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When Does Policy Reform Work? The Case of Central Bank Independence
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ABSTRACT

We argue that the question of whether and when policy reform works should be investigated together with the political economy factors responsible for distortionary policies in the first place. These not only determine the initial distortions, but also often shape policy in the post-reform environment. Distortionary policies are more likely to be adopted when politicians are unconstrained and unaccountable to citizens. This reasoning implies that policy reform should have modest effects in societies where the political system already places constraints on politicians. It also implies, however, that in societies with weak political constraints, which are often those adopting the most distortionary policies, policy reforms may be ineffective because the underlying political economy problems are not typically altered by these reforms. Policy reform should therefore have its largest effect in societies with intermediate levels of constraints. In addition, when policy reform is (partly) effective, it may lead to a deterioration in other (unreformed) components of policy in order to satisfy the underlying demands on politicians – a phenomenon we call the seesaw effect. We provide reduced-form evidence consistent with these ideas by looking at the effect of central bank independence on inflation. The evidence is consistent with the notion that central bank reforms have reduced inflation in societies with intermediate constraints and have had no or little effects in countries with the high and low levels of constraints. We also present some evidence suggesting that, consistent with the seesaw effect, in countries where central bank reforms reduce inflation, government expenditure tends to increase.

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1 Introduction

Institutional and policy reforms are often promoted as a way to improve economic performance and growth in poor countries. Reforms that have received substantial attention over the past decade or so include trade opening, financial liberalization, judicial reform, privatization, reduction of entry barriers, tax reform, removal of targeted industrial subsidies, and central bank independence, a list that includes not just the original "Washington consensus," but also a range of other reforms.

Although there are sound economic theories suggesting why these reforms might be important in improving economic performance, the experience of the last decade shows that these reforms rarely seem to have the effects anticipated by their proponents. van de Walle (2001), for instance, summarizes the ineffectiveness of two decades of reforms in Sub-Saharan Africa by noting that

> "At the dawn of the twenty-first century, most of sub-Saharan Africa remains mired in economic crisis despite two decades of donor-sponsored reform efforts ... many if not most African countries are poorer today than they were twenty years ago." (pp. 3-4)

Similarly, Velasco (2005), the current Chilean finance minister, articulates the widespread disillusion of the impact of reforms in Latin America. He argues:

> "Reformers argued, persuasively, that growth was being held back by distortions. Many of the distortions were government induced, the result of poorly conceived policies. Change policy and the economy will fulfill its potential ... A decade later the view is less sanguine: with fewer bad-policy distortions, the Latin American economies grew in the 1990s at half the rate attained during precisely those decades when the allegedly distorting policies of import substitution reached their peak: the 1960s and 1970s." (p. 2)

Why do seemingly-sensible reforms fail to generate the benefits that they promise? The critics of reform emphasize, among other things, the potential negative effects that international trade might create for infant industries, the instabilities that might be induced by financial liberalization, or the usefulness of a variety of regulations, government ownership and industrial policy in less-developed economies (see Rodrik, 2005). Stiglitz, for example argues (2002, p. 16) that in many cases

> "...the economic policies that evolved into the Washington Consensus and were introduced into developing countries were not appropriate for countries in the earlier stages of development or ... transition."

This is not the only way to interpret the apparent failure of reforms, however.

In this paper, we emphasize that to understand why reforms do or do not work, it is necessary to investigate the political economy of distortionary policies. Our general argument is that the analysis of whether, and which, reforms will lead to improved economic performance should start with an understanding of *why distortionary policies were in place to start with*. We illustrate that this perspective leads to some simple, and testable, ideas on when policy reform will be more effective, and we provide preliminary evidence consistent with these ideas.[1]

Much of the economic literature on policy reform and most of the advice given by international institutions implicitly or explicitly assume that distortionary policies were used by "accident". Either these policies were in place and remained there as a historical legacy, or they are the outcome of some mistaken economic theory or shortsightedness on the part of policymakers. Though one can undoubtedly find instances where mistaken economic theories led to disastrous policies, few policymakers create hyperinflations or large budget deficits because they think that this is good for the economy. Instead, the political economy constraints and the incentives facing politicians in many societies with weak checks and balances or poor accountability make it beneficial or convenient for them to pursue a range of distortionary policies in order to satisfy powerful constituencies or to enrich themselves.

What might explain the presence of bad policies? The literature on political economy suggests that bad policies arise because the preferences of politicians or those with power are not aligned with those of the rest of the society. The politically powerful may have an incentive to distort policies or institutions so as to redistribute income or power to themselves (e.g., Acemoglu, 2006). Their ability to do so will depend on the constraints they face, and more generally, on the structure of political institutions. A potent source of policy failure is the absence of constraints on political officeholders (e.g., North and Weingast, 1989, Persson, Roland and Tabellini, 1997, Henisz, 2000, Acemoglu, Johnson and Robinson, 2005). This perspective emphasizes that policy reform takes place in an environment where initial policies served political purposes—for example, redistributing resources to groups with power and influence. This implies that those who expect to see their rents or privileges disappear as a result of policy reform are likely to use their

[1] An alternative and complementary perspective is that reformers, who are aware of the political constraints underlying policy decisions, may push for reforms and emphasize their economic costs as part of a bargaining process among political groups and policymakers. This perspective, though plausible, has not been developed in the literature and must also ultimately model the political economy of reform.

political power to prevent the effective implementation of the reforms. Alternatively, the political realities may make it impossible or impractical for those entrusted with the implementation of reforms to carry them out. This implies that there may be a big gap between reforms *de jure* and *de facto*. In particular, only policy reforms that the groups with political power that were previously benefiting from distortionary policies cannot easily over-ride, circumvent or ignore can achieve their objectives. Whether or not these groups can thwart reforms in turn depends on the constraints on politicians and on the process of policymaking. This argument suggests that in societies such as many in Sub-Saharan Africa, where there are only few constraints and checks on politicians and on politically powerful groups, policy reform is unlikely to be very effective. This is consistent with the case study evidence and argument in van de Walle (1993, 2001). He illustrates that for African politicians

> "restoring economic stability and growth has often taken a back seat in government motivations to preserving political power."

In the context of structural adjustment he argues (2001, p. 76)

> "Often, the policies have changed on paper, but in practice, something resembling the status quo ante continues to prevail. In some cases, the old policies were reinstated under a new name or with some new policy objective ... In other cases, governments ignore the spirit of their own liberalization efforts by continuing to interfere in officially deregulated markets."

This ineffectiveness of reform is not surprising; few people would expect privatization, financial liberalization or central bank independence (henceforth CBI) to have fundamental effects in Zimbabwe as long as Robert Mugabe is in power or in Sudan as long as Omar al-Bashir's kleptocratic and genocidal regime remains in place. As an illustration of this Figure 1 plots the inflation rate in Zimbabwe with a vertical line in 1995 when the Central Bank Act was modified in order to grant the Reserve Bank of Zimbabwe greater independence.[2] Clearly, however, increased independence of the Central Bank in Zimbabwe did little to restraint the subsequent monetary policy of the government. This somewhat extreme example therefore illustrates that a major reason why policy reform will often fail is because of the absence of a functioning accountability system and lack of constraints and checks on politicians.[3]

[2] The 1995 Reserve Bank of Zimbabwe Act legislated a greater degree of autonomy for the central bank. After 1995, the bank had its own budget and could decide on its own finances. The Act also legislated the control of inflation as the unique objective of monetary policy.

[3] This example and our results below raise the question of why potentially ineffective reforms are implemented in

Does this imply that better political institutions and transparency always increase the impact of reforms? Not necessarily. Policy reform will have its greatest effect when the pre-reform policies are highly distortionary. However, we would not expect societies with a functioning system of accountability and with checks on politicians to be those pursuing such highly distortionary policies. For example, inflation was already low in the United Kingdom in the 1990s, before the Bank of England became independent in 1998.[4] Thus the room for a large effect from CBI reform was limited. Instead, high inflation or even hyperinflation are much more likely in societies with weak institutions than those where politicians are accountable, via elections or other means, to the population at large.

The arguments in the previous two paragraphs suggest that once we take a political economy perspective, policy reform should not be expected to be (equally) effective in every society and that the functioning and success of policy reform should depend on political institutions and political constraints. More specifically, these arguments suggest that there should be a potentially non-monotonic relationship between the extent of constraints on politicians and the effectiveness of policy reform. The importance of political economy factors in understanding and evaluating the success of policy reform is our main message in this paper.

We develop this perspective by investigating the interplay between policy reform and institutional constraints on politicians both theoretically and empirically. We first highlight the main issues using a simple theoretical model. The model illustrates the non-monotonic relationship between constraints on power and the impact of reforms. It also highlights how effective reform may sometimes lead to the deterioration of other (unreformed) policies a phenomenon which in previous work we called the *seesaw effect* (see also Acemoglu, Johnson, Robinson and Thaicharoen, 2003).

We then investigate the validity of these ideas by focusing on reforms related to central bank independence. CBI is a natural type of reform for us to study. Most other reforms, such as financial liberalization, judicial reform, or removal of targeted subsidies, have relatively broad-mandates and try to improve, among other things, the overall functioning of the economy, investment and growth. Instead, CBI has a much more clearly delineated target—*inflation*. We can thus judge the success of CBI by investigating whether or not it has reduced inflation. Nevertheless, even

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the first place. One obvious answer is that they are partly a response to external pressures. For example, Jácome (2001) documents an IMF Technical Assistance mission to Zimbabwe on the reform of central bank laws in 1995. This perspective suggests that externally-imposed policy reforms might be less successful and effective than those generated by internal dynamics.

[4] Inflation increased in the UK in the 1970s and early 1980s, though never to hyperinflationary levels. The desire to avoid the return of such episodes, as well as other benefits of CBI, for example, those related to credibility and transparency, might be some of the reasons why countries with relatively good policies still prefer to implement central bank reforms.

this investigation is complicated by the fact that countries often introduce CBI not as a stand-alone policy reform, but as part of a broader anti-inflation package.[5] Throughout, we therefore interpret the regression evidence on the implications of CBI as corresponding to the effects of this broad anti-inflation package that may include other reforms as well as CBI.

Our main empirical results are consistent with the hypothesis that there is a non-monotonic relationship between political constraints and the effectiveness of policy reform. We create an index of the quality of general institutions by using constraints on the executive from Polity IV data. Although the highly serially-correlated nature of data on inflation makes statistical inference difficult, the evidence is broadly consistent with a pattern in which CBI reduced inflation in countries with intermediate levels of constraints on the executive, while it appears to have had no effect in societies with the strongest institutions. For countries with the weakest institutions the general pattern is that there is no effect of CBI, though some specifications show a statistically significant, but generally non-robust, negative effect. Our empirical results rejected the hypothesis that the effect of CBI is the same between high and medium-constraint countries, but we are generally unable to reject the hypothesis that they are the same between medium and low-constraint countries.

Overall, our approach and empirical results suggest that reforming economic institutions will only be effective if the political context is right. If the context provides political constraints and accountability mechanisms so that there is a strong tendency to adopt good policies, there is little room for reforms to have major effects. If the context is bad, so that politics and policy making are highly nonrepresentative, reforms are likely to be irrelevant because they can easily be undermined. It is in intermediate situations that reforms may have some bite: constraints are weak enough to generate bad policy, but not so weak that all reforms can be undermined.

In this light, our findings provide a different interpretation to the apparent failure of various reforms implemented throughout the 1990s and early 2000s than those argued by both the skeptics and the advocates of reform. Firstly, contrary to those who oppose reforms, it is not true that all reforms have failed. In the case of CBI, which is our empirical focus in this paper, it appears that policy reform is associated with a significant decline in inflation in societies with intermediate (and sometimes low) levels of checks and constraints on politicians. Secondly, our results suggest that even in places where reforms have failed, they have *not* done so because they are inappropriate from an economic point of view. Rather, potentially sound economic reforms may often be politically non-viable in certain societies, at least if they do not take into account the political context.

[5] A clear example of this is the Argentinean case, where shortly before the introduction of CBI in 1992, a currency board pegged the exchange rate to the dollar. Figure 5 below also shows that in a number of countries inflation starts declining a few years before the introduction of CBI.

Nevertheless, it should be emphasized that all of the evidence provided in this paper corresponds to the conditional correlations in the data consistent with declines in inflation at the same time as or following central banking reforms. As we emphasize further below, policy reform in general and central bank reform in particular are endogenous and are also determined as part of the political economy equilibrium in the society. Consequently, one should be cautious in reaching strong conclusions on the basis of such evidence. Having said that, the fact that CBI is correlated with contemporaneous and future declines in inflation mostly in societies with intermediate levels of constraints on politicians is intriguing and, at the very least, requires further investigation.

Following these basic findings we then investigate whether or not there is any evidence of a seesaw effect following CBI. The seesaw effect suggests that when successful policy reform takes place in one dimension and the political equilibrium remains largely unchanged, politicians may try to use a different instrument to attain the goal which was previously being targeted with the reformed instrument. In general, the seesaw effect implies that as policy gets better in one dimension, it may get worse in another. A natural candidate for the seesaw effect in the context of CBI is fiscal policy. We therefore investigate whether or not fiscal policy changes significantly after CBI is introduced. We provide some evidence that CBI is associated with greater government expenditure as a percent of GDP in countries with intermediate constraints, while it is unrelated to government expenditure in countries with low or high constraints. This evidence is consistent with some worsening in other dimensions of policy in countries where CBI reform was effective in reducing inflation, though the effect of CBI on government expenditure is less robust than its impact on inflation.

The recent economic history of Colombia and Argentina, depicted in Figure 2, illustrate the seesaw effect. In both countries the introduction of CBI in 1991 was followed both by significant falls in inflation and increases in government expenditures as a percent of GDP. In the Argentinean case, as in many other countries in our sample, inflation starts decreasing before central bank reform, which, as mentioned above, suggests that CBI is part of a broader package of reforms aimed at controlling and stabilizing inflation.

The pattern observed in Colombia has been linked to the political economy of redistribution by scholars. Jaramillo, Steiner and Salazar (1999) and Carrasquilla (1999) noted that the increase in inflation in the early 1970s followed the contested presidential election of 1970 where it is widely believed that the dominant Liberal and Conservative parties, then operating the so-called 'national front' and alternating in power, fixed the results to defraud the true winner Gustavo Rojas Pinilla, leader of the ANAPO party. Jaramillo, Steiner and Salazar (1997) claim that "seeking for a broader base of supporters, the new government increased government expenditure.... As

aggregate demand kept increasing ... inflation, that had remained in one digit figures for decades, accelerated" (p. 147). Clientelism during this period took the form not only of increased government expenditure financed with seigniorage, but also involved the provision of cheap credit from the central bank to various firms and sectors (Cabrera and Ocampo, 1980, p. 136).

In the post-CBI period, 1994 saw a political situation resembling the suspicions of fraud in 1970. It was discovered that the political campaign of the Liberal candidate Ernesto Samper, who won the presidential election, had received large amounts of money from members of the Cali drug cartel. A much discussed hypothesis is that in order to avoid impeachment by Congress, president Samper had to engage in intensive clientelism. Though he may have done this in different ways, he was unable to use the same instruments as President Pastrana did in the 1970s since the central bank had become independent. As Reyes et. al. (1998, p. 11) point out "during 1995-96, under the new government of President Samper, instruments of monetary and fiscal policy were in opposite directions, partly as a reflection of the conflict between the Central Bank and the government: monetary policy becomes strongly contractionist... and fiscal policy becomes expansionist". Several commentators at the time claimed that the increase in government expenditure could be explained by the desire of Samper to remain in power (see, e.g., Sierra, 2004). This took the form of substantial wage increases to public employees (in particular teachers, organized in a politically powerful union) between 1995 and 1998 (Echeverry, 2002). Similarly, Davila Ladron de Guevara et. al. (2000) claim that military expenditure was more than doubled by Samper to gain the support of the army.[6]

The rest of the paper is organized as follows. The next section discusses the related literature on the political economy of reform, on the role of CBI in combating inflation, and on possible interactions between institutional factors and the effectiveness of policies. Section 3 presents a simple model illustrating why policy reform may be most influential in societies with intermediate levels of political constraints. We also use this model to show how policy reform in one sphere can lead to a deterioration of other dimensions of policy, creating a seesaw effect. Section 4 discusses our data sources and the construction of the CBI variable. Section 5 presents our main empirical results. These results suggest that, consistent with our theoretical expectations, CBI has little effect on inflation in societies with the highest and the lowest constraints on politicians, but tends to reduce inflation in countries with intermediate levels of constraints. Section 6 investigates the seesaw effect, to see whether in societies where CBI reduces inflation, there is any evidence of

[6] The introduction of CBI coincided with the enactment of a new Constitution that mandated, among other things, larger transfers to the regions. Nevertheless, it seems unlikely that the new Constitution is responsible for the entire run-up in government expenditures. For example, Echeverry (2002) estimates that the spending items mandated by the Constitution could have explained at most 1/5 of the 20 percentage points increase in government expenditure share of GDP shown in Figure 2.

deterioration in other policies. Section 7 concludes.

2 Related Literature

Our paper is related to two broad areas of research, one on the political economy of reform in general and the other on the consequences of central bank independence. We now give a brief overview of these literatures and how our findings add to them.

2.1 Political Economy of Reform

There is a great deal of theoretical and case study work on the political economy of reform (see Rodrik, 1996, and Drazen, 2000, for overviews). Most of the theoretical research, for example, Alesina and Drazen (1991) and Fernandez and Rodrik (1991), focuses on developing explanations for why socially beneficial reforms do not occur or are delayed, though Mukand and Rodrik (2005) develop a model where policymakers adopt reforms they know to be inefficient to avoid being thought corrupt. Other work, taking political impediments to reform as given, discusses the implications of these for the sequencing of reforms, whether or not gradual or radical reform is desirable and whether or not reform can be sustained (for example Dewatripont and Roland, 1997). Most closely related to our paper are those by Shleifer and Vishny (1994) and Boycko, Shleifer and Vishny (1996) who examine the circumstances when privatization increases efficiency. In their model politicians derive political benefits from high employment levels and even though the managers of a privatized firm may maximize profits with less employment, politicians can bribe them to employ more people. They study the circumstances under which employment falls after privatization. Coate and Morris (2005), formalizing an intuition of Stigler (1971, 1972), develop a model where policy reform can reduce efficiency when politicians are initially using policy instruments to redistribute income in an optimal way. A key difference between our approach and Coate and Morris's is our emphasis on the role of political institutions. More generally, none of the papers mentioned above derive the non-monotonic relationship between reform and outcomes which is at the heart of our model.

At a general level, the entire empirical literature on the impact of policy and policy reforms on economic variables—for example, on economic growth—provides relevant and useful background to our work. The idea that policy reform might be desirable is implied from regressions showing that variation in policies account for comparative growth. Though there certainly are papers arguing this, the cross-country literature is far from a consensus (see Easterly, 2005, for a review). For instance, because policy variables exhibit multicollinearity, it is generally difficult to find robust relationships between particular policy measures and growth. Moreover, the empirical

analysis in most of these papers is based on cross-section regressions and hence omitted variable bias may be a significant concern.[7]

Most of the empirical work on reform focuses on specific instances of failed or successful reforms (for example, Bates and Krueger, 1993). In terms of cross-national empirical work, Dollar and Svensson (2000) show that political factors, particularly whether or not a country has a democratic government and how long the government has been in power, are important for the success of World Bank programs. In the related context of the effectiveness of international aid, Burnside and Dollar (2000) argued that aid increased growth when combined with good institutions and policies, though Easterly, Levine, and Roodman (2004) show that their results may not be robust. The idea that the implications of policies or shocks depend on the institutional environment has also appeared in other empirical papers. For instance, Bekaert, Harvey and Lundblad (2005) and Moene, Mehlum and Torvik (2006) show that the effect of natural resource abundance on economic growth depends on the quality of the general institutions in the society.

Our research is also related to the case study literature on Latin American politics which has argued that the appearance and reality of policy reform in Latin America may be very different. Several scholars, notably Roberts (1995, 2008), Gibson (1997) and Levitsky (2003) have argued that the adoption of Washington consensus type reforms in Latin America went alongside the continuation of populist policies and "politics as usual." The adoption of these reforms did constrain which policies could be used, but politicians such as Menem in Argentina and Fujimori in Peru realized that even policy reform could be adjusted to fit with the demands of clientelism—for example, government owned firms could be privatized, but sold relatively cheaply to those with political connections. Populism and clientelism persisted even though the instruments that they used changed, an argument clearly related to those we make in this paper.

2.2 Central Bank Independence and Inflation

One of the most studied instances of policy reform is the introduction of CBI. Theoretical work in the early 1980s, most notably Barro and Gordon (1983), argued that when unanticipated monetary policy can reduce the rate of unemployment, the government would be unable to commit to low inflation and consequently inflation would be sub-optimally high. Rogoff (1985) proposed that a solution to this problem was to delegate monetary policy to a "conservative central banker" and thus established a theoretical rationale for creating independent central banks.

There have been a large number of empirical studies over the past 15 years examining the

[7] There is also convincing microeconomic evidence that some specific types of reforms, like privatization, can have large beneficial effects. See, for example, La Porta and Lopez-de-Silanes (1999) and Galiani, Gertler and Schargrodsky (2005).

impact of central bank independence on inflation, economic growth and a variety of other variables (see Eijffinger and de Haan, 1996 for an overview). Early studies by Alesina (1988), Grilli, Masciandaro and Tabellini (1991) and Alesina and Summers (1993) used a measure of "de jure" CBI (we describe the construction of the various measures of CBI in Section 4 below) and exploited cross-sectional variation within OECD countries. Alesina and Summers report

> "a near perfect negative correlation between inflation and central bank independence" (p. 154).

This de jure index of CBI was further developed by Cukierman, Webb and Neyapti (1992) and extended to 72 countries over the period 1950-1989 where possible (i.e. if the country is independent). Using de jure indices and pooled time-series and cross-sectional regressions, Cukierman et al. (1992) and Cukierman (1992) showed that the negative correlation between de jure CBI and inflation did not hold for a cross section of developing countries, though they confirmed the earlier negative correlation for developed countries. They also showed that their de facto index of CBI (based on the turnover of governors) was positively correlated with inflation in developing countries, but not significantly correlated with inflation in developed countries. Various other papers, such as Gutiérrez (2003) and Arnone, Laurens, Segalotto and Sommer (2007), report similar results.

Nevertheless, other studies find very different results. Using updated data, Crowe and Meade (2007) do not find the same correlations. Campillo and Miron (1997) and Oatley (1999) argue that the correlation between de jure CBI and inflation is not robust to the inclusion of various covariates, such as measures of openness or the government deficit. Oatley (1999), Mangano (1998), Forder (1998) and Banaian, Burdekin and Willett (1998) also document that the results depend on the subjectively coded details of CBI measures and are not generally robust.

Keefer and Stasavage (2002, 2003), in a work related to our paper, argue that CBI will only be effective if it cannot be reversed and this will only happen if there are checks and balances. In their empirical work they interact a measure of checks and balances from Beck, Clarke, Groff, Keefer and Walsh (2001) with CBI and find that introducing CBI increases inflation unless checks and balances are sufficiently high. Their work, like much of the rest of this literature, only exploits cross-sectional variation. This strategy makes potential omitted variable bias quite severe, since countries that have introduced CBI typically have different macroeconomic equilibria than the rest.

In contrast to almost all of this literature, we focus on within-country variation. Though not a panacea against omitted variable biases, fixed-effects panel data regressions provide more convinc-

ing and more relevant conditional correlations, focusing on whether inflation declines following the introduction of CBI. Using such panel data regressions, we will show that the introduction of CBI appears to be associated with declines in inflation in countries with intermediate political constraints. The benefits of CBI in more developed economies appear to be more limited.[8]

3 Motivating Theory

In this section, we use a simple model to clarify our approach to the political economy of reform and derive the hypotheses concerning the circumstances under which CBI should have a significant impact on inflation. Our purpose is not to make a contribution to the theoretical literature on the political economy of reform, but to highlight why specific institutional reforms might have different effects depending on the constraints facing politicians. For this purpose, we choose the simplest model to communicate the major forces rather than strive for generality. Our model is a simplified version of—and a slight variant on—Grossman and Helpman's (1994) model of lobbying. A single organized lobby will try to convince a politician to choose distortionary policies. Underlying constraints and reform of specific institutions relating to this policy ("*policy reform*") might place limits on the influence of the lobby on the politician and on policy choices. We first use this model to highlight the interactions between policy reform and constraints on politicians. We then use a simple extension of the model to show how successful policy reform in one sphere can lead to a deterioration of other dimensions of policy (the "seesaw effect").

Our framework is chosen both for its simplicity and to emphasize the commonalities between CBI and other types of policy reform and does not do justice to some aspects of the macroeconomic equilibrium leading to high inflation. For example, the time-inconsistency problems emphasized by Barro and Gordon (1983) and Rogoff (1985) are absent. We provide some justification for why we think these time-inconsistency problems are not first-order in the context of high inflation in developing countries. Moreover, the war-of-attrition aspect of the conflict over policy reform emphasized by Alesina and Drazen (1991) is also absent in our setup. Although one could develop the same general insights using a war-of-attrition model, we prefer to use the simplest model to highlight the basic political economy factors affecting the effectiveness of policy reforms.

[8] This does not imply that CBI has no benefit in relatively developed countries. Given the lower levels of inflation in OECD economies, the effect of CBI will be harder to detect, particularly if it is small. Moreover, CBI might create other benefits by introducing transparency and creating insurance against possible future relaxations of monetary policy.

3.1 Model and Main Result

The economy consists of three actors, a politician, citizens and an organized group. There is a single policy variable $\pi \in \mathbb{R}_+$. This policy can be thought of as inflation to make the transition to the empirical work easier, though nothing in this section depends on this interpretation. In addition to policy π, the variable $\rho \in \{0, \rho_R\}$, with $\rho_R > 0$, denotes whether or not there has been policy reform and also parameterizes the intensity of reform (see below). A large group of citizens has preferences given by

$$u(\pi) = -\eta\pi, \tag{1}$$

where η is a strictly positive constant. These preferences imply that the "political bliss point" of the citizens (i.e., their most preferred policy) is $\pi = 0$ (since $\pi \geq 0$ by assumption), and any increase in π away from 0 reduces citizens' welfare. Thus throughout π should be thought of as a "distortionary policy". We could also make u directly depend on whether there has been policy reform, that is, on ρ. This has no effects on the major results we would like to emphasize. In addition, the linearity of u in π is only to simplify the exposition.

The second actor, the politician, has a utility function given by

$$v(\pi, \rho, t) = \lambda u(\pi) + (1 - \lambda)\, t - \rho\pi. \tag{2}$$

Here $t \in \mathbb{R}_+$ denotes a transfer from the lobby, which might correspond to explicit bribes or to campaign contributions. $\lambda \in [0, 1]$ captures how much weight the politician's utility function places on the welfare of the citizens. We think of λ as a measure of general institutional constraints on the politician (such as those measured by "constraints on the executive" or "control of corruption" in our empirical work).[9] When $\lambda = 1$, the politician must act as a perfect agent of the citizens, for example, because any deviation from the policies preferred by the citizens will be punished by quick replacement. In contrast, when λ is close to 0, there are few constraints on the politician's behavior, for example, because he is not accountable to the citizens or because he is difficult to replace using elections or other means. In this case, he can pursue policies that increase the transfers he receives with impunity. The other important feature of the preferences in (2) is the dependence on $\rho\pi$. This captures the feature that policy reform makes distortionary policies more costly for the politician (for example, providing credit to favored firms or groups, or inflationary policies to gain support become more difficult and costly). All else equal, this will discourage the use of distortionary policies by the politician. Making the use of such policies more

[9] In a richer model, it is possible that high constraints might make lobbies more powerful, because a "well-meaning" politician may be unable to act decisively to reduce inflation. Though possible, we believe that this consideration is second-order since well-meaning politicians are relatively rare.

costly for the politician is not the only way to model the effects of policy reform.[10] An alternative would be to model policy reform as introducing a hard constraint, for example, as imposing that $\pi \leq \bar{\pi}$ for some upper bound on policy $\bar{\pi}$. This is not a useful modeling strategy for understanding policy reform in societies with weak institutions, because, with such hard constraints, there would be no room for pursuing distortionary policies after the reform, whereas our focus is on whether reform will prevent the implementation of distortionary policies.

The third actor is an organized lobby, which benefits from π. Suppose that the utility of the lobby is given by

$$w(\pi, t) = \alpha\pi - \frac{\beta}{2}\pi^2 - t, \tag{3}$$

where α and β are strictly positive constants. The quadratic form is again assumed for convenience, and the fact that these preferences do not directly depend on ρ is also for simplicity. These assumptions also have no effect on the qualitative results. These preferences immediately imply that the lobby's political bliss point is

$$\pi^* \equiv \frac{\alpha}{\beta} > 0,$$

thus the lobby will try to shift policy towards higher levels of π than those preferred by the citizens. The only instrument that the lobby has available for this purpose is the transfer to the politician, t. Examples of policies for which citizens and lobbies have conflicting preferences include industrial policy, tariffs and agricultural subsidies. Inflation is another potential example, since it is often used as a means of generating funds (e.g., through the inflation tax) for redistributing to politically-powerful groups, such as public-sector employees or companies receiving procurements or industrial subsidies, at the expense of the citizens at large, or results from the use of government credits for favored firms.

Although there are three actors, citizens are passive and the main interactions are between the lobby and the politician. We model this game as follows:

- The parameter λ and the reform variable ρ are given.
- The lobby makes an offer $(\hat{\pi}, \hat{t})$ to the politician. As in Grossman and Helpman's (1994) model, this implies that if the politician accepts the transfer $\hat{t}$, he has to implement policy

[10] Yet another alternative, which in fact gives even more stark results, is to assume that these reforms act as *costly commitment devices*, and thus assume that they make distortionary policies more costly for the citizens. In this case, policy reform would discourage distortionary policies by increasing the costs that these policies impose on the society, and indirectly on the politician. In the context of CBI, for example, high inflation becomes both more costly to society and also potentially more costly to implement for the government (both because it will destroy the beneficial reputation that monetary policy may have established and also because workers' and firms' behavior would have been shaped by expectations of low inflation). The assumption used in the text may have wider applicability, motivating our choice here.

$\hat{\pi}$. This is presumably supported by a continuation game in which there are repeated interactions, but as in much of the literature, we do not model these to simplify the analysis.

- The politician chooses policy $\tilde{\pi}$. If $\tilde{\pi} = \hat{\pi}$, then the politician also receives transfer $\hat{t}$. Otherwise, he receives $t = 0$.

This is a simple game and we characterize its subgame perfect equilibrium (SPE). As usual, this is done by backward induction. In the last stage of the game, the politician will choose whichever policy maximizes his utility. Clearly, this will be either $\pi = \hat{\pi}$, so that he can receive the transfer $\hat{t}$, obtaining a utility of $\lambda u(\hat{\pi}) + (1-\lambda)\hat{t} - \rho\hat{\pi}$, or $\tilde{\pi} = 0$, in which case he will receive zero transfers and a utility level of $\lambda u(0)$.

Therefore we can summarize the best response of the politician as follows:[11]

$$\tilde{\pi} \in \begin{cases} 0 & \text{if } \lambda u(\hat{\pi}) + (1-\lambda)\hat{t} - \rho\hat{\pi} < \lambda u(0) \\ \hat{\pi} & \lambda u(\hat{\pi}) + (1-\lambda)\hat{t} - \rho\hat{\pi} \geq \lambda u(0). \end{cases} \tag{4}$$

If the lobby wishes to implement its own policy preferences, then it must satisfy this *incentive compatibility constraint* (or respect the fact that the politician will play a best response in the last stage). This implies that when the lobby wishes to implement a policy close to its own preferences, it must choose $(\hat{\pi}, \hat{t})$ as a solution to the following program:

$$\max_{\hat{\pi}\geq 0, \hat{t}\geq 0} w(\hat{\pi}, \hat{t}) \tag{5}$$
$$\text{subject to (4)}.$$

Let the solution to this maximization problem give the lobby utility $\hat{w}$. Since $(\hat{\pi} = 0, \hat{t} = 0)$ is a feasible strategy, we must have $\hat{w} \geq 0$. Moreover, it is also evident that this problem will lead to a solution with $\hat{w} > 0$, when $\hat{\pi} > 0$, and also $\hat{t} > 0$ will be chosen if and only if the solution to (5) also involves $\hat{\pi} > 0$.

We next characterize the solution to this problem. The incentive compatibility constraint of the politician, (4), requires that if $\hat{\pi} > 0$, then

$$\hat{t} = \frac{\lambda\eta + \rho}{1-\lambda}\hat{\pi}.$$

Substituting this into the objective function of the lobby, (3), we have the problem of the lobby as

$$\max_{\hat{\pi}\geq 0} \alpha\hat{\pi} - \frac{\beta}{2}\hat{\pi}^2 - \frac{\lambda\eta + \rho}{1-\lambda}\hat{\pi}, \tag{6}$$

whenever it wants to implement the policy $\hat{\pi} > 0$. Inspection of this maximization problem establishes our first result:

[11] To simplify the notation, this expression already imposes the choice that will prevail in equilibrium when the politician is indifferent.

Result 1 If $\lambda \geq \bar{\lambda} \equiv \alpha/(\alpha+\eta)$, then the lobby prefers not to have an influence on policy regardless of whether $\rho = 0$ or $\rho = \rho_R$.

This result follows immediately, since when $\lambda > \bar{\lambda}$, the utility-maximizing policy for the lobby is to choose $\hat{\pi} = 0$. Since λ corresponds to a measure of the quality of checks on the politician, this result suggests that when these checks are sufficiently strong, the political system will generate a policy choice that is not distortionary, regardless of whether there has been reform or not. In terms of our empirical work below, this result suggests that in societies where there are significant constraints on politicians, reforms should have relatively small effects. This can be understood by considering the example of inflation. Consequently, though CBI might limit inflation in well-governed societies, we would not expect a very large decline in inflation as a result of central bank reform, since these societies would not have chosen highly distortionary policies to start with.

More generally, the solution to the lobby's maximization problem in (6), and thus the (subgame perfect) equilibrium level of policy, is given by:

$$\tilde{\pi} = \max\left\{\frac{1}{\beta}\left(\alpha - \frac{\lambda\eta + \rho}{1-\lambda}\right); 0\right\}. \tag{7}$$

This equation shows that the sensitivity of equilibrium policy $\tilde{\pi}$ to ρ (policy reform) will be limited when λ is low. Intuitively, when there are no checks on the politician in power, he will do whatever maximizes his utility, and this will involve maximizing the transfers he receives. Consequently, transfers can outweigh the costs that policy reform imposes on the politician's use of distortionary policies. In terms of the inflation example, the politician in power can put pressure or use other means to force the central bank to increase the money supply and inflation, even if choosing high inflation might have become more difficult or costly.[12] Interpreted differently, equation (7) suggests that in societies with low λ, *de jure* reform may not translate into *de facto* reform, because despite the greater cost of π to the politician, the political equilibrium will induce him to choose policies not so different from the pre-reform era.

The following result now readily follows from (7):

Result 2 Suppose that $\lambda < \bar{\lambda}$. Then, a reform that increases ρ from 0 to ρ_R will reduce $\tilde{\pi}$. Moreover, for $\lambda \in \left(0, \frac{\alpha - \rho_R}{\eta + \alpha}\right)$, the greater is λ, the greater is the decline following policy reform.

[12] This will also be true when inflation or other distortionary policies also become more costly for the society as a whole after reform. For example, inflation might be disastrous for the future of the economy and ruin the potential benefits that might have resulted from credibly establishing the independence of the central bank (and this can be incorporated by including $\rho\pi$ in the utility function of the citizens), but when λ is low, this will still not deter politicians from using distortionary policies.

This result therefore implies that when constraints are not so high as to have avoided the use of distortionary policies in the first place, policy reform might be effective. However, how effective it will be is a function of the constraints on the politician. The greater is λ, the more transfers are necessary for the politician to adopt the distortionary policy after reform and thus the lower will be the equilibrium distortionary policies following reform.

Putting these two results together, we conclude:

Result 3 Policy reform will have the largest effect on distortionary policies in societies with intermediate levels of constraints on politicians, and it will have no effect or only limited effects in societies with the highest and the lowest levels of constraints.

In the empirical work that follows, we investigate whether the effects of CBI reforms on inflation are consistent with the predictions in Result 3.

3.2 The Seesaw Effect

We now use the model from the previous subsection to illustrate the "seesaw effect," whereby successful policy reform might lead to a deterioration in other dimensions of policy. To do this, let us augment the previous model with another policy dimension, denoted by $\theta \in \mathbb{R}_+$, and modify citizen preferences to

$$u(\pi, \theta) = -\eta\pi - \eta'\theta,$$

where η' is also a strictly positive constant. This implies that θ is another distortionary policy and thus the political bliss point of the citizens now corresponds to $(\pi, \theta) = (0, 0)$. It is important to note that, in this instance, policy reform is narrowly targeted at π, and thus only makes policy π more costly for the politician. Some reforms, which involve the introduction of greater accountability on politicians, would not fit this pattern. CBI reform is a natural candidate in this context, since it is primarily focused with monetary policy and inflation.

The preferences of the lobby are modified to

$$w(\pi, t) = \alpha\pi + \alpha'\theta - \frac{\beta}{2}(\pi + \theta)^2 - t,$$

with again $\alpha' > 0$. The preferences of the politician are unchanged. We again look for a subgame perfect equilibrium.

The best response of the politician now implies

$$t = \frac{\lambda\eta + \rho}{1 - \lambda}\pi + \frac{\lambda\eta'}{1 - \lambda}\theta.$$

With an identical reasoning to that in the previous subsection, the optimal policy-transfer combination for the lobby is then given by the solution to the following maximization problem:

$$\max_{\hat{\pi}\geq 0,\hat{\theta}\geq 0} \alpha\hat{\pi}+\alpha'\hat{\theta}-\frac{\beta}{2}\left(\hat{\pi}+\hat{\theta}\right)^2-\left(\frac{\lambda\eta+\rho}{1-\lambda}\hat{\pi}+\frac{\lambda\eta'}{1-\lambda}\hat{\theta}\right). \tag{8}$$

To simplify the discussion, let us impose the following assumption:

$$\eta'>\eta \text{ and } \alpha'<\alpha. \tag{9}$$

This assumption implies that policy θ is more costly for the citizens and less beneficial for the lobby than policy π. In view of this, the following result is immediate:

Result 4 Suppose (9) holds and there has been no policy reform, that is, $\rho=0$. Then, $\tilde{\theta}=0$.

Intuitively, it is more economical for the lobby to receive policy favors through π, which is both more beneficial for the lobby and less costly for the citizens. Consequently, policy θ will never be used in equilibrium (either $\pi>0$ and $\theta=0$, or $\pi=\theta=0$). Result 4 is a consequence of the simplifying assumptions made in this subsection; in particular, it depends on the assumption that the two policies, π and θ, are perfect substitutes. Without this assumption, both policies might be used simultaneously before policy reform. Nevertheless, our main result, Result 5, would continue to apply even when these policies are not perfect substitutes.

Next, suppose, that policy reform is enacted, so that $\rho=\rho_R>0$. Our main result in this subsection is that, following such policy reform, it may become beneficial to use the alternative distortionary policy, θ. The following result summarizes the conditions under which this will happen.

Result 5 Suppose (9) holds and consider policy reform increasing ρ from 0 to ρ_R. If

$$\alpha-\frac{\lambda\eta+\rho_R}{1-\lambda}<\alpha'-\frac{\lambda\eta'}{1-\lambda}, \tag{10}$$

and if

$$\lambda<\tilde{\lambda}\equiv\frac{\alpha'}{\alpha'+\eta'},$$

then the equilibrium following policy reform involves $\tilde{\pi}'=0$ and

$$\theta'=\frac{1}{\beta}\left(\alpha'-\frac{\lambda\eta'}{1-\lambda}\right)>0.$$

This result follows readily from the maximization problem (8), combined with (9) and (10). Note that (9) and (10) are consistent with each other provided that ρ_R is sufficiently large—meaning that reforms is effective in making policy π costly. Result 4 implies that before policy

reform the equilibrium involved $\tilde{\theta} = 0$. Moreover, given (9) and (10), before policy reform the equilibrium involves $\tilde{\pi} > 0$. Consequently, policy reform in this case creates a typical seesaw pattern; the policy that is regulated with the reform goes down (we go from $\tilde{\pi} > 0$ to $\tilde{\pi}' = 0$), but at the same time the political process generates rents for the still-powerful lobby by using an alternative policy instrument more intensively (we go from $\tilde{\theta} = 0$ to $\tilde{\theta}' > 0$). This result highlights that when the political-economic interactions leading to distortionary policies remain unchanged, the imposition of a (specific or narrowly-targeted) policy reform might only change the form of redistribution towards politically powerful groups—rather than eliminate policy distortions entirely.

An interesting implication of the specific configuration of parameters given by (9) and (10) should also be noted: in the case discussed in Result 5, policy reform makes both citizens and the lobby worse-off. Instead of the less costly instrument, now redistribution takes place with the more costly instrument. This is not a general result and policy reform might improve the allocation of resources despite the presence of seesaw-like effects. Nevertheless, this result points out the potential pitfalls of specific policy reforms in societies where constraints on politicians are absent and political-economic interactions lead to dysfunctional policy choices.

3.3 General Discussion

The model we have developed here is in the spirit of standard approaches to redistributive politics. In particular, as noted above, it does not include any element of time inconsistency. We do not believe that time-inconsistency issues play a major role in understanding high inflation or hyper-inflationary episodes in less-developed economies. Most instances of high inflation are directly related to the inability of governments to fund their (often politically-motivated) expenditures through taxation and borrowing. Such policies are much more likely to emerge when there is severe distributional conflict that the political system is unable to resolve or when politicians have only limited instruments to use to distribute patronage. The increasing inflation in Zimbabwe, depicted in Figure 1, is an example of this; President Mugabe turned to hyperinflation when he had no further resources left to redistribute patronage to the military and to his key supporters.

Finally, we should also note that though we followed Grossman and Helpman (1994) in setting up the model with lobbies making offers to politicians, the model could be reformulated to allow politicians to make offers to interest groups without affecting any of the results. This reformulation might be more in line with the political experiences of countries in Sub-Saharan Africa or Latin America, where interest groups are as likely to be captured by politicians as politicians are likely to be captured by interest groups (see Acemoglu, Robinson and Verdier, 2003, for a discussion).

For instance, in his seminal study of economic policy in Ghana, Killick (1978, p. 35) notes that president "Nkrumah succeeded in capturing the lobbies; in making them dependent on him instead of himself on them". The example of Argentina under Perón also illustrates the same pattern (see, e.g., Collier and Collier, 1991). First as minister of labor and then president in the 1940s, Perón played an active role in creating the interest groups which then constituted his support base. Certain groups in society will have (political) resources that politicians need and politicians will offer them redistribution in exchange for this support. The model above could be reformulated along these lines and policy reform would now represent an increase in the cost to the politicians in supplying policy favors to interest groups, possibly because they now have to use patronage to also control those who run the independent central bank. Our major results, in particular Results 3 and 5, would continue to apply in this modified setup.

4 Data Sources and Construction

Throughout the paper we focus on the "post-Bretton Woods" period 1972-2005.[13] Between 1946 and 1971 countries under the Bretton Woods system agreed to coordinate monetary policy in order to fix their currencies with respect to gold. This naturally limited the discretion that both governments and central banks had in managing their monetary policies. This implies that the post-Bretton Woods era is a natural period for us to focus on in the analysis of the relationship between CBI and inflation.

Several approaches have been used to measure CBI and there is some controversy over the advantages and disadvantages of different approaches (see Arnone, Laurens and Segalotto, 2006, for a comprehensive overview). The key question centers around whether one should use *de jure* measures, which capture how much independence the central bank has in law, or *de facto* measures, which correspond to how much independence the central bank has in practice. Another distinction which has been made is whether or not the central bank has "goal independence," in the sense of being able to determine its owns objectives, or "operational independence," where it may not set its own goal but has freedom to achieve any goal set without interference.

Grilli, Masciandaro and Tabellini (GMT) developed an index based on Aufricht (1967), emphasizing political independence, as measured by the procedures regarding the appointment of the central bank board, the relationship between the bank and the government in the formulation of monetary policy, and the formal responsibilities of the central bank. They also measured "economic independence," which focuses on whether or not the central bank must finance government

[13] The Bretton Woods system collapsed in 1971 when the United States suspended the convertibility of dollars to gold.

debt. The current state of the art of the measurement of de jure CBI stems from Cukierman (CUK) (1992) and Cukierman, Webb and Neyapti (1992). Cukierman and his collaborators constructed an index of de jure CBI for 72 countries over the period 1950-1989 coding the variable for 4 ten-year periods with the index being constant within the period. They used 16 different characteristics in the index with different weights.[14]

Each of the above indices has various drawbacks. Mangano (1998) argues that there is significant subjectivity both in the criteria included in the different indices and in the interpretation of laws and legislature.[15] It appears that these indices are not capturing only *de jure* CBI, but are, at least in part, informative about how monetary policy is being conducted in practice. The focus on policy reform makes it important that we focus on *de jure* CBI. A related problem is that most existing work reports values for CBI indices computed at a specific point in time. However, within-country variation is essential for our empirical strategy (for panel fixed-effect regressions).[16]

In order to overcome these problems, we measure *de jure* CBI by a dummy variable that takes a value of 1 in every year after a major reform to the constitution or central bank law leading to increased independence, and zero elsewhere. The advantage of this measure is that it does not incorporate information on the *de facto* conduct of monetary policy. A drawback is that this measure assumes CBI increases by the same magnitude in every country following a reform (which we know is not true as reforms in different countries introduced different levels of independence). Nevertheless, it captures in a simple way the effect of central bank reform and changes in *de jure* CBI.

[14] For instance, 8 characteristics were used to judge the extent of limitations on central bank lending to the government and these collectively received half of the weight in the index. Four legal characteristics which concerned the way governors were appointed or dismissed were given 1/5th of the weight and three other characteristics which determined how independent the policy making process of the bank was were given 15% of the total weight.

[15] In particular, from a comparison of the CUK and GMT indices Mangano concludes that "... [there is] a significant degree of inconsistency between the two indices' valuation of their common criteria. Only in one country (out of 17) and in the case of one criterion (out of 9) have CUK and GMT translated the legislation in exactly the same way: their interpretation of the laws governing the Italian CB, and of the regulations concerning the CB Governors' terms of office in the countries sampled, exhibit no divergence. On the other hand, their average interpretation spread when examining Danish, French, Greek, and Japanese legislation is close to 50%, and they disagree in nearly 60% of countries when deciding whether the CB is legally allowed to purchase government debt in the primary market or not. Overall, it appears that in the 17 countries included in both CUK's and GMT's samples, virtually a third of the values attributed to their nine common criteria are subject to non-negligible interpretation problems" (pp. 476-477).

[16] Exceptions that construct and use time-varying indices are: Polillo and Guillen (2005), who provide values of the Cukierman index for the period 1989-2000 for a sample of 90 countries; Jácome and Vasquez (2005) for Latin America; Cukierman, Miller and Neyapti (2002) for former Soviet countries; Arnone, Laurens, Segalotto and Somer (2007) for a sample of emerging market countries; and Crowe and Meade (2007) for a sample of 102 countries.

Both Arnone et.al (2007) and Crowe and Meade (2007) explore time-series variation in these indices by taking values of them at two points in time (late 1980s and early 21st century) and assume the change from one value to another occurs in the year in which central bank reform took place.

Our main sample consists of 52 countries for which information on changes in their central bank legislation was reported by Jácome and Vasquez (2005) and Polillo and Guillén (2005). We exclude all former socialist countries since there is limited data for these countries before CBI and they enact CBI at the same time as many other reforms associated to the transition from planned to market economies. We also exclude Africa since central bank reforms in these countries are harder to determine and interpret, and in most cases, the reforms fell short of creating truly independent central banks.[17]

Our sample includes almost every OECD and Latin American country and covers a sample of 12 Asian countries (see Appendix Table A1). To construct our CBI dummy for Latin American countries we used the dates of major central bank reforms provided by Jacome and Vasquez (2005). For the remaining countries, the CBI dummy takes a value equal to one starting in the year in which the Cukierman index constructed by Polillo and Guillén (2005) increases. Moreover, for every country we used Arnone, Laurens, Segalotto and Somer (2007), who provided the year of major central bank reforms, to verify that a major reform did take place in the year in which the index constructed by Polillo and Guillén (2005) increases. Whenever there was disagreement between Polillo and Guillén (2005) and Arnone, Laurens, Segalotto and Somer (2007), we consulted additional sources (such as the central bank's website) in order to identify the year in which the most substantial reform towards CBI (if any) took place. Similarly, for countries for which the index constructed by Polillo and Guillén (2005) did not increase between 1989 and 2000 we used Arnone, Laurens, Segalotto and Somer (2007) and other sources to explore if a central bank reform took place after 2000. The countries included in our sample and the details of the coding, including the laws that amended central bank charters as well as additional sources used can be found in Appendix Table A1. As is evident from the table, most central bank reforms in these countries took place during the 1990s.

In addition to this sample we also examined the impact of CBI on the 40 of these 52 countries that changed their CBI over our sample period. Focusing on this sample enables us to obtain identification from differences in the timing of CBI; the countries in this sample might also be more homogeneous since they have all undergone the same policy reform.

Though we believe our CBI dummy is a transparent way of investigating the relationship between CBI and inflation, we also study the robustness of our results by using the Cukierman index. Since these data are not in the form of an annual time series and earlier data exhibit almost no variation we take the value of the index in 1989 and assume that this value holds for

[17] For example, the Cukierman index of central bank independence reported by Polillo and Guillen (2005) is very low for most African countries and reforms to the central bank charters during the nineties caused very small increases in these indices.

all pre CBI periods. We then use the 2003 value from Crowe and Meade (2007) for all post CBI periods.

Our main measure of political institutions is constraints on the executive from the Polity IV dataset, which codes the extent of constitutional limits on the exercise of arbitrary power by the executive. The Polity dataset reports a qualitative score, between 1 and 7, for every independent country. We computed the average of the constraints on the executive variable for the period 1972-2004, and then classified each country in our sample into low, medium and high constraints on the executive categories.[18] Countries within one-standard deviation from the sample mean (of the average constraints on executive) were assigned to the medium-constraint category, while the rest were assigned to high-constraint and low-constraint groups. The histogram in Figure 3 shows the distribution of average constraints on the executive for our sample as well as the cutoffs for the different categories. Appendix Table A2 shows the category in which each country was classified. The low and medium constraints on the executive categories are composed mainly of Asian and Latin American countries, while most OECD countries are in the high-constraint category.

To check that our results are not driven by the specific cutoffs used in creating the low, medium and high groups, we also look at the interaction of a quadratic function of the average constraints on the executive with the CBI dummy. We show that the results using this approach are similar to those estimated using the dummies for low, medium and high constraints.

In addition, we also check the robustness of our results by using different measures of institutions. In particular, we use the rule of law and the control of corruption indices constructed by Kaufmann, Kraay and Mastruzzi (2007) for the period 1996-2005.[19] These indices are reported on a scale from -2.5 to 2.5 and are based on subjective perceptions by public sector, private sector and NGO experts.[20] The classification of countries based on these variables, following the same one standard deviation rule described above, is reported in Appendix Table A2. Overall, the classification under the three institutional variables is similar. The most notable exception is Singapore, which is classified as a low-institutions country under constraints on the executive but as a high-institutions country under both the rule of law and control of corruption indices.

[18] We use the average of constraints on the executive over 1972-2004 rather than its value at the beggining of the period or its year-to-year variation because the average value of this variable appears to provide a better and less noisy measure of how constrained politicians are in a given country. The changes in this variable from year to year are subject to potential miscodings, which are averaged out when we considered the average constraints on the executive over a reasonable period of time.

[19] One advantage of these indices is that they measure institutional quality around the time of central bank independence for most countries.

[20] The exact questions for the two variables are: "the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, the police, and the courts, as well as the likelihood of crime and violence" and "the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests" (Kaufmann et.al., 2007, p. 4).

Our main dependent variable, inflation, was obtained from the International Financial Statistics (IMF) and corresponds to the annual percentage variation of the consumer price index.[21] Figures 4, 5 and 6 plot the inflation data over time as well as the date of CBI (indicated by a vertical line) for all the countries in our sample. Figure 4 looks at the 8 countries in the low constraints on the executive category, Figure 5 looks at medium-constraint countries, while Figure 6 examines the countries with high levels of constraints. In order to isolate changes in individual country inflation rates, throughout these figures the average normalized world inflation is subtracted from each country's normalized inflation rate (so that the horizontal line at zero indicates when the inflation rate of the country is at the world average).[22] Figure 4 suggests that there appears to be a mixed association between inflation and CBI in countries with the weakest constraints. In China and Guyana, there is a decline in inflation following the introduction of the CBI, whereas in Guatemala or Nepal, inflation drifts upward over time and the introduction of CBI in 2002 in both countries appears to have had no effect on this process. Figure 5 shows several cases where there are significant disinflations concurrent with the introduction of CBI. This happens in Colombia and Argentina, as we already discussed in the Introduction, but it also seems to occur in Greece, Turkey and Uruguay. It is important to note that in a number of instances, such as in Bolivia or Chile, inflation starts declining before CBI. Finally in Figure 6 there is no case where CBI is followed by a large fall in inflation.

The comparison of Figures 4 and 5 shows that, in contrast to our theoretical model, inflation is generally higher in medium-constraint countries than in low-constraint countries. We do not have an explanation for this pattern. It may reflect the fact that in countries with low constraints politicians have access to other instruments for achieving their political objectives and do not need to rely primarily on monetary policy (which may be a relatively blunt instrument to achieve clientelistic objectives or self-enrichment).

The data on government expenditure as percentage of GDP we use in Section 6 were obtained from the World Economic Outlook (IMF).[23] In our robustness checks we also use additional macroeconomic variables to control for other time-varying determinants of inflation. We use the log of GDP per capita (in constant prices, chain series from PWT 6.2). Also, to control for the extent to which fixed exchange rate regimes might have provided an anchor for inflation and limited the discretionary use of monetary policy, we use an index of exchange rate flexibility

[21] The inflation data reported for Qatar by the IFS show an unusual spike in 1998 and 1999. Rather than verifying and modifying the data provided by the IMF for every country we use the data exactly as reported by the IFS. However, all our results are robust to excluding Qatar from the sample.

[22] Normalized inflation is defined as inflation/(1+inflation), see equation (11) in the next section.

[23] Government expenditure corresponds to Total Expenditure and Net Lending by the General Government (WEO variable GGTENL).

constructed by Reinhart and Rogoff (2002). This index takes values between 1 and 6, with higher values corresponding to more flexible exchange rate regimes. The index is reported on an annual basis and covers the period 1972-2001.

5 Central Bank Independence and Inflation

In this section, we present our main results concerning the relationship between CBI and inflation. Throughout, the left-hand side variable is defined as

$$y_{c,t} = \frac{\text{inflation}_{c,t}}{1 + \text{inflation}_{c,t}}, \tag{11}$$

where $\text{inflation}_{c,t}$ denotes the inflation rate (e.g., 0.1 for 10% inflation) for country c in year t. This transformation is useful, since, otherwise, hyperinflationary episodes entirely dominate the empirical analysis. An alternative would have been to use the logarithm of inflation, but this is not possible when there are cases of zero inflation. Moreover, using logs would shift the outlier problem to cases in which there are very low levels of inflation. With a slight abuse of terminology, we refer to $y_{c,t}$ as "inflation" (rather than referring to it as "normalized inflation").

It should be noted throughout that changes in CBI are not randomly assigned or exogenous, so the empirical work we present here is intended to uncover robust correlations between central banking reform and contemporaneous or subsequent declines in inflation. As already noted in the Introduction, CBI is often adopted as part of an anti-inflation package of policies and this can be seen in Figures 4 and 5, where we show a number of instances in which inflation starts declining a few years before CBI. This is indicative of a pattern where other anti-inflation measures might be taken simultaneously with or just before the introduction of CBI.

5.1 The Main Effect of Central Bank Independence on Inflation

Our general estimating equation for Table 1 is

$$y_{c,t} = \sum_{j=1}^{k} \zeta_j y_{c,t-j} + \phi_0 x_{c,t} + \sum_{j=1}^{k} \phi_j x_{c,t-j} + \delta_c + \omega_t + \varepsilon_{c,t}. \tag{12}$$

Here the first summation includes lags of inflation and helps us control for potential serial correlation in this variable. The variable of interest is a dummy for CBI, described in the previous section, and denoted by $x_{c,t}$. Since CBI may have delayed effects, we sometimes also control for lags of CBI as shown by the second summation. The number of lags of inflation and CBI are taken to be the same for simplicity. In addition, all regressions include the δ_c's, which stand for a full set of country dummies and the ω_t's, which are a full set of year dummies. The error term

$\varepsilon_{c,t}$ captures all omitted influences. Since CBI is not "randomly assigned," this disturbance term can be correlated with some of the right-hand side variables. It is therefore important to interpret the estimates we report as conditional correlations rather than causal effects. The error term $\varepsilon_{c,t}$ may also have residual serial correlation and to control for this, throughout all standard errors are fully robust for arbitrary serial correlation at the country level (i.e., clustered at the country level, see Wooldridge, 2002).

Columns 1-3 of Table 1 examine the whole sample. Columns 4-6 repeat the same regressions focusing on the sample of countries that changed their CBI and thus rely only on differences in the timing of CBI to identify its effect on inflation. The first column of Table 1 includes only the contemporaneous CBI dummy, $x_{c,t}$. The estimate of ϕ_0 is -0.036 with a (robust) standard error of 0.034. Therefore, in this first specification, there is a negative effect of CBI on inflation, but this effect is not statistically significant at 10%. The magnitude of the coefficient is also rather small. This estimate of ϕ_0 implies that CBI is associated with a reduction in the annual inflation rate of 9 points (for example from 58% to 49%), while the mean of annual inflation in the whole sample is 58%.[24]

The specification in column 1 does not control for persistence in inflation, however. Since inflation is a highly serially-correlated variable doing so can have major effects on the estimates. Column 2 thus includes five lags of inflation, but still only the contemporaneous CBI dummy. When these lags are included, one can distinguish between short and long-run effects of CBI. The short-run effect is still given by ϕ_0, whereas the long run effect is

$$\text{Long-run effect} = \frac{\phi_0}{1 - \sum_{j=1}^{5} \zeta_j}$$

Column 2 reports both of these, together with the p-value for the statistical significance of the long run effect. It shows that neither the short run nor the long-run effect are significant. For example, the long-run effect is about double the impact of CBI on inflation suggested in column 1, but it is only significant at 13%. The lags of inflation themselves are highly significant. The results in the first two columns therefore show that despite the preponderance of theory and some evidence that CBI is important in practice, in this broad sample of countries the effect of CBI on inflation is modest and not statistically significant.

Column 3 also includes the five lags of the CBI dummy. In this case, the long run effect is

[24] To calculate the economic magnitude of the coefficient estimates, we use average inflation over our sample period. If, instead, we use median inflation (8% instead of 58%), then the magnitude is even smaller and suggests CBI reduces inflation by 4 points. Throughout, the economic magnitudes implied by median inflation are about 60% smaller than those implied by mean inflation.

given by

$$\text{Long-run effect} = \frac{\sum_{j=0}^{k} \phi_j}{1 - \sum_{j=1}^{k} \zeta_j}$$

In this specification the short-run effect is -0.031 (suggesting CBI decreases inflation by 8 points) and is again insignificant. The long-run effect is estimated to be -0.087 (suggesting CBI decreases inflation by 22 points in the long run) but it is also insignificant (significant at just below 13%). Column 4 then re-estimates the basic model from column 1 using the smaller sub-sample of countries with change in CBI. The estimated effect is now -0.063 with a standard error of 0.030 and is now significant. This turns out to be the general pattern from these 3 columns. Both the short and the long-run effects are negative and the estimated effects are larger.

All in all then the basic message of Table 1 is that there is some weak evidence that CBI does reduce inflation and this is particularly true when we only look at the sample of countries that changed their CBI over the period.

5.2 Central Bank Independence, Political Constraints and Inflation

Why does CBI not have a more major (quantitatively more significant) effect on inflation? The answer we will propose is based on the motivating theory presented in Section 3, that CBI will have a strong effect on inflation only in societies with intermediate levels of constraints on politicians. Let the dummies H_c, M_c and L_c denote a high, medium or low-constraint country respectively. Specifically, for each country one of these dummies takes the value 1, while the other two take the value zero. Including interactions with these dummies, the general estimating equation becomes

$$\begin{aligned} y_{c,t} = & \sum_{j=1}^{k} \zeta_j y_{c,t-j} + \phi_0^H H_c x_{c,t} + \phi_0^M M_c x_{c,t} + \phi_0^L L_c x_{c,t} \\ & + \sum_{j=1}^{k} \phi_j^H H_c x_{c,t-j} + \sum_{j=1}^{k} \phi_j^M M_c x_{c,t-j} + \sum_{j=1}^{k} \phi_j^L L_c x_{c,t-j} + \mathbf{Z}'_{c,t}\boldsymbol{\nu} + \delta_c + \omega_t + \varepsilon_{c,t} \end{aligned} \tag{13}$$

This equation implies that ϕ_0^H measures the short-run effect of CBI on countries with high constraints on the executive, while with the full set of lags included,

$$\text{Long-run effect}^H = \frac{\sum_{j=0}^{k} \phi_j^H}{1 - \sum_{j=1}^{k} \zeta_j}$$

corresponds to the long-run effect for these countries. The short-run and the long-run effects for medium and low-constraint countries are defined similarly. In (13) we also include a vector of country and time-varying covariates, $\mathbf{Z}_{c,t}$ (with a vector of coefficients denoted by $\boldsymbol{\nu}$). These covariates will be included in the robustness checks reported in Tables 7a and 7b.

Table 2 reports the results of estimating (13) in our base sample, with constraints measured with the average constraint on executive from the Polity IV data as described in Section 4. The first 3 columns are for the whole sample. Column 1 is again the most parsimonious specification, which does not include any lags of inflation or of the CBI dummy. The estimates suggest that CBI has no effect on inflation in low and high-constraint societies, but has a marginally significant effect of -0.071 (standard error of 0.044) in the sample of medium-constraint societies. This effect is twice the size of the estimate in column 1 of Table 1, showing that almost all of the effect in Table 1 is due to the impact of CBI on inflation in societies with intermediate levels of constraints. Moreover, the p-values at the bottom of the table indicate that we can reject the null hypothesis that the impact of CBI in the medium-constraint group is equal to the effect in the low or the high-constraint group. Column 2 shows similar results when the lags of inflation are included (again the effect of CBI on inflation is statistically significant at about 7% significance level). However, in this case, even though the long-run effect in the medium-constraint group is almost twice as large as the effect for the low-constraint group, we can no longer reject the null hypothesis that they are equal (we continue to reject the hypothesis that the effect is the same between high and medium-constraint countries).

The specification that includes the lags of CBI, as well as the lags of inflation, is reported in column 3. Now the long-run effect in the sample of countries with intermediate constraints is larger at -0.125, and is significant at about 6%. The effects in societies with high or low constraints continue to be insignificant. In this specification, we can reject that the effect of CBI is the same in the medium and low-constraint countries at 10% (and we continue to reject that they are the same in the high and medium countries at 1%).

Columns 4-6 estimate the same models for the sample of countries that experienced a change in CBI. The effects of CBI in medium-constraint countries are now quantitatively larger and more significant. The short-run effect of -0.097 in column 4 is significant and implies that CBI is associated with a decline in inflation of 24 points for this group of countries.[25] We continue to reject the hypotheses that this effect is the same as that for high or low-constraint countries. In columns 5 and 6, once we include lags of the CBI dummy and inflation, the short-run effect becomes smaller and less significant, but the long-run effects are statistically and economically significant. The effect in column 6 of -0.196, for example, implies CBI reduces inflation by 49 points. As in columns 1-3 there is no evidence that CBI influences inflation in countries with high constraints. However, the results in these columns show some evidence that CBI might have a

[25] If we use median inflation to calculate the magnitude of the coefficient, the coefficient implies that CBI reduces inflation by 11 points.

negative long-run effect on inflation in low-constraint countries, though this effect is smaller than that for medium-constraint countries.

Overall, we conclude from this evidence that the conditional correlations between the introduction of CBI and changes in inflation are broadly consistent with the theoretical ideas suggested in Section 3. In particular, CBI appears to be followed by declines in inflation in countries with intermediate levels of constraints on politicians, while there is no evidence of a negative effect of CBI on inflation in high-constraint countries. In low-constraint countries, there is typically no effect of CBI on inflation, though some specifications show negative but less significant effects. Nevertheless, it is worth noting that while we can reject the hypothesis that the effect of CBI on inflation is different between high and medium-constraint countries, we can only reject the same hypothesis in some of the specifications for medium and low-constraint countries.

5.3 Robustness

Tables 3-7 investigate the robustness of these results. In Table 3 we replicate columns 1, 3, 4 and 6 of Table 2, but using the rule of law and control of corruption indices constructed by Kaufmann et.al. (2007). The results in columns 1-4 based on the full sample are similar to those in columns 1-3 of Table 1 and do not show statistically significant effects of CBI. The results in columns 5-8, which focus on the sample of countries that experienced a change in CBI, are more encouraging for us. They are broadly similar to those in columns 4-6 of Table 2. Columns 5 and 7 show evidence of a statistically significant short-run effect of CBI on inflation only in the countries with medium institutions (both when using the rule of law or control of corruption indices). These coefficients are of similar magnitude to the ones reported in column 4 of Table 2. Columns 6 and 8, on the other hand, show evidence of a negative statistically significant long-run effect of CBI on inflation in both the medium and low-institutions countries. These results again show that the effects in the medium and high-institutions countries are statistically different, but we cannot reject the null hypothesis that the effects in the low and medium groups are equal. Overall, the results using the alternative measures of institutions are generally consistent with those reported in Table 2, though with these measures the differences between low and medium-constraint countries are less pronounced.

An econometric problem in the estimation of (13) is that the equation includes both fixed effects and lagged dependent variables. In the presence of lagged dependent variables, the key regressor $x_{c,t}$ (and its lags) will be mechanically correlated with $\varepsilon_{c,s}$ for $s < t$, so the standard fixed effects estimator, used in Table 2, is inconsistent (e.g., Wooldridge, 2002, chapter 11). However, it can be shown that the fixed effects estimator becomes consistent as the number of time periods

in the sample increases (i.e., as $T \to \infty$). Even though we have a relatively large number of time periods here, this source of inconsistency might still be important depending on how close to unit root inflation dynamics are. The most common way of ensuring consistency in this case is to use the GMM estimator developed by Arellano and Bond (1991). This involves differencing (13) to eliminate fixed effects, so that we have

$$\Delta y_{c,t} = \sum_{j=1}^{k} \zeta_j \Delta y_{c,t-j} + \phi_0^H H_c \Delta x_{c,t} + \phi_0^M M_c \Delta x_{c,t} + \phi_0^L L_c \Delta x_{c,t} \quad (14)$$
$$+ \sum_{j=1}^{k} \phi_j^H H_c \Delta x_{c,t-j} + \sum_{j=1}^{k} \phi_j^M M_c \Delta x_{c,t-j} + \sum_{j=1}^{k} \phi_j^L L_c \Delta x_{c,t-j} + \Delta\omega_t + \Delta\varepsilon_{c,t}$$

and then using lags of $y_{c,t}$ and $x_{c,t}$ to instrument for the differenced terms (here $\Delta y_{c,t} = y_{c,t} - y_{c,t-1}$, and so on). These lags will be valid instruments to solve the endogeneity problem resulting from the mechanical correlation between $x_{c,t}$ and the error term if there is no additional serial correlation in $\varepsilon_{c,t}$ (so that there is no second-order serial correlation in $\Delta\varepsilon_{c,t}$), which can be tested. Table 4 reports the results of estimating (14) where we replicate columns 2-3 and 5-6 of Table 2 (throughout the rest of the paper L_c, M_c and H_c are again based on the constraints on the executive variable). The results are similar to those of Table 2. In particular, the interactions between the medium constraints dummy and CBI are still negative and the estimates are statistically more significant than in Table 2. There is no evidence of a negative effect of CBI on inflation in high-constraint countries. The results in Table 4 also show some evidence of a negative effect of CBI in low-constraint countries once we focus on the sample of countries that changed their CBI in columns 3 and 4. Nevertheless, these results should be interpreted with caution; though the tests for serial correlation cannot reject the null hypothesis of no second order correlation in the differenced residuals, the Sargan overidentification tests reject the null hypothesis in all columns, which implies that different lags estimate different magnitudes for the coefficients of CBI and lagged inflation (which is often a problem when using this GMM procedure with large T).

Table 5 investigates alternatives to the use of the three dummy variables H_c, M_c and L_c for high, medium and low constraints on the executive to capture the nonlinear effects of this variable. In particular, we use a quadratic in the average of constraints on the executive interacted with the CBI dummy. The coefficients reported evaluate the quadratic at the levels 1, 4 and 7 of constraints on the executive. The results in Table 5 are broadly similar to those in Table 2. The short and long-run effect of CBI on inflation is always negative and significant for countries with intermediate constraints. There is no evidence of a significant effect of CBI in countries with high or low constraints. However, even though the effects are larger in the medium than in the low and high-constraint groups, we can only reject that they are equal when comparing the high and

intermediate group. Overall, these results suggest that the specific way of parameterizing the nonlinearity in the exact cutoffs between low, medium and high constraints is not too important for our results.

Table 6 reports the results of a simple falsification exercise. We include both the contemporaneous and the five-year lead of CBI. To the extent that inflation was already declining in some countries *before* central bank reform, this lead variable will capture the decline. When this is the case, we cannot have much confidence that CBI might in fact be a major factor in the decline in inflation. The contemporaneous effect of CBI in countries with intermediate levels of constraints is still significant. The five-year lead is never negative for this group and typically very small. Hence the negative association between CBI and inflation in this group of countries is not driven mainly by a secular decline in inflation. For high-constraint countries, the lead of CBI is also never significant and is typically very small. For low-constraint countries, there is some evidence of a prior trend upwards in inflation. This suggests that in some of these cases CBI may have been introduced in the midst of particularly high inflationary episodes.

Finally, Tables 7a and 7b conduct a range of other robustness checks. In Table 7a we focus on the full sample and we use the equivalents of columns 1 and 3 of Table 2. In Table 7b we restrict ourselves to the sample of countries that changed their CBI and use the equivalents of columns 4 and 6 of Table 2. Columns 1 and 2 of Tables 7a and 7b report the robustness of the results to including potential time varying determinants of inflation. In particular we include 5 lags of log of GDP per capita and 5 lags of an exchange rate flexibility index constructed by Reinhart and Rogoff (2002). While the negative effect of CBI on inflation is not significant when we focus on the full sample, the results in Table 7b show a similar pattern to the one depicted in Table 2 with a negative and statistically significant long run effect of CBI only in the group with intermediate constraints on the executive. The results in columns 3 and 4 of Tables 7a and 7b include a quadratic time trend interacted with region dummies to control for differential trends in inflation across regions. These additional controls have little effect on the estimates. In column 3 of Table 7a, the estimate of the impact of CBI in medium-constraint countries is -0.065, with a standard error of 0.044 which is similar to that reported in column 1 of Table 2. The long-run effect in column 4 however, is smaller in magnitude and less significant than in column 2 of Table 2. Nevertheless, columns 3 and 4 in Table 7b show that in the sample of countries that changed CBI, once we control for differential regional trends, the results are again similar to those in Table 2.

In columns 5 and 6 of Tables 7a and 7b, we exclude Western Europe entirely. This robustness check is motivated by the concern that policy dynamics and the effect of CBI on inflation might

be different in Western Europe than the rest of the world. It is therefore useful to see whether similar results are obtained when the contrast with the West European countries is removed. The results in this case are again similar to the baseline estimates.

Columns 7 and 8 include an additional dummy for the introduction of the European Central Bank or the country in question joining the monetary union after the European Central Bank. Again, there is little change here from the results we found in Table 2.

Finally, columns 9 and 10 show the robustness of our results to using the CBI index constructed by Cukierman rather than the CBI dummy. While, as discussed in Section 4, there are concerns related to the coding and interpretation of this index, it still constitutes a useful check on our measure of CBI and on our results. The results using this index are similar to those reported in Table 2. As with our main results, only the interaction between the medium constraints dummy and the new CBI index is negative and statistically significant.[26]

Interestingly, in columns 5-10 of both Tables 7a and 7b we can now reject the null hypothesis that the effects in the intermediate group are equal to those in the low or in the high-constraint group.

We also checked the robustness of the results reported in Table 2 to the "type" of CBI different countries implemented. In particular, we ran the same regressions as in Table 2 with a dummy for "goal independence" of the CBI. This dummy takes a value of 1 for countries where CBI reform defined inflation as the unique objective of monetary policy and zero everywhere. This is a useful robustness check against the possibility that CBI may have very different effects when the central banker is truly "conservative" with price stability as the unique objective (as with the Bundesbank) than in instances where CBI has multiple objectives (as with the U.S. Federal Reserve). The results using the "goal independence" CBI dummy are analogous to those in Table 2 and suggest a similar pattern with a negative effect of goal independence on inflation only in countries with intermediate constraints on the executive. We do not report these results to save space. We also briefly investigated whether changes in the dynamics and persistence of inflation in the mid-1980s, documented for example by Mumtaz and Surico (2006) and Stock and Watson (2007), might be responsible for our results. As a crude control for this possibility, we interacted the lags of inflation with a dummy for the period 1972-1990 and a dummy for the period 1991-2005. The results of this exercise led to a similar pattern to that found in Table 2, with a negative effect of CBI only in countries with intermediate constraints on the executive, though the statistical

[26] The coefficient in column 9 of Table 7b of -0.224 implies that an increase of one standard deviation in the index is associated with a decrease of 11 points in the inflation rate in countries with intermediate constraints. The coefficient in column 10, on the other hand, suggests that an increase of one standard deviation in the CBI index decreases inflation by 18 points in the long run.

significance of some of the estimates became weaker. These results are again not reported to save space.

6 The Seesaw Effect

In this section, we investigate the implications of CBI reform for other dimensions of policy. In particular, we look at whether CBI is followed by an increase in government expenditure as a percent of GDP in societies with intermediate political constraints. Our basic econometric model is again (13) but now the dependent variable will measure fiscal policy. Table 8 reports the differential effects of CBI in high, medium and low-constraint societies on government expenditure as percentage of GDP. The table shows that there is no evidence that introducing CBI in countries with high or low constraints has any impact on government expenditure relative to GDP in either the short or long-run. However, in medium-constraint countries, where CBI is associated with declines in inflation, CBI also appears to be associated with an increase in government expenditure. Both the short and the long-run effects are positive for these countries in all specifications, and in columns 2, 3, and 5, these effects are statistically significant. In column 2 the estimated ϕ_0^M is 0.011 with a standard error of 0.004, and suggests an immediate increase in government expenditure equivalent to just above 1% of GDP. The long-run effect of 0.050 is also significant and corresponds to a substantial 5% point increase in government expenditure relative to GDP in the long-run in medium-constraint countries that have introduced CBI.

Table 9 shows that the broad pattern is similar when we use the Arellano-Bond GMM estimator (as in Table 4). In this case, the evidence consistent with the seesaw effect is somewhat stronger, though now we also find some positive long-run effect of CBI on government expenditure in low-constraint countries (see, for example, column 2). Finally, Table 10 reports a falsification exercise similar to that in Table 6. Here we again include a 5 year lead of the CBI dummy to check whether the estimates in Table 8 might be capturing a secular upward trend in government expenditure in countries with intermediate constraints. The results in Table 10 do not show any evidence of such a pattern. The interaction between the medium constraints dummy and the lead of the CBI dummy is never significantly different from zero.

We also checked whether CBI is associated with a change in government budget balance (again measured as a fraction of GDP). These results do not show any significant effect of CBI on government balance (results not reported to save space). This might be because governments in medium-constraint countries, which show a significant increase in spending, may have also raised revenues. Alternatively, government balance may have improved automatically because these governments held nominal debt and benefited from the decline in interest rates associated

with reduced inflation. Counteracting this, however, they are also likely to have experienced a reduction in the inflation tax.

Overall, we conclude that there is some suggestive evidence consistent with the seesaw pattern, whereby in some of the cases where CBI reduces inflation, there may be an increase in government expenditure as a share of GDP. Nevertheless, this result is not always robust and further investigation is necessary before reaching a firm conclusion.

7 Conclusions

In this paper, we argue that to understand when policy reform will be effective one must understand the "political context" that leads to distortionary policies in the first place. Though such a claim would seem natural to those steeped in political economy, it appears not to have influenced either the design of policy reform in the past or the recent wave of revisionist research on the failures of reform. Rather, scholars have taken some recent instances of failures of reform to imply that the reforms themselves were misconceived because of second-best problems. We believe that a much more fruitful approach is to study the political economy constraints that interact with the implementation and the effects of reform.

To develop this perspective, we construct a simple political economy model of policy distortions and show that when such distortions arise as a result of the political equilibrium, there may be strong forces, from those initially benefiting from the distortions, that negate the effects of the reform. The model illustrates in a simple way that both the extent of distortionary policy and the effects of reform will generally depend on political institutions (for example, on various measures of the constraints on political office holders). The first major insight of the model is that policy reform may not be effective when constraints are so weak that reform can be undermined or when constraints are sufficiently strong that policy is unlikely to have been highly distortionary to start with. Rather, it is at intermediate values of constraints that policy reform might be most effective. The second important lesson from the model is that with multiple policy instruments, when reform is partially effective, it may lead to the *seesaw effect*, whereby reform in one dimension leads to more intensive use of other distortionary instruments.

The paper also provides empirical evidence consistent with these patterns in the context of CBI. Our evidence suggests that CBI is associated with significant declines in inflation in countries with medium constraints, while there are no or smaller effects for countries with high and low constraints. There is also some evidence that, consistent with the seesaw effect, in countries where CBI is associated with reduced inflation, there is also an increase in government expenditure. This might partly reflect the use of an alternative policy instrument to achieve goals that high inflation

was previously being used for.

Do these results imply that policy reform can never work? We do not think this is the correct conclusion. Firstly, our evidence is consistent with the view that targeted reforms, such as anti-inflation programs and CBI, can be effective. Secondly, the evidence is difficult to reconcile with a naive approach which assumes that politicians adopt reforms for well meaning reasons or because they have decided that their old policies were inappropriate. In this light, if reforms fail to be fully effective, this must be at least partly because of the constraints placed by existing political economy factors. In particular, when reforms are promoted by international organizations and imposed on reluctant leaders, they are less likely to be effective, or at the very least, they need to be designed much more carefully to ensure effectiveness. Otherwise, our model and the empirical correlations suggest that *de jure* reform may not translate into *de facto* reform, and when it does, other dimensions of policy may deteriorate.

The general message from our paper is that the analysis of policy reform should start with an understanding of the political economy constraints leading to distortionary policies in the first place. This type of political economy analysis might be ultimately useful both to predict when reforms are likely to be effective and to understand how reforms can be designed better so as to reduce the risk of backlash. While we are currently far from a satisfactory theoretical or empirical understanding to be able to design policy reforms that are robust to such challenges, we hope that our paper and others in this vein make the case that an analysis of the political economic roots of distortionary policies must be part of any debate on the effectiveness and design of reforms.

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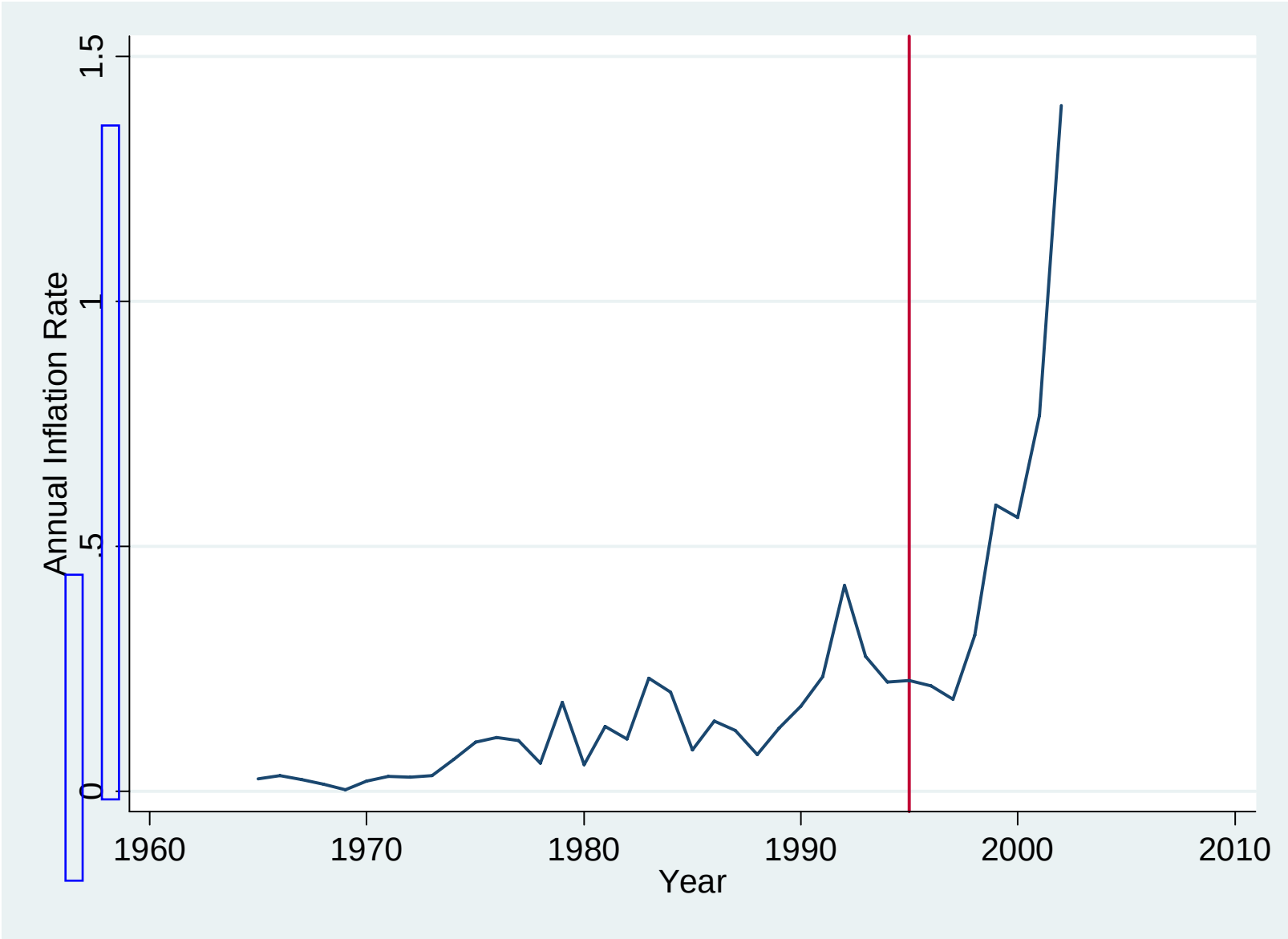
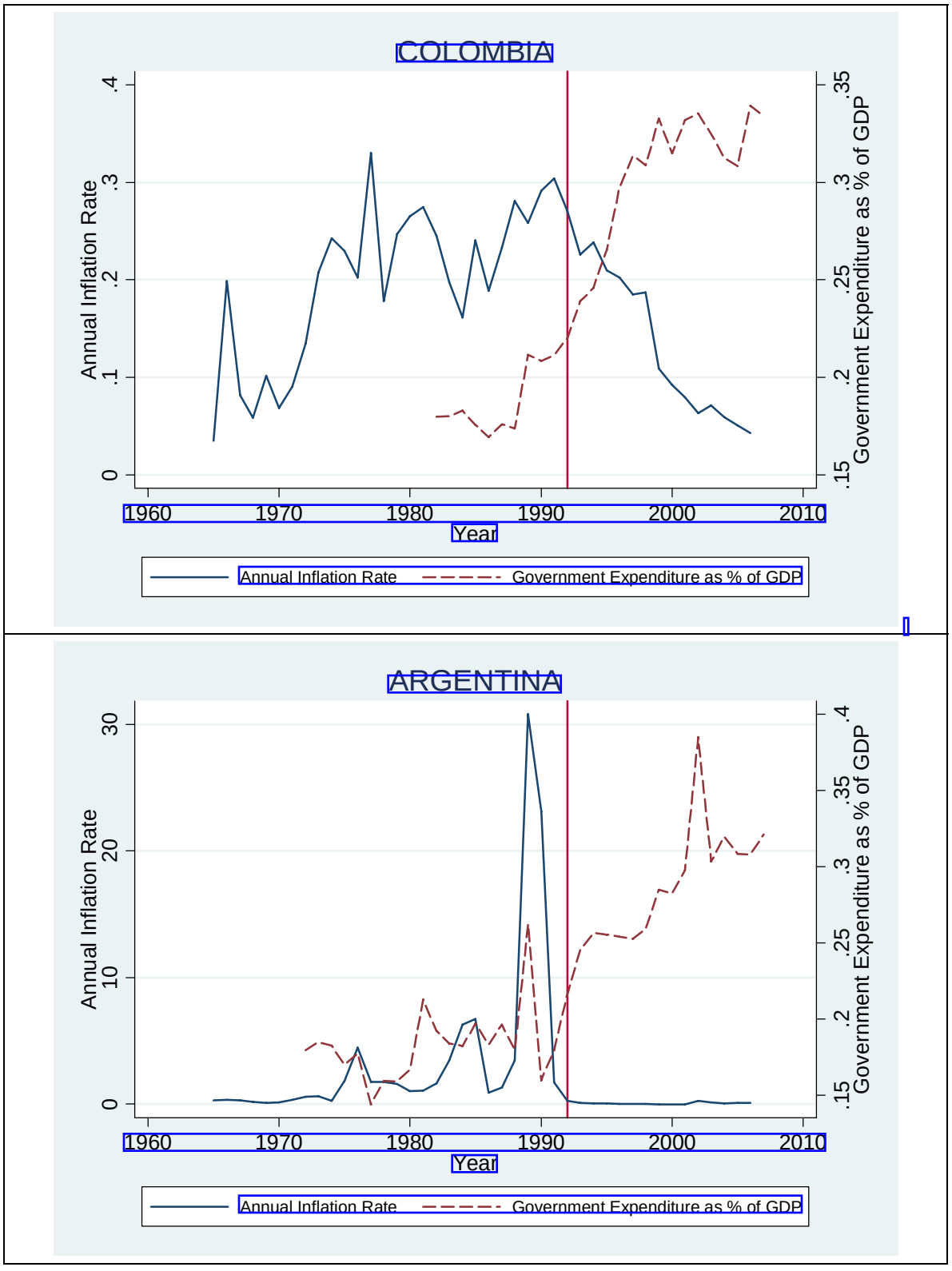
Figure 1
The Case of Zimbabwe



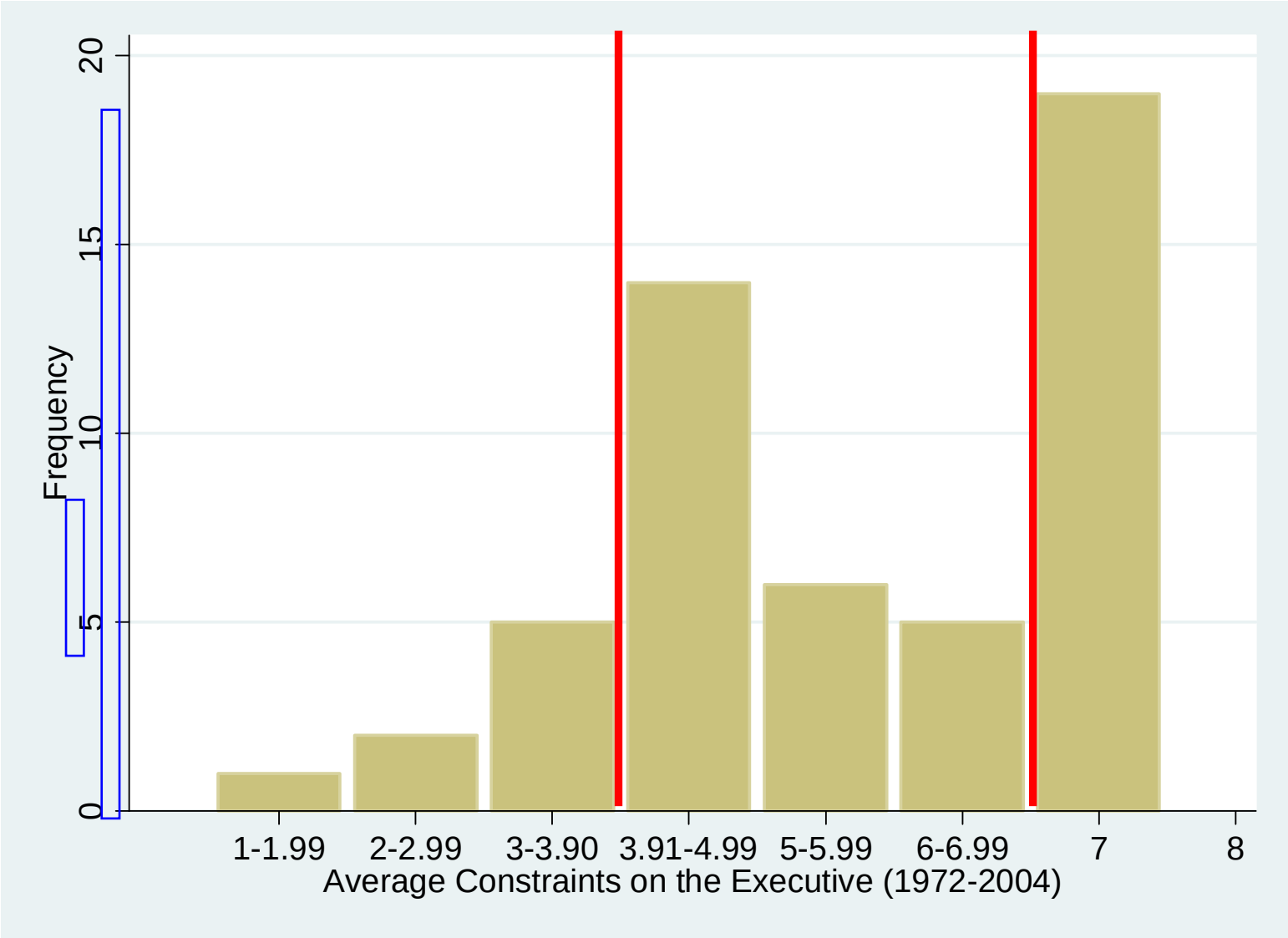
Note: Annual Inflation Rate corresponds to the annual variation in the consumer price index reported in the International Financial Statistics (IMF). Vertical line shows the year of Central Bank reform taken from Polillo and Guillen (2005).

Figure 2
The See-Saw Effect



Note: Annual Inflation Rate (scale on the left vertical axis) corresponds to the annual variation in the consumer price index reported in the International Financial Statistics (IMF). Government expenditure data (scale on the right vertical axis) are from World Economic Outlook (IMF). Vertical line shows the year of major Central Bank reform taken from Jácome and Vasquez (2005).

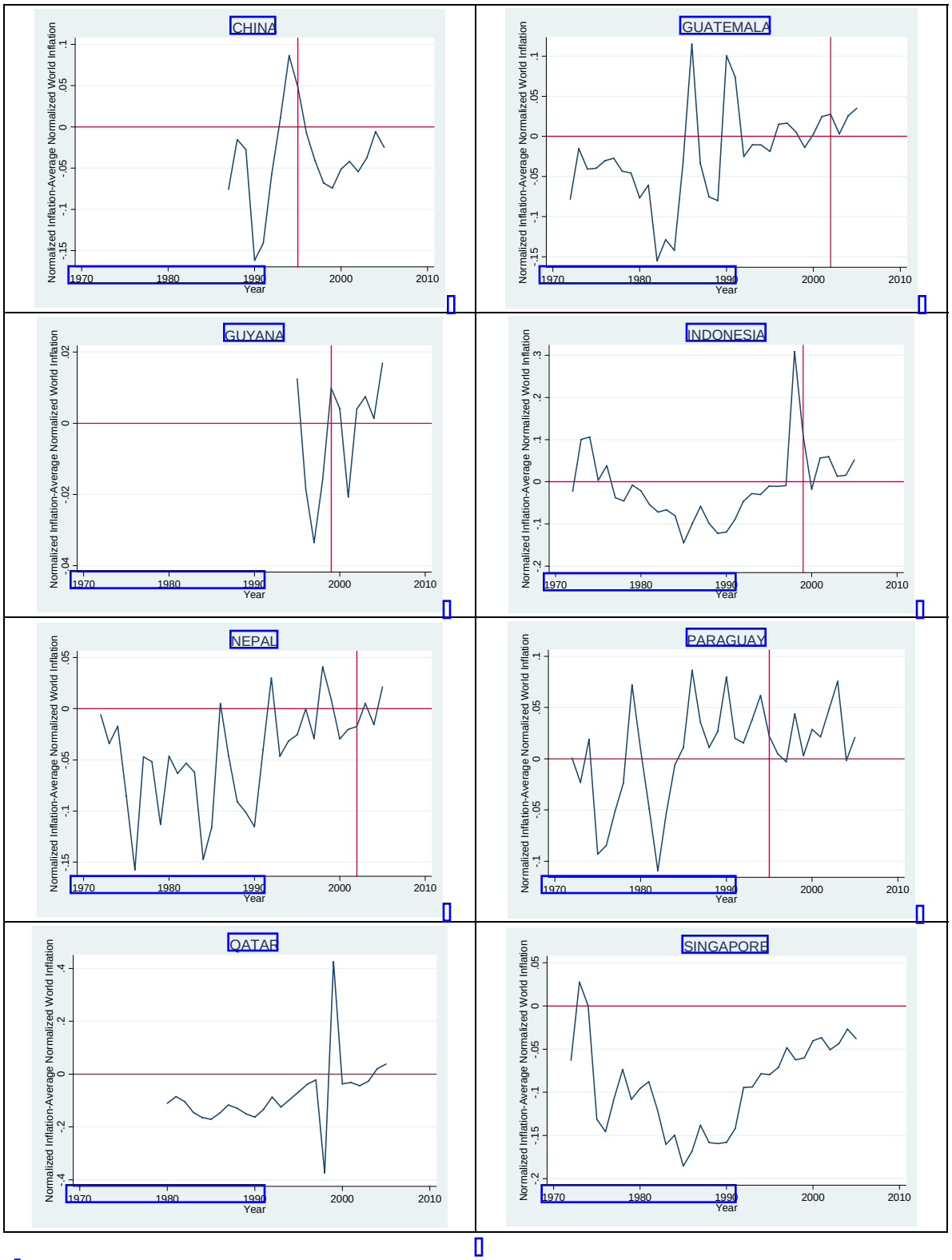
Figure 3
Histogram of Constraints on the Executive
Average 1972-2004



Note: Constraints on the Executive data are from Polity IV. Vertical lines at 3.9 and 7 show the cutoffs between the low, medium and high-constraint categories.

Figure 4a

Difference from Average Normalized World Inflation for countries with Low Constraints on the Executive



Note: Inflation data are from International Financial Statistics (IMF). Normalized inflation defined as inflation/(1+inflation). All figures show the difference of the country's normalized inflation and world average normalized inflation. Horizontal line at zero to illustrate whether the country's inflation is above or below the world average inflation. Vertical line shows year of major Central Bank reform. For details see text and Appendix Table A1.

Figure 5a

Difference from Average Normalized World Inflation for countries with Medium Constraints on the Executive

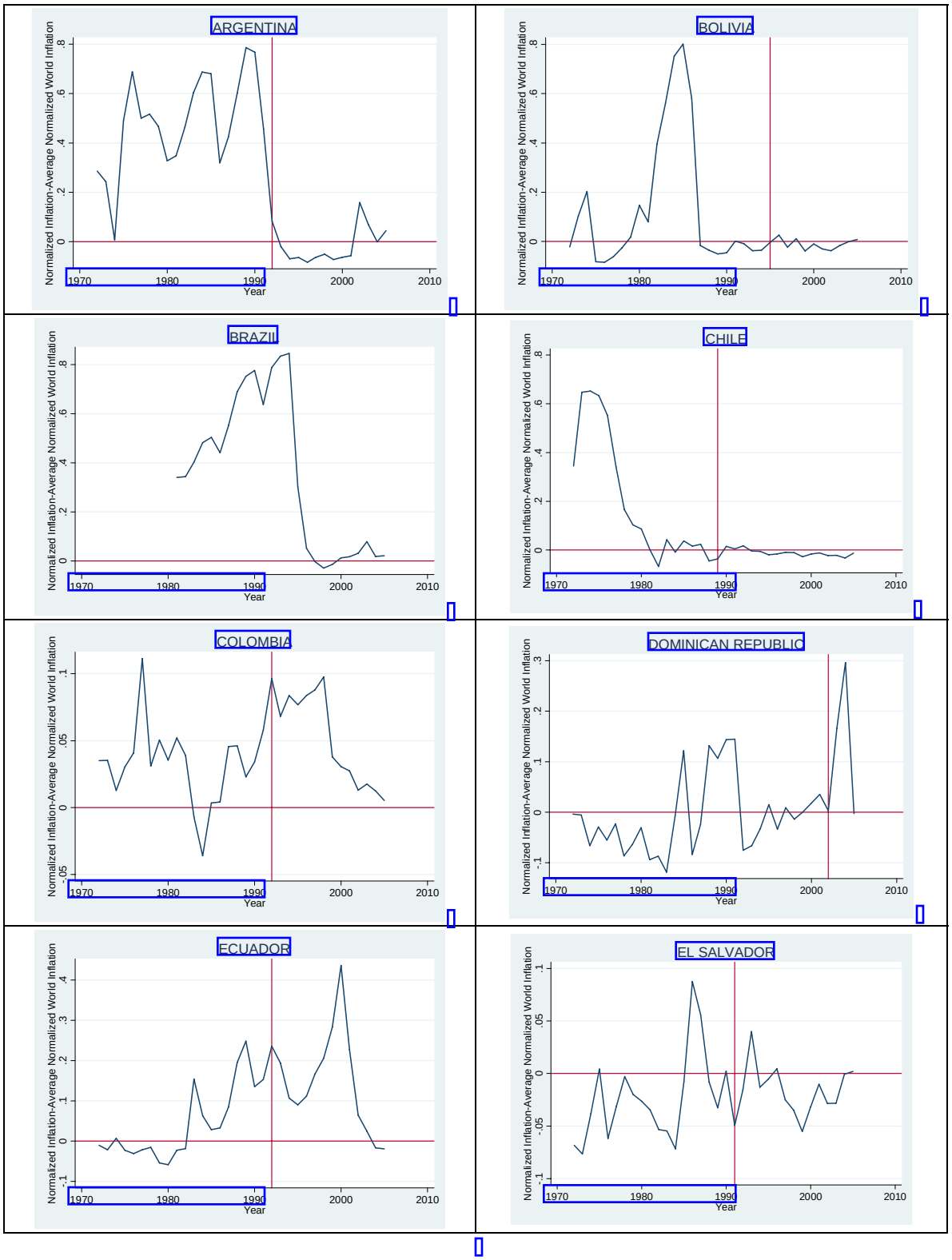


Figure 5b

Difference from Average Normalized World Inflation for countries with Medium Constraints on the Executive

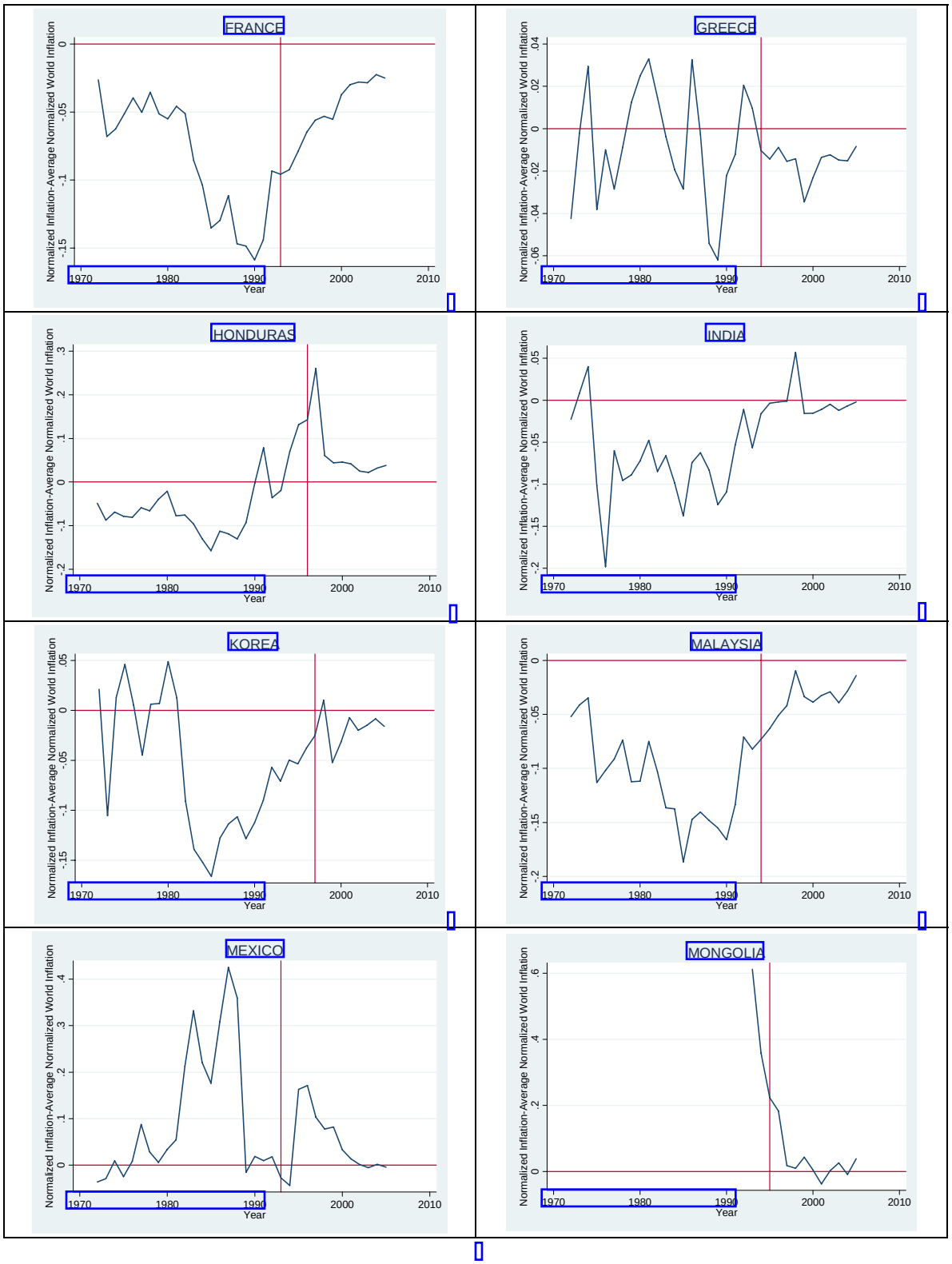
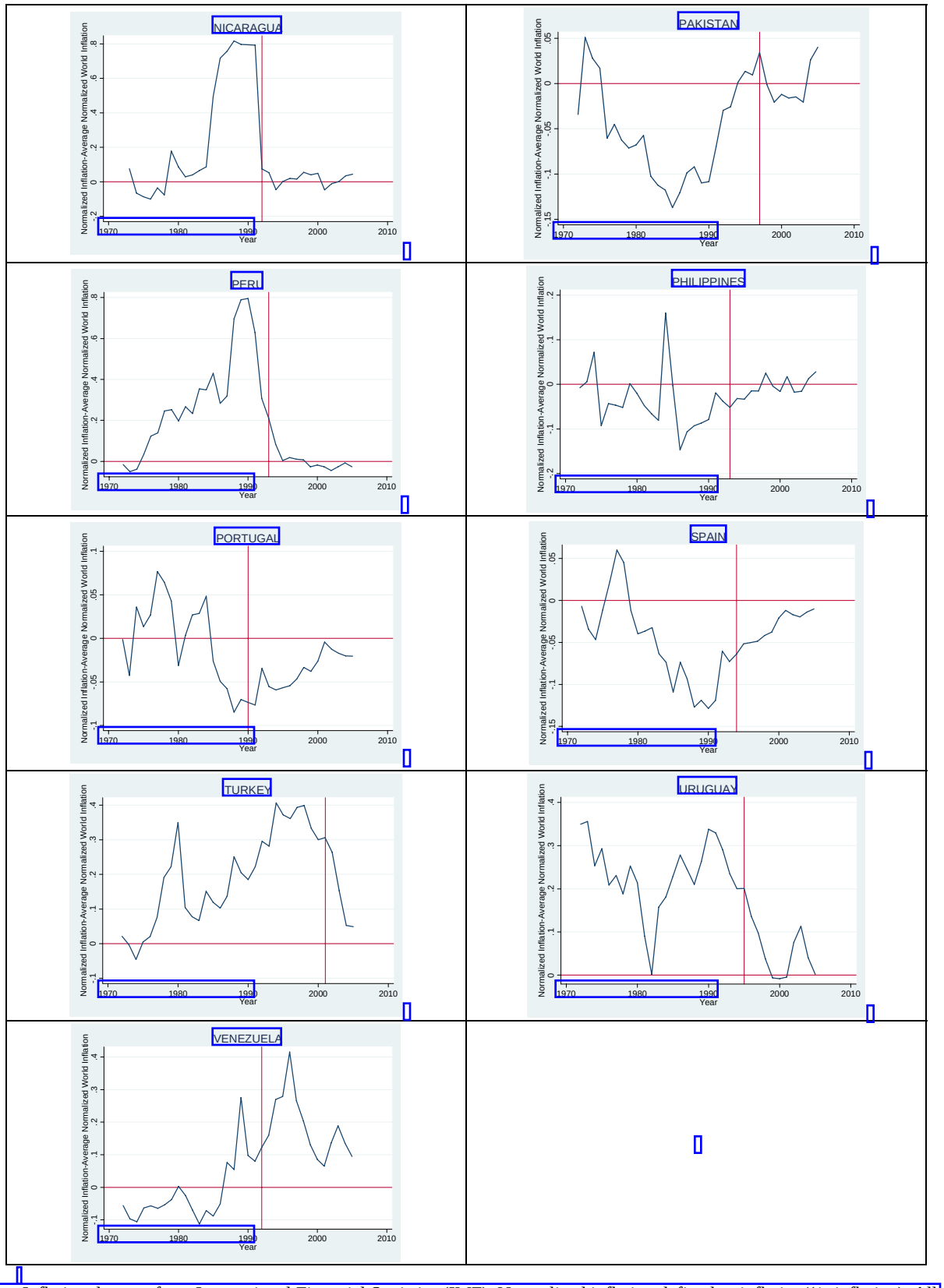


Figure 5c

Difference from Average Normalized World Inflation for countries with Medium Constraints on the Executive



Note: Inflation data are from International Financial Statistics (IMF). Normalized inflation defined as inflation/(1+inflation). All figures show the difference of the country's normalized inflation and world average normalized inflation. Horizontal line at zero to illustrate whether the country's inflation is above or below the world average inflation. Vertical line shows year of major Central Bank reform. For details see text and Appendix Table A1.

Figure 6a

Difference from Average Normalized World Inflation for countries with High Constraints on the Executive

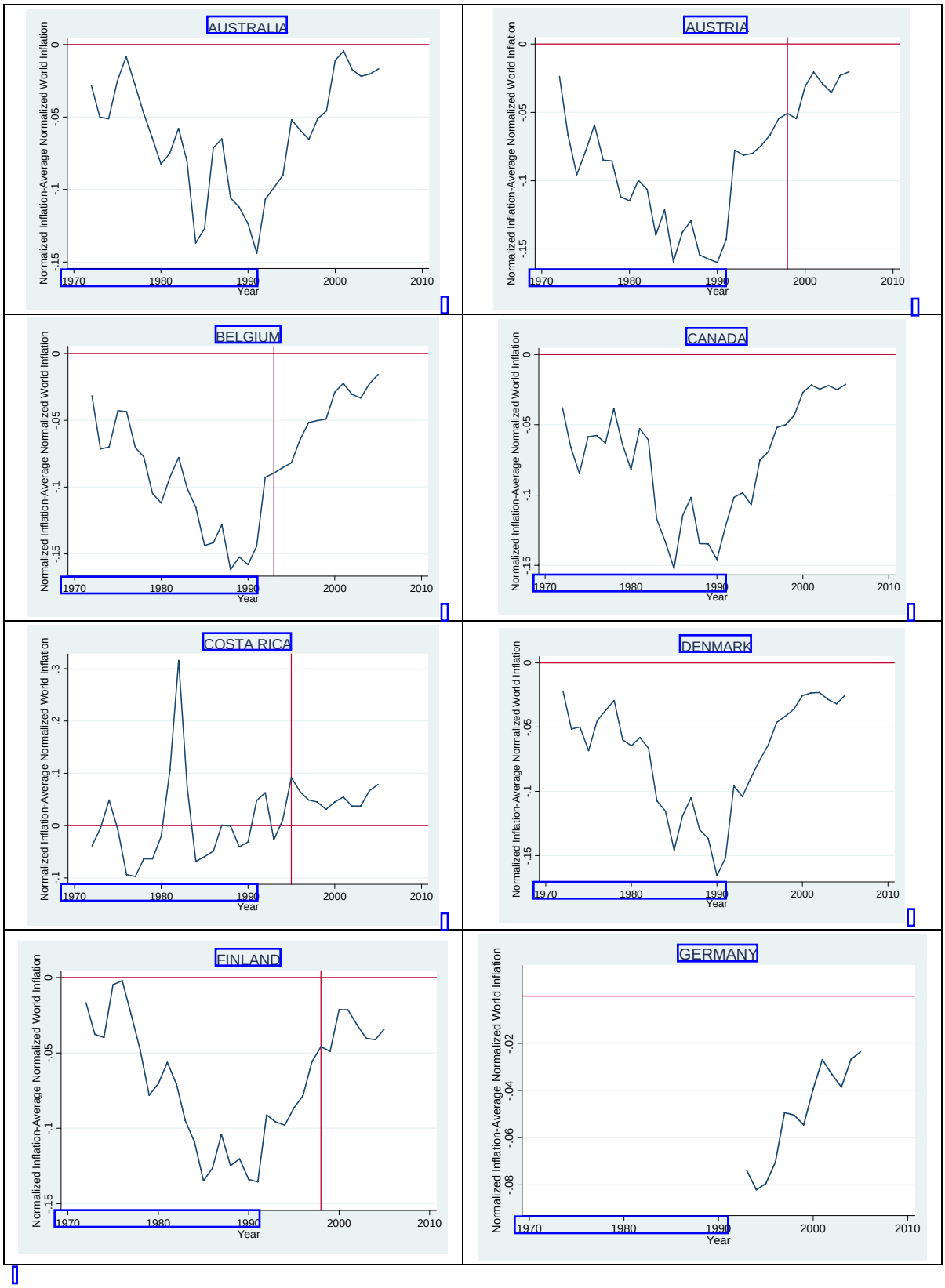


Figure 6b

Difference from Average Normalized World Inflation for countries with High Constraints on the Executive

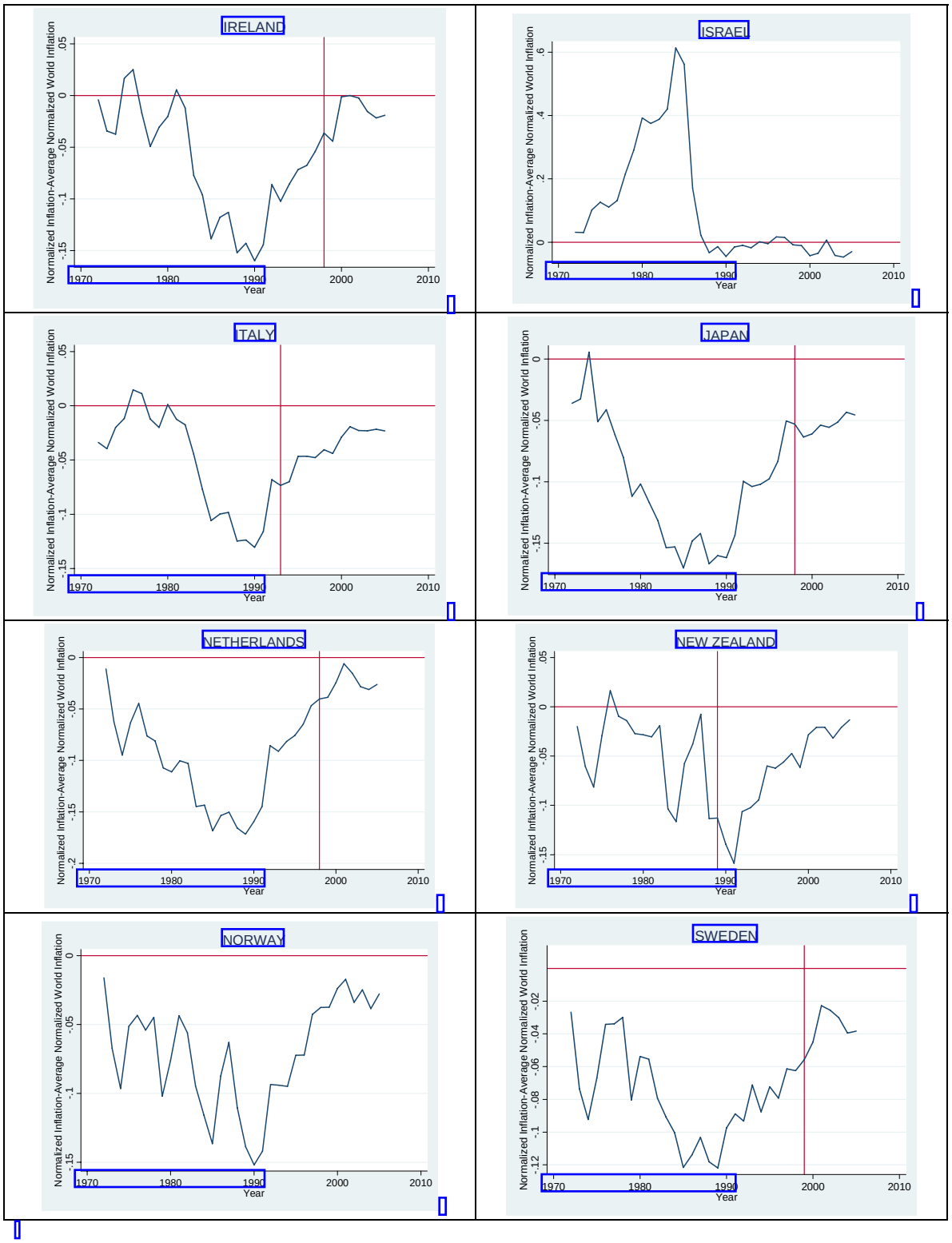
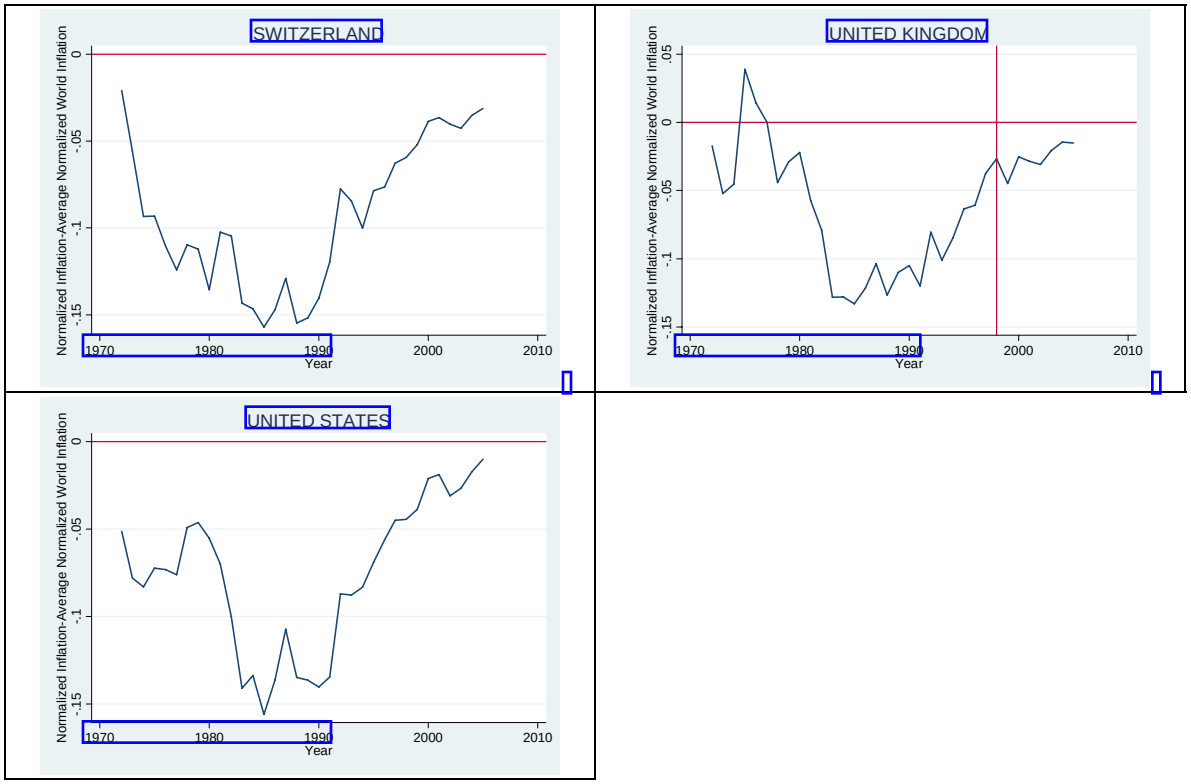


Figure 6c

Difference from Average Normalized World Inflation for countries with High Constraints on the Executive



Note: Inflation data are from International Financial Statistics (IMF). Normalized inflation defined as inflation/(1+inflation). All figures show the difference of the country's normalized inflation and world average normalized inflation. Horizontal line at zero to illustrate whether the country's inflation is above or below the world average inflation. Vertical line shows year of major Central Bank reform. For details see text and Appendix Table A1.

Appendix Table A2

Institutional Categories based on Constraints on the Executive from Polity IV and Governance Measures by Kaufmann, Kraay and Mastruzzi (2007)

Country	Coding based on Constraints on the Executive	Coding based on Rule of Law	Coding based on Control of Corruption
ARGENTINA	MEDIUM	MEDIUM	MEDIUM
AUSTRALIA	HIGH	HIGH	HIGH
AUSTRIA	HIGH	HIGH	HIGH
BELGIUM	HIGH	MEDIUM	MEDIUM
BOLIVIA	MEDIUM	MEDIUM	LOW
BRAZIL	MEDIUM	MEDIUM	MEDIUM
CANADA	HIGH	HIGH	HIGH
CHILE	MEDIUM	MEDIUM	MEDIUM
CHINA	LOW	MEDIUM	MEDIUM
COLOMBIA	MEDIUM	LOW	MEDIUM
COSTA RICA	HIGH	MEDIUM	MEDIUM
DENMARK	HIGH	HIGH	HIGH
DOMINICAN REPUBLIC	MEDIUM	LOW	MEDIUM
ECUADOR	MEDIUM	LOW	LOW
EL SALVADOR	MEDIUM	LOW	MEDIUM
FINLAND	HIGH	HIGH	HIGH
FRANCE	MEDIUM	MEDIUM	MEDIUM
GERMANY	HIGH	HIGH	HIGH
GREECE	MEDIUM	MEDIUM	MEDIUM
GUATEMALA	LOW	LOW	LOW
GUYANA	LOW	MEDIUM	MEDIUM
HONDURAS	MEDIUM	LOW	LOW
INDIA	MEDIUM	MEDIUM	MEDIUM
INDONESIA	LOW	LOW	LOW
IRELAND	HIGH	HIGH	MEDIUM
ISRAEL	HIGH	MEDIUM	MEDIUM
ITALY	HIGH	MEDIUM	MEDIUM
JAPAN	HIGH	MEDIUM	MEDIUM
KOREA	MEDIUM	MEDIUM	MEDIUM
MALAYSIA	MEDIUM	MEDIUM	MEDIUM
MEXICO	MEDIUM	MEDIUM	MEDIUM
MONGOLIA	MEDIUM	MEDIUM	MEDIUM
NEPAL	LOW	MEDIUM	MEDIUM
NETHERLANDS	HIGH	HIGH	HIGH
NEW ZEALAND	HIGH	HIGH	HIGH
NICARAGUA	MEDIUM	LOW	LOW
NORWAY	HIGH	HIGH	HIGH
PAKISTAN	MEDIUM	LOW	LOW
PARAGUAY	LOW	LOW	LOW
PERU	MEDIUM	LOW	MEDIUM
PHILIPPINES	MEDIUM	MEDIUM	MEDIUM
PORTUGAL	MEDIUM	MEDIUM	MEDIUM
QATAR	LOW	MEDIUM	MEDIUM
SINGAPORE	LOW	HIGH	HIGH
SPAIN	MEDIUM	MEDIUM	MEDIUM
SWEDEN	HIGH	HIGH	HIGH
SWITZERLAND	HIGH	HIGH	HIGH
TURKEY	MEDIUM	MEDIUM	MEDIUM
UNITED KINGDOM	HIGH	HIGH	HIGH
UNITED STATES	HIGH	HIGH	MEDIUM
URUGUAY	MEDIUM	MEDIUM	MEDIUM
VENEZUELA	MEDIUM	LOW	LOW

Assignment of countries to low, middle and high institutions categories is based, respectively, on the average of the Constraints on the Executive variable from Polity IV (for the period 1972-2004) and the average of the Rule of Law and Control of Corruption measures from Kaufmann, Kraay and Mastruzzi (2007) for the period 1996-2005. All countries within one-standard deviation from the sample mean were assigned to the middle-constraints category.