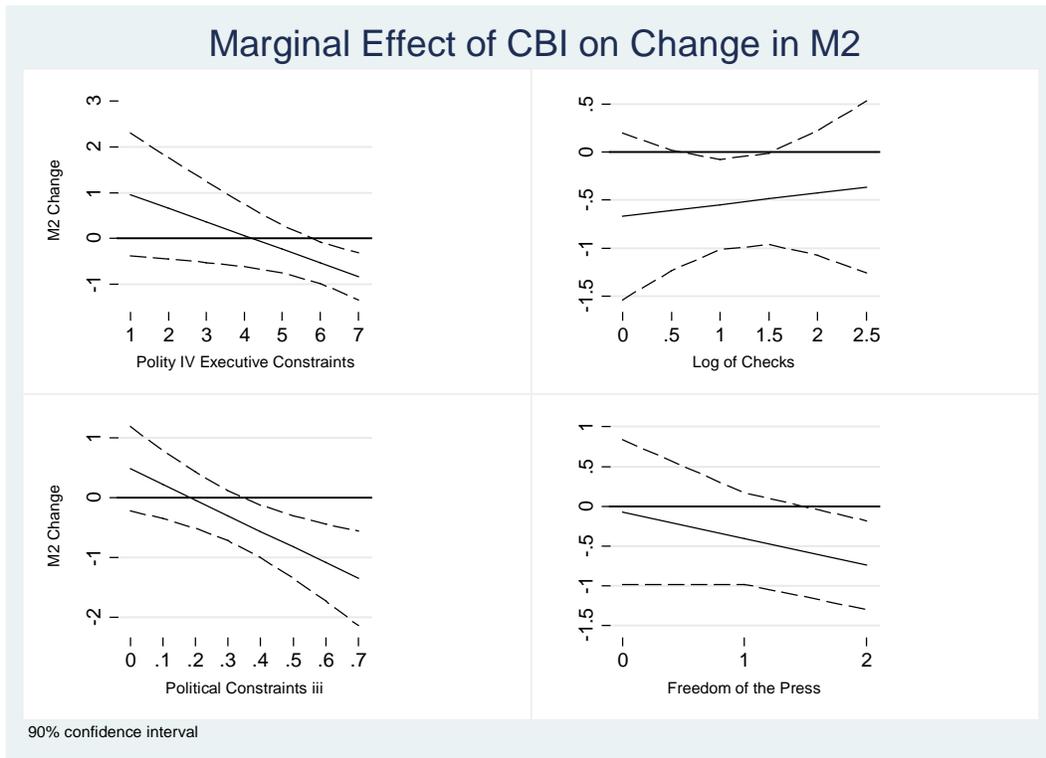


Figure 4:

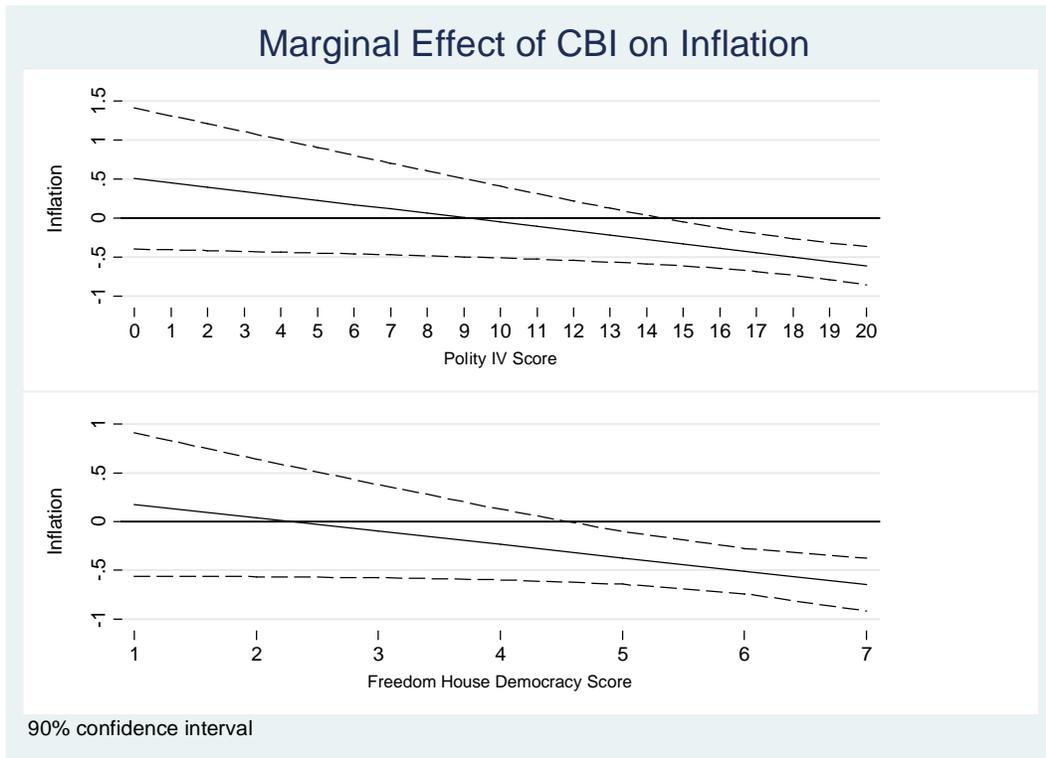


Figure 5:

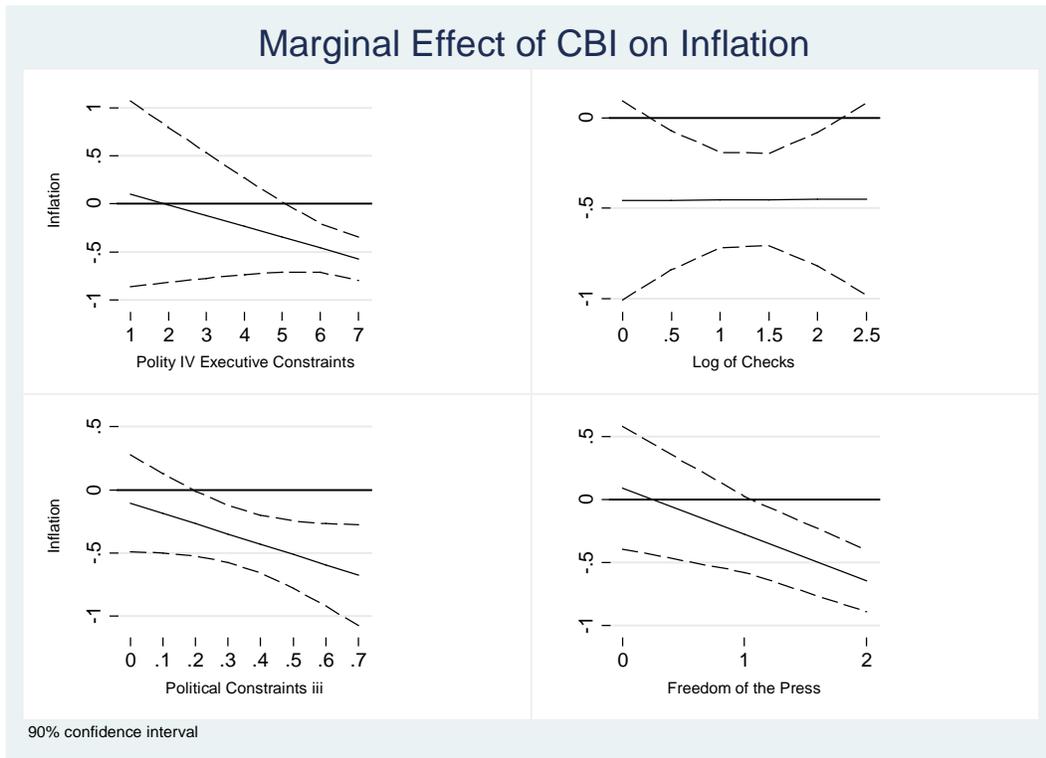


Figure 6:

