

## Monetary Institutions, Partisanship, and Inflation Targeting

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**Abstract:** Since 1989, 25 countries have adopted a monetary policy rule known as inflation targeting (IT), in which the central bank commits to using monetary policy solely for the purpose of meeting a publicly announced numerical inflation target within a particular time frame. In contrast, many other countries continue to conduct monetary policy without a “nominal anchor” or any explicit policy rule. Inflation targeting has received much attention from policymakers and the IMF, but scholars of international political economy have not accounted for variation in adoption of IT. We construct a simple model that demonstrates that countries are more likely to adopt IT when there is a conformity of preferences for tight monetary policy between the government and the central bank. More specifically, the combination of a right-leaning government and a central bank without bank regulatory authority is likely to be associated with the adoption of IT. Results from Markov transition models estimated on a time-series cross-sectional dataset of 49 countries between 1987 and 2003 provide strong statistical support for our argument about the adoption of IT. Additionally, estimates from both Heckman selection models and non-parametric matching methods provide strong evidence of the association between IT and low inflation.

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## 1. Introduction

In recent times, a consensus has emerged that low and stable inflation is essential for economic growth and development. Governments have adopted a variety of monetary policy strategies to combat inflation, including most notably the granting of independence to the central bank and the adoption of a fixed exchange rate. However, an alternative strategy known as “inflation targeting” (hereafter IT) is receiving an increasing amount of attention from policymakers and central bankers, including Federal Reserve Chairman Ben Bernanke. IT is a transparent monetary policy rule in which the central bank commits to using monetary policy solely for the purpose of meeting a publicly announced numerical inflation target within a particular time frame. Since 1989, some 25 countries have adopted IT as a monetary policy rule, and the evidence thus far suggests that it is an effective inflation-fighting strategy (Bernanke *et al* 1999; Truman 2003; IMF 2006). In a recent publication, the International Monetary Fund (IMF) reported that an additional 20 countries were seeking technical assistance from the IMF’s staff to implement IT, and that ten were expected to adopt a formal inflation target within the next five years (IMF 2006). Indeed, the IMF is sanguine about the widespread implementation of IT—which it refers to as the “monetary framework of choice”—in the developing world (IMF 2006).

The emergence of IT presents a puzzle for scholars of international political economy and central banking, and exposes a weakness in the dominant analytical framework for the study of monetary policy. The political economy literature sets up a dichotomy between one monetary policy rule—a fixed exchange rate—and the alternative of central bank independence as solutions to the time-inconsistency problem in monetary policy.<sup>1</sup>

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<sup>1</sup> The framework comes from a seminal special issue of *International Organization*, including contributions by Bernhard, Broz, and Clark (2002); Bernhard and Leblang (2002); Broz (2002), Clark (2002); Freeman (2002); Frieden (2002); Hallerberg (2002); and Keefer and Stasavage (2002). Also see Simmons (1994) and Bearce (2003).

Central bank independence, however, is not a monetary policy rule. Independent central bankers are not all alike: some, for example, might be especially concerned about financial stability, while others might use quantitative targets to guide their monetary policy decisions. Moreover, the available evidence on central bankers' varied career backgrounds (Adolph 2005) does not support the assumption that independent central bankers are uniformly conservative inflation-fighters, as required by the classic model by Rogoff (1985). In short, if a fixed exchange rate is not a viable option, policymakers have an important decision to make about monetary policy rules, even if the central bank has a high degree of independence from political pressures.

The question of monetary policy rules has grown more salient as countries have abandoned fixed exchange rates in the wake of currency crises and speculative pressures. For example, foreign exchange pressures forced Britain and Sweden to terminate their exchange rate pegs in the early 1990s, and both countries promptly turned to inflation targeting as an alternative nominal anchor (Bernanke *et al.* 1999). More recently, policymakers and economists have grown skeptical of the benefits (and feasibility) of fixed exchange rates in an era of high capital mobility (e.g., Agenor 2001; Eichengreen 1999; Obstfeld and Rogoff 1995). The Asian financial crisis in the late 1990s expedited the trend away from pegged exchange rates, and today nearly half of all developing countries and 95 percent of developed countries have *de jure* floating currencies (IMF 2006). With the decline of fixed exchange rates as the basis for monetary policy, inflation targeting has become a popular, although not universal, strategy for managing inflation (Calvo and Reinhart 2002).

The increasing popularity of IT is not limited to emerging market countries, or to countries experiencing exchange rate crises. Indeed, the first country to adopt inflation targeting was New Zealand in 1989, which had abandoned its pegged exchange rate four years earlier. More recently, Norway transitioned from a decade-long period of managed

floating to an IT regime in 2001 (Soikkeli 2002). The idea of an inflation target has even emerged in the United States as a potential alternative to the wholesale discretion granted to the Federal Reserve to set monetary policy, although as of this writing no such institutional change appears likely in the short term.<sup>2</sup>

The apparent resistance to a formal inflation target by U.S. policymakers is a reminder that IT is not politically palatable in all countries or at all times; indeed there is striking variation in the adoption of IT around the world. Some countries continue to conduct monetary policy with no nominal anchors in an environment of flexible exchange rates. Aside from the U.S., examples include Argentina, Japan, Malaysia, and Switzerland, among others. The variation in the adoption of IT therefore presents a puzzle for scholars of monetary policy institutions. Economists have focused on the macroeconomic *consequences* of IT, but there has been little systematic research on the political and economic determinants of the adoption of IT around the world.<sup>3</sup> Why do some countries adopt IT while others do not? In an environment of floating exchange rates, when do policymakers trust their central banks to enact appropriate monetary policy without imposing a monetary policy rule?

The goal of this paper is to explain the variation in the adoption of IT around the world. We begin by constructing a simple model based on the Barro-Gordon framework (Barro and Gordon 1983). The model demonstrates that the adoption of IT follows a political

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<sup>2</sup> The Federal Open Market Committee (FOMC) discussed the possibility of adopting an inflation target, and the expected resistance from members of Congress to such a move, during its meeting on June 27-28, 2000. See Federal Open Market Committee 2000. More recently, Fed Chairman Ben Bernanke has advocated the adoption of inflation targeting. See Bernanke 2003.

<sup>3</sup> Studies of the macroeconomic effects of IT include *inter alia* Ball and Sheridan (2003); Levin, Natalucci, and Piger (2004); Truman (2003); and the empirical studies in Loayza and Soto (2002). Truman (2003) includes a separate analysis of IT as a dependent variable which focuses primarily on economic variables, including domestic economic conditions, exchange rates, and central bank independence. Bernanke *et al* (1999) includes a number of case studies of countries that adopted IT; some of those cases touch on political factors, but no systemic assertions are made with regard to the influence of politics or institutions on the adoption of IT. Gerlach (1999) attempts a more systemic analysis of the influence of central bank independence and EU membership on the choice of IT, but his cross-sectional research design (with only 22 observations) limits the significance of his findings.

calculus based on the existing institutional structure of the central bank and the government's own consideration of the trade-off between inflation and alternative economic goals. An important observable implication of the model is that countries are more likely to adopt inflation targeting when there is a conformity of preferences for tight money between the government and the central bank. Indeed, an inflation target is rarely foisted upon unwilling central banks, and central banks themselves are unlikely to adopt inflation targets without the overt or tacit support of the government. More specifically, the combination of a right-leaning government and a central bank without bank regulatory authority is likely to be associated with the adoption of IT. On the other hand, left-leaning governments, whose supporters are generally favorable toward employment-friendly monetary policy, will rarely favor IT themselves. Central banks with official responsibility for bank regulation will be similarly averse to IT, instead favoring a more flexible monetary approach that is sensitive to the effects of interest rate changes on financial intermediation. We use a time-series cross-sectional dataset of 49 countries between 1987 and 2003 to test the claims from our model. Results from a Markov transition model provide strong statistical support for our argument about the adoption of IT. In addition, we conduct two separate tests of the efficacy of IT in fighting inflation. Results from both a Heckman selection model and a non-parametric matching methods analysis provide strong evidence of the association between IT and low inflation.

This paper proceeds as follows. In the next section, we provide a literature review and an explanation of inflation targeting as a nominal anchor for monetary policy. We then derive testable hypotheses from a formal model of the government's choice of adopting inflation targeting that incorporates factors such the central bank's institutional mandate, partisanship, and the trade-offs inherent in monetary policymaking. In sections 4 and 5, we present the data, results and statistical models that are used to test our claims. We conclude

by discussing the implications of our findings for the study of central banking and monetary policy, and offer guidance for future research.

## **2. Inflation Targeting: A Brief Primer**

Inflation targeting is a monetary policy framework in which the government and/or the central bank announces an official numerically-specified target for inflation over a given time period (Agenor 2001; Bernanke and Mishkin 1997; Bernanke *et al.* 1999; Svensson 1997). The inflation target may be a specific level (e.g., two percent) or a range (e.g., between one and three percent). Accompanying the target is a public commitment to price stability as the primary or overriding goal of monetary policy, and a promise to hold central bankers accountable should they fail to meet the inflation target. The practice of inflation targeting requires the central bank to publish inflation forecasts on a regular basis, and to maintain transparency about its strategies for keeping inflation in check (Svensson 1997).

An inflation target is a “nominal anchor” for monetary policy. Just as a fixed exchange rate serves to anchor the public’s expectations of inflation, so too does an inflation target serve as a visible signal of the central bank’s monetary policy goals. The public at large is acutely aware of changes in the price level; individual consumers may not have the capacity to ascertain day-to-day changes in the price indexes used by central banks, but they certainly do feel the pinch of higher (or lower) prices in housing, durable goods, and consumer products over time. Unlike alternative quantitative targets for monetary policy, such as the money supply, an inflation target lends itself to public monitoring. If a central bank fails to meet its stated inflation target, it cannot hide from public reproach. The publication of inflation forecasts and current macroeconomic conditions by the central bank strengthens the public’s ability to monitor the central bank’s policy decisions.

The emergence of inflation targeting coincides with the breakdown of the Bretton Woods international monetary system in the early 1970s and the relative decline in the

popularity of fixed exchange rates. In 1985, fixed exchange rates accounted for more than 50 percent of developed country monetary policy regimes and 75 percent of developing (non-industrial) country regimes; in 2005, the respective figures were five percent and 45 percent, with further declines expected in the short term (IMF 2006). The trend away from fixed exchange rates reflects an emerging consensus among economists and policymakers that floating exchange rates are a better choice for industrialized and emerging-market countries (Husain, Mody, and Rogoff 2005). For example, Levy-Yeyati and Sturzenegger (2003) find a positive association between *de facto* floating exchange rate regimes and economic growth in developing countries. More important is the increasing frequency of speculative attacks and banking crises in countries with rigid exchange rate regimes (Husain *et al* 2005). In an environment of high capital mobility, exchange rate pegs suffer from fragile credibility, and serve as poor substitutes for sound domestic macroeconomic policymaking (Agenor 2001; Obstfeld and Rogoff 1995). At the heart of the problem is that governments with fixed exchange rates must refrain from using monetary policy for any purpose other than maintaining the parity of the currency. Such a commitment simply lacks credibility when the government faces powerful incentives to use monetary policy for political purposes—such as to prime the economy in advance of an election—or to stabilize the economy in the event of exogenous shocks or economic downturns.

With the decline in the popularity of exchange rate pegs, many countries have searched for alternative nominal anchors to keep inflation under control. Early attempts to target the money supply were largely unsuccessful, in part because central banks did not view monetary targets as a serious commitment to low inflation (Mishkin 2000). In addition, the notion that faster money supply growth automatically triggers higher inflation has fallen out of favor with economists and central bankers (Agenor 2001; Mishkin 2000). Countries seeking an alternative nominal anchor have therefore turned to inflation targets. New Zealand became the IT

pioneer in 1989 when Parliament passed the Reserve Bank of New Zealand Act, thereby establishing a quantitative target for inflation (see Bernanke *et al.* 1999; Nicholl and Archer 1992). A number of countries soon followed suit, including Canada (1991), Australia (1993), Finland (1993), and Mexico (1995). As of 2003, there were 20 countries whose central banks explicitly targeted inflation, and an additional two (Finland and Spain) that adopted IT in the 1990s but then joined the European Monetary Union and no longer have autonomous monetary policies (see Table 1). In addition, the Slovak Republic, Indonesia, and Romania all adopted IT in 2005 (IMF 2006). The group as a whole includes 16 countries that are generally considered “emerging market” countries, and nine developed countries. To be sure, the practice of IT varies across these countries; for example, some central banks, such as the Bank of England, are more diligent in disseminating detailed inflation forecasts than central banks with more limited human resources and expertise.

Empirical studies of the macroeconomic impact of IT have grown increasingly optimistic about its effectiveness in fighting inflation. Truman (2003), for example, conducts a large-sample analysis and finds that countries that adopt IT have lower inflation levels, controlling for a battery of economic controls. Similar findings are reported in Levin, Natalucci, and Piger (2004) for a subset of developed countries. All empirical studies of IT come with important caveats about limited sample sizes and time periods; of course, IT remains a relatively new technology and still requires time to prove itself. Some studies, such as Ball and Sheridan (2003), are skeptical of the independent impact of IT on inflation outcomes. However, it is telling that the IMF has embraced IT as a monetary policy strategy, especially for developing countries. A lengthy IMF report entitled “Inflation Targeting and the IMF” shares the results of an in-house assessment of the salutary macroeconomic effects of IT, and recommends an increase in research, staff training, and more sophisticated Fund surveillance to support the surge in the popularity of IT (IMF 2006). Our own empirical

analysis, presented below, provides additional evidence of the strong link between IT and low inflation.

### **3. The Model: The Economy and Loss Functions**

We construct a simple open economy monetary policy model to explain when countries are likely to adopt an inflation target as a nominal anchor for monetary policy. We begin with the standard assumption that monetary policy involves a short-run trade-off between maintaining low inflation and expanding output to reduce unemployment. There are two main actors in the model: the central bank and the government. The model focuses on how strategic interaction between the central bank and the government affects the adoption of an inflation target. This approach is consistent with the existing literature, which demonstrates that central banks and government leaders jointly determine whether or not to adopt IT (Truman 2003; Agenor 2001). Indeed, as emphasized by Agenor (2001:42), the choice and implementation of an inflation target “typically represents an understanding between the government and the governor (or president) of the central bank.” We also assume that the government and central bank in our model can either choose between the specific commitment technology of IT or remain in a discretionary status quo (such as the float) without a commitment technology.

We adopt the aforementioned assumption not only because it is standard practice in the extant formal literature (see, for e.g., Persson & Tabellini 2000; Waller & Walsh 1996; Mishkin and Westelius 2006), but also because our primary objective is to examine the conditions under which IT is adopted. Agenor (2001) and the IMF (2006) also emphasize that countries contemplating an inflation target generally choose between total discretion in monetary policy or an IT commitment technology. Indeed, we find in our data (described

later) that the vast majority of inflation targeters had a de facto floating exchange rate for at least several months before adopting IT, therein suggesting that our assumption is realistic.<sup>4</sup>

We begin our presentation of the model by first defining the government's and the central bank's loss functions before solving for the model's equilibrium result. Following the extant literature (see, for e.g., Persson and Tabellini 2000; Barro and Gordon 1983), the government ( $G$ ) in our model is assumed to have the quadratic loss function:

$$L_G = \frac{1}{2}[(y - \bar{y})^2 + \theta_G \pi^2] \quad \bar{y} > 0, G = L, R \quad (1)$$

where  $G=L$  denotes a left-leaning government and  $G=R$  indicates a right-leaning government. In (1),  $\theta_G$  is the weight that the government places on controlling inflation and thus captures the government's aversion for inflation.<sup>5</sup> Unlike standard loss functions used in the literature, the key modification in the government's loss function in our model is that the parameter  $\theta_G$  is directly influenced by government partisanship in that  $\theta_L$  (the weight that a left-leaning government places on controlling inflation) differs from  $\theta_R$  (the weight a right-leaning government places on controlling inflation). Following existing studies, we assume that rightist governments place more weight on controlling inflation than leftist governments.<sup>6</sup> Hence, more formally, we let  $\theta_R > \theta_L$  and assume that  $\theta_R$  is high and increasing when a right-leaning government is in office.

The expression  $(y - \bar{y})^2$  in (1) captures deviations of output from the output target. Output in the economy follows from the familiar "Lucas-style" specification and is assumed

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<sup>4</sup> 19 out of a total of 22 IT countries in our sample had a de facto floating exchange rate for several months (in some cases a few years) before adopting IT.

<sup>5</sup> We allow  $\theta_G$  to be unbounded ( $\theta_G \in [0, \infty)$ ) to avoid imposing an artificial upper bound on  $\theta_G$ .

<sup>6</sup> See Alesina & Rosenthal (1995), Alesina, Roubini & Cohen (1997), Franzese (2002), Bearce (2003), and Oatley 1999.

to be a function of surprise inflation engineered by a policy-maker and a supply shock that is normally distributed with mean 0 and variance  $\sigma_\varepsilon^2$ ,

$$y = \pi - \pi^e + \varepsilon \quad (2)$$

Equation (2) implies that the natural level of output is normalized to zero (in log). As in standard monetary policy models, the supply shock can be observed by the government and the central bank (whose loss function is defined below) but not *ex ante* by wage setters who set wages equal to expected inflation, i.e.  $w = \pi^e \equiv E_{t-1}(\pi)$  where  $E(\cdot)$  is the expectations operator.<sup>7</sup> We assume that purchasing power parity holds. Hence, if  $e$  denotes the logarithm of the price of one unit of foreign currency expressed in terms of national currency and  $\pi^{F^*}$  measures the log of the foreign price level, the exchange rate is  $e = \pi - \pi^{F^*}$ .<sup>8</sup>

Having defined the government's loss function in (1), we now describe the central bank's loss function. Unlike the monetary policy models in the literature, which assume that the central bank's preferences on inflation are unknown and are therefore a stochastic parameter<sup>9</sup>, we suggest that the central bank's institutional mandate is one indicator of its inflation preferences. In particular, following extant studies that examine the central bank's role as a bank regulator (Barth *et al* 2003; Copelovitch and Singer 2006), we argue that central banks that hold or share bank regulatory authority are functionally responsible for maintaining the stability and profitability of the commercial banking sector, and are therefore less likely to alter interest rates solely on the basis of price-stability objectives. This is not to say that central banks with regulatory responsibilities do not care about inflation; indeed

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<sup>7</sup> Wage-setters in the economy thus form their wage expectations before supply shocks are realized.

<sup>8</sup> Suppose that  $\alpha$  is the weight that the incumbent places on ensuring that the difference between wages and prices are not large, while  $\beta$  is the weight that he or she places on minimizing the output gap. Then from (1) the floating exchange rate in the open economy is given as  $e = e_{t-1} + \beta\alpha$

<sup>9</sup> See, for example, Cukierman (1992) and Waller & Walsh (1996).

commercial banks themselves are generally considered to be strong advocates of price stability (Frieden 1991). However, banks are particularly sensitive to changing financial market conditions because they must pre-commit to loan terms. If the central bank increases interest rates based exclusively on expected changes in the price level, banks with fixed-rate loans will face declining profits as they are forced to raise their own deposit rates. The overall increase in the cost of funds increases the likelihood of bank failures (OECD 1992). Customers with flexible-rate loans face a greater default risk in an environment of rising interest rates, thereby exacerbating the instability in the banking sector (OECD 1992; Tuya and Zamalloa 1994). Clearly no central bank with regulatory responsibility wants to preside over an environment of declining bank profits or bank instability. We therefore expect central banks with bank regulatory responsibility to be more sensitive to bank stability when setting monetary policy than central banks without such responsibility (Copelovitch and Singer 2006). On the other hand, if bank regulation is the responsibility of a separate agency—such as the U.K.’s Financial Services Authority rather than the Bank of England—we expect the central bank to be more predisposed toward price stability as the main objective of monetary policy. We acknowledge that the central bank’s institutional mandate is not the sole determinant of its monetary policy preferences; however, we believe that it is an important influence, and it is an easily observable variable across a wide variety of cases. Moreover, Copelovitch and Singer (2006) and Posen (1995) have demonstrated that combining monetary policy and bank regulatory responsibilities in one agency leads to higher inflation for a large panel of countries since the 1970s. It should also be noted that central banks’ regulatory mandates are not significantly correlated with levels of central bank independence. Regulatory central banks can range from relatively dependent (e.g., Italy) to relatively independent (e.g., New Zealand).

The central bank's institutional mandate enters its loss function via the parameter  $\lambda$  which takes the value of 1 if the task of bank regulation has been separated from the central bank's monetary policy-making functions and 0 otherwise. Because our model focuses on inflation targeting, we follow Svensson (1997) and assume in the model that an inflation target,  $\pi^T$ , can be used as a commitment device to maintain low inflation. (We support this assumption with empirical evidence below.) Gathering the information in the preceding paragraphs together, we thus define the central bank's loss function as:

$$L_{CB} = \frac{1}{2} [(1 - \lambda)(y - \bar{y})^2 + (\theta_G + \lambda)(\pi - \pi^T)^2] \quad (3)$$

where  $(y - \bar{y})^2$  captures deviations of output from the output target, while the parameters  $\pi^T$  and  $\lambda$  were described above. The parameters  $\bar{y}$ ,  $\lambda$  and  $\pi^T$  in (3) are also typically incorporated in the players' loss functions in extant models by, for example, Mishkin and Westelius (2006), Clark (2002), Cukierman (1992), and Waller & Walsh (1996). But there are some simple yet key differences between our model and the models presented by the scholars mentioned above. First, in our model, the parameter  $\lambda$  is common knowledge because the central bank's institutional mandate is public information. This is in sharp contrast to Cukierman (1992) and Waller & Walsh (1996) where  $\lambda$  is stochastic and given by a specific (usually normal) distribution. This difference leads to substantively different results that we explore below. Second, extant models that include the IT parameter  $\pi^T$  in the players' loss function almost entirely focus on the impact of IT on inflation (see Svensson 1997, Mishkin and Westelius 2006). While we also study the impact of IT on inflation, our primary objective is to examine the conditions under which IT is likely to be adopted. Third, compared to the central bank's loss function in existing models, a critical modification in our model is the introduction of the term  $(\theta_G + \lambda)$ . By incorporating  $\lambda$  and  $\theta_G$  in the manner shown in (3), we

can derive a tractable closed-form equilibrium solution from the model and examine how the interaction between the government's and the central bank's preferences influence the adoption of inflation targeting. Moreover, comparative statics from the model with respect to the parameters  $\lambda$  and  $\theta_G$  provide us with information on when and how the combined effect of the government and central bank's preferences over inflation affect adoption of an inflation target. We formally describe the model's equilibrium solution and comparative static results below and then state the testable hypotheses derived from the model's comparative statics.

### 3.1 Equilibrium Solution and Comparative Static Results

We solve for the model's equilibrium solution in two cases. First, as done conventionally in the literature, we solve for the monetary policy outcomes of inflation and output in a hypothetical discretionary case where the government unilaterally sets  $\pi^G$  and  $y^G$  in the absence of any commitment technology. Second, we solve for the Nash equilibrium monetary policy outcome that results from the strategic interaction between the government and the central bank, and then conduct comparative statics to examine when an inflation target is more likely to be adopted. For the discretionary case, we obtain:

**Lemma 1:** *In a discretionary equilibrium, where the government neither consults the central bank nor uses any other commitment technology, inflation is given by  $\pi^G = \bar{y} / \theta_G - \varepsilon / (1 + \theta_G)$  and output  $y = \varepsilon \theta_G / (1 + \theta_G)$ . The government's expected losses in the discretionary case is:*

$$E(L^G) = \frac{1}{2} [(\bar{y})^2 \frac{1 + \theta_G}{\theta_G} + \sigma_\varepsilon^2 \frac{\theta_G}{1 + \theta_G}] \quad (4)$$

**Proof:** See Appendix

Similar to existing models (see Barro and Gordon 1983; Persson and Tabellini 2000), the solution  $\pi^G$  reveals the standard inflationary bias that occurs in the discretionary case.

Although Lemma 1 is a useful benchmark, it is insufficient for explaining when countries are

more likely to adopt IT. We thus solve for the Nash equilibrium solution from the model that results from strategic interaction between the government and the central bank:

**Lemma 2:** *Given the Central Bank's loss function in equation (3), the Lucas supply function in (2) and the government's preference parameter with respect to inflation as given by  $\theta_G$  ( $\theta_L$  or  $\theta_R$ ), the realized inflation and output level in a Nash equilibrium is respectively*

$$\pi^* = \pi^T + \bar{y}(1 - \lambda) - \frac{\lambda \varepsilon}{1 + \theta_G} \quad (5)$$

$$y^* = \frac{\varepsilon \lambda}{1 + \theta_G} - \frac{\lambda \bar{y}}{\theta_G} \quad (6)$$

**Proof:** See Appendix

The result in Lemma 2 formally characterizes the Nash equilibrium level of output and inflation. But much like Lemma 1, the result posited in Lemma 2 does not provide substantive insights *per se*. Rather, comparative statics conducted on the Nash solution of  $\pi^*$  in (5) provides the following substantive result from our model.

**Proposition 1:** *If a right-leaning government is in office ( $\theta_G = \theta_R$ ) and if the central bank does not have bank regulatory responsibilities ( $\lambda = 1$ ), then the likelihood that an inflation targeting regime ( $\pi^* = \pi^T$ ) is adopted will increase since:*

- (i)  $\pi^* = \pi^T$  for  $\lambda = 1$  and  $\theta_G = \theta_R$
- (ii)  $\pi^*$  converges to  $\pi^T$  for increasing  $\theta_R$ ,  $\theta_R \rightarrow \infty$  and  $\lambda = 1$ .

**Proof:** See Appendix

Less technically, Proposition 1 predicts that the likelihood that an inflation target is adopted will increase when a right-leaning government is in office and when the central bank is not a bank regulator. Further, it also suggests that a right-leaning government and a non-regulatory central bank have no incentives to deviate from an inflation targeting regime in equilibrium and will thus maintain IT.

The prediction in Proposition 1 is based on two technical exercises conducted on the Nash equilibrium result in Lemma 2. First, given our assumption that right-leaning governments prefer lower inflation, we study the behavior of the Nash solution of  $\pi^*$  by

considering the limiting value of  $\theta_R$  and thus allowing  $\theta_R$  to increase. Second, we examine how  $\pi^*$  changes when the central bank does not have bank regulatory responsibility in its mandate. The result from these two technical exercises is that neither a right-leaning government nor a central bank without bank regulatory authority can unilaterally determine the choice and implementation of an inflation target. Rather, it is the combined effect of having a right-leaning government and a central bank without regulatory responsibilities that substantially increases the likelihood of adopting an inflation target.

A formal examination of the effect of the limiting value of  $\theta_R$  (which captures increasing  $\theta_R$ ) on  $\pi^*$  reveals that the Nash inflation outcome declines when a right-leaning government is in office. More importantly, a right-leaning government will favor adoption of an inflation target but will be unable unilaterally to implement an IT regime. Instead, comparative statics from our model show that an inflation targeting regime ( $\pi^* = \pi^T$ ) is more likely to emerge if a right-leaning government is in office ( $\theta_G = \theta_R$ ) and if the central bank does not have bank regulatory authority ( $\lambda = 1$ ).

The intuition behind this result has four components. First, as suggested earlier, both right-leaning governments and central banks without regulatory authority are especially interested in keeping inflation in check. The compatibility of preferences over inflation between a right-leaning government and a non-regulatory central bank is necessary because it fosters mutual agreement between these two parties on using a formal inflation target, which not only substantially enhances the credibility of the government's commitment to low inflation but also allows both a right-leaning incumbent and a non-regulatory central bank to explicitly signal their commitment to low inflation—owing to the transparency of IT—to financial markets. Further, our model shows that given the compatibility of preferences, a right-leaning government and a non-regulatory central bank will mutually recognize *ex ante* that the *ex post* expected losses under

IT will be lower than losses without IT (formally,  $E(L^{IT}) < E(L^G)$ ).<sup>10</sup> Second, no central bank has the political power unilaterally to impose a formal inflation target in the absence of overt or tacit support from the incumbent government. However, an inflation-averse right-leaning government will provide the necessary political legitimacy and political support for the implementation of IT by the central bank.

Third, a rightist government will be unable to implement an inflation target without the central bank's cooperation, since government officials lack the technical expertise and necessary economic information to design an inflation targeting rule. Our model shows that by actually finding an optimal inflation target ( $\pi^{T^*}$ )<sup>11</sup>, a non-regulatory central bank will provide the necessary technical expertise to design IT. Thus, the central bank itself must also be predisposed to tight monetary policy in order for IT to be politically and institutionally viable. Fourth, an inflation target may provide a right-leaning government and a non-regulatory central bank with a formal institutional mechanism to tie the hands of future incumbents who may be tempted to raise output by creating surprise inflation. This is particularly salient if a right-leaning incumbent and non-regulatory central bank expect future left-leaning governments that are—as suggested in the literature on partisanship and inflation<sup>12</sup>—more likely to use output expansion as a political tool and are thus less likely to control inflation via institutional mechanisms such as IT. Indeed, given that comparative statics from our model reveal that left-leaning incumbents are less likely to adopt IT to pursue output expansion,

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<sup>10</sup> In the appendix, we show in the “proof of Claim 1” that the expected losses under IT is:

$$E(L^{IT}) = \frac{1}{2} [(\bar{y})^2 \frac{\theta_R^2 + \lambda(1 + \theta_R)}{\theta_R^2} + \sigma_\varepsilon^2 \frac{\lambda + \theta_R}{1 + \theta_R}]$$

and prove that for  $\lambda = 1$  (non-regulatory central bank) and increasing  $\theta_R$  (inflation averse preferences of right-leaning incumbent)  $E(L^{IT}) < E(L^G)$ .

<sup>11</sup> The closed form solution of  $\pi^{T^*}$  in our model is given in the proof of Lemma 2.

<sup>12</sup> See, for e.g., Alesina & Rosenthal (1995), Alesina, Roubini & Cohen (1997) and Franzese (2002).

right-leaning incumbents and non-regulatory central banks may perceive IT as a strategic tool to prevent future incumbents from opportunistic output expansion.<sup>13</sup>

Before moving on to the empirical analysis, it is important to note that the results of the model and the causal intuition that explains proposition 1 are based on the assumption that IT is an effective inflation-fighting strategy. But does IT actually work? Our model suggests that IT does reduce inflation; more formally,  $\pi^*$  declines when  $\pi^T$  is set.<sup>14</sup> Thus, IT is not a symbolic gesture, nor is it a passive signal of the government's or central bank's monetary policy preferences. Rather, IT is better viewed as a technology that can be employed to fight inflation. This assertion requires empirical validation. Below, we conduct a series of empirical tests of the model's claims, including an analysis of the likelihood of adopting IT, and a separate examination of the efficacy of IT in fighting inflation.

#### 4. Statistical Methodology: The Markov Transition Model

Our strategy for testing the predictions from our model is two-fold. First, we focus on testing hypothesis 1, which predicts that an inflation target is more likely to be adopted when a right-leaning incumbent is in office and when the central bank is not a bank regulator. Second, we briefly test the claim that inflation targeting reduces inflation.

To test hypothesis 1, we use a Markov transition model (Beck *et al* 2002). In the Markov transition model,  $y_{i,t}$  is the state of the binary dependent variable in period  $t$  and  $y_{i,t-1}$  is the state of the binary dependent variable at  $t-1$ . Note that  $y_{i,t} = 1$  if an inflation target has been adopted at  $t$  and  $y_{i,t} = 0$  otherwise. By using the Markov chain framework, the transition model thus captures the effect of the independent variables on (i) the

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<sup>13</sup> Since left-leaning governments on average are more concerned about expanding output than reducing inflation, they will reduce the weight – i.e.  $\theta_L$  – on controlling inflation. Comparative statics show that if  $\theta_L$  decreases,  $\pi^* \neq \pi^T$ ; the likelihood of IT adoption will thus be low under left-leaning incumbents.

<sup>14</sup> See proof of claim 2 in the appendix.

transition probability that a country will formally adopt an inflation target at  $t$  given that it did not have an inflation targeting regime at  $t-1$  ( $p_{01} = \Pr(y_{i,t} = 1 | y_{i,t-1} = 0)$ ) and (ii) the conditional probability that a country will maintain an inflation target at  $t$  given that it had adopted an inflation target at  $t-1$  ( $p_{11} = \Pr(y_{i,t} = 1 | y_{i,t-1} = 1)$ ).<sup>15</sup> We estimate the Markov transition model via Probit to examine the impact of the covariates on the transition that a country may switch to an inflation target ( $p_{01}$ ) and the conditional probability that a country may maintain an inflation target ( $p_{11}$ ). The transition model that we estimate by Probit is,

$$\Pr(\mathbf{y}_{i,t} = 1 | \mathbf{y}_{i,t-1} = 0) = \text{Probit}(\mathbf{x}_{i,t}\boldsymbol{\beta}_0) \quad (7)$$

$$\Pr(\mathbf{y}_{i,t} = 1 | \mathbf{y}_{i,t-1} = 1) = \text{Probit}(\mathbf{x}_{i,t}\boldsymbol{\beta}_1) \quad (8)$$

Combining equations (7) and (8) leads to

$$\Pr(\mathbf{y}_{i,t} = 1 | \mathbf{y}_{i,t-1} = j) = \text{Probit}(\mathbf{x}_{i,t}\boldsymbol{\beta}_0 + y_{i,t-1}\boldsymbol{\beta}_1) \quad (9)$$

In (9), the vector  $\boldsymbol{\beta}_0$  denotes the estimates of the effect of covariates  $\mathbf{x}_{i,t}$  on the transition probability that a country will switch from not having an inflation target at  $t-1$  to actually adopting an inflation target at  $t$ . The vector  $\boldsymbol{\beta}_1 = \boldsymbol{\beta}_0 + \boldsymbol{\gamma}$  denotes the effect of  $\mathbf{x}_{i,t}$  on the conditional probability that a country will maintain the inflation target at  $t$  given that it had an inflation target at  $t-1$ .

We use the Markov transition model for three main reasons. First, the transition model estimates how certain theoretically specified variables influence the probability that a country will adopt IT at  $t$  given that it did not previously have an IT regime. Hence, it allows us to test the claim that the combination of a right-leaning government and a central bank that is not a bank regulator increases the likelihood of adopting IT. Second, note that the model presented above suggests that right-leaning governments and non-regulatory central banks have incentives to

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<sup>15</sup> The transition model is constructed by interacting all independent variables with the lagged value of the dependent variable in a first order Markov chain.

maintain IT after its adoption. The transition model also allows us to test this claim. Third, the transition model provides accurate estimates that account for temporal and state dependence in the data, as well as serial correlation. The transition model is estimated for the tests via MLE with robust standard errors that are adjusted for potential within-country clustering.

#### 4.1 Data and Dependent Variable

We compiled a time-series cross-sectional (hereafter TSCS) dataset for 49 countries from the developed and developing world from 1987 to 2003 to test the prediction in hypothesis 1. Of these 49 countries, 29 are OECD countries (see Table 1). The lack of data on our key independent variables and some economic control variables (described below) for many developing countries prevented us from extending the size of our sample. We selected 1987 as the first year in which IT was an available option, given that New Zealand was the first to adopt IT two years later in 1989. The results of our econometric models are robust to extending the sample back to years before 1987.

<<Insert Table 1 about here>>

In accord with the formal model, we operationalize the dependent variable *Inflation Target* as a dichotomous measure that takes the value of 1 if a country has formally adopted a numerical target for inflation, and 0 otherwise.<sup>16</sup> The variable is taken from Truman (2003), and is based on whether a country's central bank publicizes a numerical inflation target, and whether it describes itself as an inflation targeter. Using Truman's (2003) definition, we find that there are 22 countries that have formally adopted and implemented an inflation target in the 1987 to 2003 time period (see Table 2). Our data closely match the sample used by Fatas, Mihov, and Rose (forthcoming), with two exceptions: first, we include a handful of countries that adopted an inflation target after the last year (2000) of their sample; and second, our sample does not

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<sup>16</sup> The countries that are classified as inflation targeters in our sample use only an inflation target and not any other instrument as a nominal anchor for monetary policy.

include the 12 countries in the European Monetary Union beginning in 1999. Our sample, however, does code Finland and Spain as inflation targeters from 1993 and 1995 (respectively) up until they adopted the Euro in 1999. All 12 Eurozone countries are dropped from our sample from 1999 onwards, because their inclusion as independent observations is dubious in light of their delegation of monetary policy authority to one supranational central bank.<sup>17</sup>

<<Insert Table 2 about here>>

#### 4.2 Independent and Control Variables

The first independent variable, *Separate Central Bank* (labeled as *Separate*), takes the value of 1 if the central bank is not responsible for bank regulation, and 0 for all other cases, including when the central bank is the sole bank regulator or when it is one of multiple regulators (as in the U.S.). Data on this variable come from four sources: (i) Copelovitch and Singer (2006), (ii) Barth, Caprio, and Levine (2003), (iii) *Bank for International Settlements* (2006) and (iv) the *Bankers Almanac* (2006).<sup>18</sup> In our sample of 49 countries, 29 have central banks that are not responsible for bank regulation, while the remaining countries have central banks that are bank regulators.

The second independent variable is government *Partisanship*, which is taken from the World Bank's Database of Political Institutions (DPI) that has been updated to 2004 (Beck *et al* 2001). The variable takes the value of 0 for leftist governments, 1 for centrist governments, and 2 for rightist governments.<sup>19</sup> Because hypothesis 1 predicts that the adoption of an inflation target is more likely under the combined effect of a right-wing government *and* the presence of a central bank that is not a bank regulator, we interact

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<sup>17</sup> Econometric issues aside, the coding of the European Central Bank (ECB) as an inflation targeter by Fatas *et al* is debatable. The ECB marries its numerical *definition* of price stability (under two percent inflation) with a policy strategy that emphasizes a quantitative assessment of money supply growth.

<sup>18</sup> *Bank for International Settlements* (<http://www.bis.org/cbanks.htm>) and the *Bankers' Almanac* (<http://www.bankersalmanac.com>) contain detailed information about the regulatory responsibilities of over 120 central banks from around the world.

<sup>19</sup> We rescale the DPI partisanship variable from 0(right)-2(left) to 0(left)-2(right) to facilitate testing of our theory.

*Partisanship* with *Separate*. We expect that the estimate of *Partisanship* x *Separate* will be positive, indicating a higher likelihood of adopting IT when rightist governments are combined with non-regulatory central banks.

We include a number of economic control variables in the Markov transition model. First, scholars have suggested that an increase in the volatility of economic growth encourages governments to adopt inflation targeting in order to induce economic stability (Svensson 1997). We thus include *GDP growth variability*, operationalized as the standard deviation of a 5-year rolling average of real GDP growth for each country, in the specification and expect that its coefficient will be positive. Similarly, higher inflation rates in the economy are likely to encourage authorities to opt for an inflation target to tame inflation. Hence, *Inflation* – operationalized as the Consumer Price Index in percentage terms – is expected to be negatively correlated with the dependent variable. Data for *GDP growth variability* and *Inflation* are from the IMF's *International Financial Statistics* (hereafter IFS) (2004).

High interest rates (real or nominal) typically reflect dissatisfaction with current economic performance and increased inflationary expectations, and may prompt policymakers to adopt IT. We include *Nominal Interest Rate*, measured as the money market rate in percentage terms, and *Real Interest Rate*, measured in percentage terms as  $(1 + \text{nominal interest rate} / (1 + \text{inflation rate}) - 1)$  in the specification. The coefficients of both variables are expected to be positive. We also include *Real effective exchange rate (REER) Variability*, operationalized as the standard deviation of 5-year rolling average of real effective exchange rate and (ii) *Nominal Effective Exchange Rate (NEER) Variability* operationalized as the standard deviation of 5-year rolling average of nominal effective exchange rate) in the specification. We do not have strong expectations about the effect of these two controls. High exchange rate volatility could raise the level of expected inflation and thus contribute positively to the choice of IT. However, volatility could also push in the direction of greater

discretion for monetary policy—for example, to maintain the value of the currency—and therefore discourage the adoption of IT. Data for *Nominal* and *Real Interest Rate* are drawn from the IMF's *IFS* (2004), while data used to construct *REER* and *NEER Variability* are taken from Reinhart and Rogoff (2004).

Governments in countries with a poor current account position might attempt to finance a large deficit by following expansionary monetary policies, and thus will avoid adopting IT. We include *Current Account Position* (calculated as deficits as a percentage of nominal GDP), and expect that its coefficient will be negative in the specification. We control for *GDP per capita* given large variation in income levels across countries in our sample and the possibility that this could affect monetary policy including IT. It has been suggested that greater trade openness may make it harder for authorities to tie their hand to an inflation target (IMF 2006). We incorporate *Trade Openness* (the ratio of the sum of exports and imports to GDP) and anticipate that it will have a negative sign. Data for *Current Account Position*, *Trade Openness* and *GDP per capita* are drawn from the World Bank's *World Development Indicators* (WDI) (2004) and the World Bank's *Global Development Finance* (GDF) (2004).

We also include a dummy for *Floating Exchange Rate* regime. This variable is expected to have a positive effect since countries that float their currency may favor using an inflation target as a nominal anchor for monetary policy (IMF 2006). We use Reinhart and Rogoff's (2004) data on *de facto* exchange rate regimes to operationalize this variable.<sup>20</sup> They classify exchange rate regime choices made by 153 countries since 1946 into a fine-grained 15-point scale, which is then categorized into a coarse 5 point scale. We discard observations from the 15-point scale that are classified as “freely falling” (including episodes of currency crises and

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<sup>20</sup> Reinhart and Rogoff (2004) use parallel market exchange rates, foreign reserve movements, moving averages of currency volatility and extensive country chronologies to determine the actual operation of an exchange rate regime over time. This data has now been updated to December 2003.

hyperinflation) and for which parallel market data are missing.<sup>21</sup> We operationalize the Reinhart and Rogoff scale as a binary variable by treating all *de facto* exchange rate arrangements at or above the 6-point cut-off in the Reinhart-Rogoff scale as a float, while treating observations that are included below the 6-point cut-off as fixed.<sup>22</sup>

In addition to economic controls, we include political and institutional controls in the specification. First, scholars have suggested that independent central banks may be favorable to IT—or indeed that IT cannot be effective when the central bank lacks operational autonomy (Agenor 2001; IMF 2006). We control for central bank independence (CBI), which is operationalized by using the continuous 0-1 index of central bank independence created by Cukierman *et al* (2002), where 0 indicates low CBI and 1 high CBI.<sup>23</sup> Readers may conjecture that CBI may be correlated with the independent variable *Separate*. While there is no theoretical reason to believe that CBI is correlated with *Separate*, we conducted some diagnostic tests and found that the correlation between CBI and *Separate* is low (0.29) and insignificant, therein mitigating concerns of collinearity between these two variables. We also control for the degree of transparency of political institutions with the *Polity IV* index.<sup>24</sup> The literature pulls in opposing directions in this issue area. On the one hand, IT requires the dissemination of inflation forecasts and other monetary policy information, which will likely be more effective in transparent (i.e., democratic) political regimes (Rosendorff and Vreeland 2006). On the other hand, Broz (2002) has argued that the transparency of the political system substitutes for the transparency of monetary policy, and thus IT should be superfluous in countries with

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<sup>21</sup> We do so since observations of currency crises do not capture deliberate exchange rate regime choice.

<sup>22</sup> Our results are robust to changing the cut-off points.

<sup>23</sup> Cukierman *et al*'s (2002) index is a composite measure of 16 different aspects of central bank statutes, such as the relative autonomy between the government and central bank, which political actor presides over the decision to replace the central bank chair and the scope of decision-making with respect to all monetary policy. This index is available for all the countries in our data.

<sup>24</sup> The Polity IV measure for regime type ranges from -10 (denoting a full autocracy) to +10 (denoting a full democracy). Following Broz (2002), we subtract the Polity IV “democracy” score from the “autocracy” rating for each observation; this constitutes the Polity IV index in our model.

transparent political institutions and independent central banks. We therefore do not have strong expectations about the influence of transparency of political institutions (operationalized via the Polity Iv index) on the adoption of IT.

Finally, we include the number of *Veto Players* in government, which is drawn from the *Checks* variable in World Bank's DPI (Beck *et al* 2001).<sup>25</sup> Once again, the political economy literature is inconclusive about the impact of veto players on the choice of monetary institutions (see Hallerberg 2002; Keefer and Stasavage 2002), and thus we are agnostic as to its effect on the adoption of IT.

## 5. Findings and Analysis

In Table 3, we report the results from the Markov transition models that have been estimated on the global sample. We focus primarily on discussing the estimate of  $\beta_0$ , which captures the effect of the covariates on the probability of adopting an inflation target.

<<Insert Table 3 about here>>

Note that the estimated coefficient of  $\beta_0$  for *Partisanship* x *Separate* in model 1 is positive and highly significant at the 1% level for the global sample. Furthermore, the estimate of  $\beta_1$  for *Partisanship* x *Separate* is positive and highly significant as well. These results indicate that the combined effect of a right-wing incumbent and a non-regulatory central bank increases the likelihood of adopting and maintaining an inflation target, therein statistically corroborating the prediction from our model. To gauge the interactive term's substantive impact from its estimate of  $\beta_0$ , we carefully check the predicted change that it has on the probability of adoption of an inflation target by following the procedure suggested by Ai and Norton (2003). These scholars provide a procedure – described formally in the Appendix – to calculate both the substantive effect of interaction terms such as *Partisanship* x *Separate* and its associated t-

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<sup>25</sup> The *Veto Players* measure in the DPI for parliamentary countries assumes that each party within a government constitutes its own veto. For presidential systems, this measure counts each political institution (legislature, executive, etc.) as long as each political chamber is not ruled by a single party.

statistics in non-linear models estimated via Probit or Logit. The results from following this procedure for the global sample are reported in Panel A, table 4.

<<Insert Table 4 about here>>

Observe that when *Separate* is set equal to 1 (indicating that the central bank is not a bank regulator) and the other variables are held at their means, increasing *Partisanship* by one standard deviation above its mean in the sample – i.e., from .9 to 1.6, indicating a right-leaning government – increases the likelihood of adopting IT by an impressive 35%; this substantive effect is also highly significant.<sup>26</sup> We illustrate the substantive effect described above with 95% confidence intervals in Figure 1 (derived from model 1), which shows that when *Separate* is equal to 1, increasing *Partisanship* by one standard deviation above its mean increases the probability of IT adoption from approximately .55 to .76 (equivalent to 35%). These results provide strong statistical support for hypothesis 1—that the combination of a right-leaning government and a central bank without regulatory authority increases the likelihood of adopting IT. Further, with respect to the individual components of *Partisanship* x *Separate* we find that the estimate of *Separate* and *Partisanship* are each weakly significant at the 10% level. This suggests that the combination of the two variables—rather than each variable individually—drives the adoption of IT as indicated by the significance of *Partisanship* x *Separate*.<sup>27</sup>

<<Insert figure 1 about here>>

In model 2 we re-estimate the specification in model 1 with two additional economic controls: *Real GDP Gap* and *Financial Depth*.<sup>28</sup> The IMF (2006) and some scholars (e.g. Hu

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<sup>26</sup> When *Separate* changes from 0 to 1 and the other variables are held at their means, increasing *Partisanship* by one standard deviation above its mean increases the likelihood of IT adoption by 33%.

<sup>27</sup> We estimated an additional transition model where we dropped *Partisanship* x *Separate* but retained the individual components of this interaction term and other controls. The results, available on request, show that *Separate* and *Partisanship* remain individually positive, but weakly significant at the 10% level.

<sup>28</sup> *Real GDP gap* is operationalized as [(actual real GDP – potential real GDP)/potential real GDP] in percentage terms. *Financial Depth* is measured as the average ratio of M2 to nominal GDP. Data for constructing these two variables are drawn from the IMF's *IFS* (2004).

2003) have suggested that an increase in the *Real GDP Gap* and greater *Financial Depth* may induce countries to adopt IT. We report the estimates in Table 3. The interaction term *Partisanship* x *Separate* remains positive and highly significant even after including the two additional controls, which are not statistically significant. In model 3, we also re-estimate the specification in model 1 but drop the dummy de facto *Floating Exchange Rate*. The estimates from this model that are reported in Table 3 indicates that the interaction term *Partisanship* x *Separate* remains positive and significant at the 1% level.

As an initial test of robustness, we divided our sample into two separate subsamples of OECD and non-OECD countries. We then separately estimated the baseline specification in model 1 for each of these two subsamples. The results from this exercise are reported in Table 5. The coefficient of *Partisanship* x *Separate* in the OECD sample (model 4) and the non-OECD sample (model 5) remains positive and significant. Much like the global sample, the constitutive components of our key interaction term *Separate* and *Partisanship* are each weakly significant in the OECD sample. In the non-OECD sample, we find that while *Partisanship* is weakly significant, *Separate* is insignificant. Substantively, we find that when *Separate* is set equal to 1 and the other variables in the specification in model 5 are held at their means, increasing *Partisanship* by one standard deviation above its mean increases the likelihood of adopting IT by an astounding 36% in the OECD sample and by 25% in the non-OECD sample. In short, there is strong statistical and substantive support for the prediction in hypothesis 1 in the global, OECD and non-OECD samples.

<<Insert Table 5 about here>>

Our political controls – *Polity IV*, *veto players* and *CBI* – are insignificant in all the Markov transition models. This finding supports the argument that IT can be flexibly adapted to a variety of political environments, including levels of democracy, veto players, and central bank independence (Bernanke *et al.* 1999; Truman 2003; IMF 2006). In contrast, the economic

control variables fare better in the estimated models. For instance, the estimate of *GDP Growth variability* and *Inflation* have the expected positive signs and are significant in each model in both tables. Among the interest rate variables, we find that *Nominal Interest Rate* is insignificant, while *Real Interest Rate* is consistently positive and significant. *Nominal* and *Real effective exchange rate variability* is insignificant in all the models.

We suggested earlier that countries with large current account deficits are less likely to adopt inflation targeting. Indeed, the coefficient for *Current Account Position* is consistently negative and significant, confirming our hypothesis. However, *Trade Openness* and *GDP per capita* are both insignificant in each model. In sharp contrast, we find that the *Floating Exchange Rate* variable is positive and highly significant in all the transition models for the global, OECD and non-OECD samples, indicating an association between floating exchange rates and the adoption of IT. This finding confirms the notion that IT is an alternative, not a complement, to fixed exchange rates. Indeed, many countries in our sample, including Britain and Sweden, adopted IT after the collapse of their fixed exchange rate regimes.

We conducted a number of robustness tests and diagnostics to check the econometric validity of these results. First, to check once again for specification robustness, we added the following variables to each model in Tables 3 and 5 that may have a positive (or negative) effect on the adoption of inflation targets: *Inflation Volatility*, *Real GDP growth volatility*, *fiscal position*, *Government Polarization* and *Financial Openness*. Inclusion of these variables did not substantively or significantly alter any of the results in the transition models reported in Tables 3 and 5.<sup>29</sup> Diagnostics indicate that the correlation between other variables in each specification is weak and insignificant, thus alleviating further concerns of collinearity in the empirical models.

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<sup>29</sup> The models with the additional controls are not reported to save space but are available on request.

Additional tests also suggest that none of the estimated models suffers from multicollinearity.<sup>30</sup> Finally, we checked for potential serial correlation by implementing Gourieroux, Monfort and Trognon's (1982) score test of the null of serially uncorrelated errors for each model. The p-values from this score test failed to reject the null hypothesis of no serial correlation in each specification, thus suggesting that serial correlation is not a problem in the models.

## 5.1 Inflation Targeting and Inflation

Having found strong statistical support for the prediction in hypothesis 1, we briefly test below the claim from our model which posits that a full-fledged inflation target will lower inflation in the economy. Given that inflation targets have a non-random distribution in the data, we need to explicitly account for the selection of inflation targeting when testing their impact on inflation. We thus use parametric and non-parametric matching methods to test the effects of the dummy *Inflation Target* on inflation since they help us account for selection of IT when examining its impact on inflation. With respect to parametric methods, we estimate a Heckman selection model on the global sample. For the Heckman model, we first estimate via Probit the first stage selection equation where we examine the impact of certain variables that lead to the adoption of IT. Because we have a well-specified theory on the factors that lead to the adoption of an inflation target, we use the specification in model 1, table 3 as the selection equation where the dependent variable is the dummy *Inflation Target*.

The estimated selection equation is used to derive the variable  $\Lambda(IT)$  which separately provides an estimate of the bias introduced into the sample by the process that determines the probability of observing inflation targets. We then introduce the selection-corrected estimate  $\Lambda(IT)$  as a substitute for the IT dummy in the second stage of the Heckman model, i.e. the outcome equation, where the dependent variable is *Inflation*. In the

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<sup>30</sup> Chatterjee, Price & Haidi (1999) suggest that multicollinearity exists if the largest Variance Inflation Factor (VIF) is greater than 10 and the mean VIF is larger than 1. The mean and largest VIF value in each empirical model is much lesser than these threshold values; thus multicollinearity is not a problem.

outcome equation, estimated via OLS with panel-corrected standard errors (PCSEs) and fixed effects, we control for several variables that are typically included in empirical models of inflation<sup>31</sup>: *Liquid Liabilities/GDP*, *Log(Money Growth)*, *central government spending as a % of GDP*, *lag inflation*, *Trade Openness*, *Polity IV*, *GDP per capita* and *CBI*.<sup>32</sup> Further, given our assumption that right-wing incumbents and banks without regulatory authority prefer low levels of inflation, we control for *Partisanship* and the dummy *Separate* as well in the outcome equation. The results from the outcome equation of the Heckman model for the global, OECD and non-OECD samples are reported in model 6, 7 (OECD) and 8 (non-OECD) in Table 6 respectively. The selection-corrected estimate of the dummy for inflation targeting countries, *Lambda(IT)* in models 6, 7 and 8 is negative and highly significant at the 1% level. This certainly provides support for our claim that a formal full-fledged inflation target reduces inflation even after controlling for several variables that may affect the level of inflation.<sup>33</sup>

<<Insert Table 6 about here>>

Although the Heckman model provides encouraging results, it is well known that the standard Heckman procedure suffers from key limitations including heavy reliance on distributional assumptions. Hence, we use non-parametric matching methods that avoid strong assumptions about functional form to assess the impact of inflation targeting on inflation. Specifically, to examine the effect of a formal inflation target on inflation we employ two matching algorithms: nearest neighbor and the stratification approach that are briefly described below. These two approaches match observations with similar characteristics, excepting that one group of countries adopts an inflation target (the “treatment group”) and the other does not (the “control group”). Following the matching of

<sup>31</sup> For example, see Broz (2002) and Alesina, Roubini and Cohen (1997).

<sup>32</sup> Data for *Liquid Liabilities/GDP*, *Log(Money Growth)* and *central government spending as a % of GDP* are from the IMF’s IFS (2004). The sources for the other variables were described earlier.

<sup>33</sup> The respective coefficients of *Partisanship* and *Separate* in the outcome equation of the Heckman model are negative, but significant at only the 10% level.

observations, we assess the “treatment effect” by measuring the difference in the mean inflation level between the two groups.

To assess similarity among countries and construct the samples of countries with and without a full-fledged inflation target (the “participation” and “non-participation” observations, respectively), we first consider a set of observable country characteristics. In theory, one should match each participation observation with a non-participation observation that has exactly the same observed values of a vector of other characteristics that determine participation ( $\mathbf{x}_i$ ). But because matching on  $\mathbf{x}$  is impossible in social science datasets, we follow Rosenbaum and Rubin (1983) and match on *propensity scores*, which is the estimated probability of treatment (i.e. adoption of *Inflation target*) conditional on a set of observable characteristics, this is labeled as  $p(\mathbf{x}_i)$ . Once propensity scores are derived, countries in the sample are paired according to one of the following two matching criteria.<sup>34</sup>

The nearest neighbor approach matches each participation observation to the nonparticipation observation that has the nearest propensity score. After each non-participation observation is used, it is “returned” to the pool of non-participation observations. The treatment effect of inflation targeting on inflation is then computed as a simple average of the differences in inflation outcomes across the paired matches. The stratification approach divides the sample into several groups, or strata, based on their propensity scores. Within each stratum, the average of the participation observations is matched with the average of the non-participation observations. An average of the difference in outcomes of the strata, weighted by the number of participation observations

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<sup>34</sup> Before proceeding to matching, we verified that conditioning on  $p(\mathbf{x}_i)$  produces similar results as conditioning on the vector  $\mathbf{x}_i$ . That is, we checked whether the distribution of  $\mathbf{x}_i$  is similar across the treatment and prospective control group conditional on the propensity score, which in the parlance of matching methods is known as the balancing hypothesis.

in each one, is then calculated to create the treatment effect. The standard errors for estimating the treatment effect of inflation targeting on inflation via the nearest neighbor or strata approach are based on bootstrapping.

To implement each of the matching methods described above, we first estimate a benchmark probit model that accounts for the adoption of an inflation target by countries; this probit model is estimated to calculate propensity scores. The specification for this probit model is the same as the specification in model 1, table 3 that explains adoption of an inflation target. We then employ nearest neighbor and strata matching methods to evaluate the impact of inflation targeting on inflation for the global, OECD and non-OECD samples.<sup>35</sup> We find that the mean inflation level in countries in the global, OECD and non-OECD samples with an inflation target is significantly and substantially lower than in the matched samples without inflation targets; this result is invariant to the matching method employed (see Table 7). Specifically, in the global sample, we find that the average inflation level in countries with an inflation target, compared to countries without an inflation target, ranges from 6.05 percent lower with the strata method to 5.27 percent lower with the nearest neighbor method. These results are statistically significant at the 1% level. We obtain similar substantive and significant results via matching methods for the global, OECD and non-OECD samples. Finally, given that inflation may be endogenous to the dummy *Inflation Target*, we estimated two-stage probit least squares (2SPLS) models that are used to correct for endogeneity between a dummy independent variable (IT) and a continuous dependent variable (inflation) (Alvarez and Glasgow 2000). Results from the 2SPLS models estimated for the global, OECD and non-OECD samples –that are not reported to conserve space but are available on request – show that IT significantly, in the statistical sense, reduces inflation.

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<sup>35</sup> When estimating the treatment effect, we made sure that the treatment group and the prospective control group are comparable, i.e. that they share a common support for  $p(\mathbf{x}_i)$ .

## 6. Conclusion

The premise of this paper is that the adoption of inflation targeting is a political decision within the context of monetary policymaking. In today's environment of global finance, fixed exchange rates are often not a viable option for fighting inflation. Thus, governments must make some important decisions about monetary policy. Political scientists have largely focused on one strategy—granting political independence to the central bank—as an alternative to fixed exchange rates. This paper demonstrates that governments have an additional decision to make: whether or not to impose a transparent monetary policy rule on the central bank. We argue that countries are more likely to adopt inflation targeting when there is a conformity of preferences for tight money between the government and the central bank. The central bank's regulatory mandate—that is, whether or not it is tasked with regulating the banking sector—is one important indicator of its monetary policy preferences, since regulatory central banks are likely to be more sensitive to financial stability concerns when setting interest rates. The monetary preferences of the government are best reflected by the incumbent's partisanship, as right-leaning governments are generally more partial toward price stability than their left-leaning counterparts. Countries are therefore more likely to adopt inflation targeting when there is a right-leaning administration combined with a central bank that is not directly responsible for bank regulation. On the other hand, we find that left-leaning governments and central banks with bank regulatory responsibility are unlikely to favor inflation targeting. The results of our transition model on data from 49 countries from the 1987-2003 period provide strong evidence of our arguments.

Economists have become optimistic about the efficacy of IT in fighting inflation, although skeptics remain (e.g., Ball and Sheridan 2003), and extant empirical analyses are often hampered by small samples and suboptimal modeling choices. To support our claim that IT is an inflation-fighting mechanism, we conduct a thorough empirical examination of

the link between IT and inflation. We believe that our results—relying on a Heckman selection model as well as non-parametric matching methods—are the most compelling to date, and establish a firm connection between the adoption of IT and lower inflation.

Our findings challenge the conventional dichotomy between fixed exchange rates and central bank independence, and also provide a potential explanation for the poor performance of central bank independence alone as a predictor of inflation outcomes. Inflation targeting provides a transparent nominal anchor for monetary policy. Thus, a central bank with an explicit inflation target is likely to behave differently from a central bank with complete autonomy in setting monetary policy goals. At a minimum, scholars should be careful to consider the presence or absence of IT when discussing the institutional structure of the central bank. Indeed, as our empirical analysis demonstrates, central bank independence captures only part of the full picture.

Finally, our results imply a steady increase in the number of countries enacting IT, given the decreasing popularity of fixed exchange rates. The IMF has adopted a decidedly positive stance toward IT, especially for developing countries searching for anti-inflationary credibility (IMF 2006). If countries are forced to float their exchange rates in the wake of currency crises, or if governments choose to allow their exchange rates to float due to domestic or international political pressures, the conditions are ripe for an incoming right-leaning government to impose an inflation target with the help of a willing central bank.

The study of IT should continue with an extension of the dataset used in this paper, especially as the number of countries adopting IT increases. However, detailed case studies that focus on political and institutional variables should accompany any further efforts at quantitative analysis. The careful tracing of the causal mechanisms that drive the adoption of IT will serve to complement the findings of large-n studies.

## Appendix

**Proof of Lemma 1:** The first order condition of the government's loss function in (1) with respect to  $\pi$  given the Lucas supply curve in (2) is:

$$\frac{\partial \mathcal{L}_G}{\partial \pi} = \pi(1 + \theta_G) - (\pi^e - \varepsilon + \bar{y}) = 0 \quad (\text{A1.1})$$

Taking expectations in (A1.1) and using the resulting  $\pi^e$  yields after some algebra  $\pi^G = \bar{y} - \frac{\varepsilon}{1 + \theta_G}$ .

From the first order condition of the government's loss function in (1) with respect to  $y$ , we obtain

$$\frac{\partial \mathcal{L}_G}{\partial y} = y - \bar{y} = 0 \text{ which } \Rightarrow y = \bar{y}. \text{ Substituting } \bar{y} \text{ with } y \text{ in } \pi^G \text{ and solving for the discretionary output}$$

yields  $y = \varepsilon / (1 + \theta_G)$ . Substituting  $\pi^G$  and  $y^G$  in the loss function in (1) and taking expectations yields

$$\text{the expected losses under discretion } E(L^G) = \frac{1}{2} [(\bar{y})^2 \frac{\theta_G}{1 + \theta_G} + \sigma_\varepsilon^2 \frac{\theta_G}{1 + \theta_G}] \text{ QED.}$$

**Proof of Lemma 2:** The first order condition of the central bank's loss function in (3) with respect to  $\pi$  given the Lucas supply curve and the government's relative aversion for inflation  $\theta_G$  is:

$$\frac{\partial \mathcal{L}_{CB}}{\partial \pi} = \pi(1 + \theta_G) - (1 - \lambda)(\pi^e - \varepsilon + \bar{y}) = 0 \quad (\text{A1.2})$$

Taking expectations as given and using the resulting  $\pi^e$  yields after some algebra the Nash equilibrium

$$\text{level of inflation } \pi^* = \pi^T + \bar{y}(1 - \lambda) - \frac{\lambda \varepsilon}{1 + \theta_G}. \text{ From the first-order condition of the loss function in}$$

$$(3) \text{ with respect to } y, \text{ we get } \frac{\partial \mathcal{L}_{CB}}{\partial y} = y(1 - \lambda) + \bar{y}(\lambda - 1) = 0 \text{ which implies that } y = \bar{y}. \text{ Solving for the}$$

$$\text{Nash equilibrium output using the Lucas supply curve yields } y^* = \frac{\varepsilon \lambda}{1 + \theta_G} - \frac{\lambda \bar{y}}{\theta_G}. \text{ Substituting } \pi^* \text{ and}$$

$$y^* \text{ in (1), we find that the optimal value of } \pi^{T*} \text{ that minimizes } E(L^G) \text{ is } \pi^{T*} = -\frac{\bar{y}}{\theta_G} \text{ QED.}$$

**Proof of Proposition 1:** Under a right-leaning incumbent,  $\theta_G = \theta_R$  which  $\Rightarrow \pi^* = \pi^T + \bar{y}(1 - \lambda) - \frac{\lambda \varepsilon}{1 + \theta_R}$ .

By construction  $\theta_R$  strictly increases. In the limit  $\theta_R \rightarrow \infty$  (this captures strictly increasing  $\theta_R$ ),

$$\pi^* \text{ converges to } \lim_{\theta_R \rightarrow \infty} \pi^* = \pi^T + \bar{y}(1 - \lambda). \text{ From } \pi^* = \pi^T + \bar{y}(1 - \lambda) \text{ that } \pi^* = \pi^T \text{ iff } \lambda = 1. \text{ Hence}$$

$\pi^* = \pi^T$  for  $\theta_R \rightarrow \infty$  and  $\lambda = 1$ . For  $\lambda = 1$ , the first order condition of the loss function in (3) w.r.t  $\pi$  is

$$\frac{\partial \mathcal{L}_{CB}}{\partial \pi} = (\theta_R + 1)(\pi - \pi^T) = 0 \text{ which } \Rightarrow \pi = \frac{\pi^T (\theta_R + 1)}{(\theta_R + 1)} \text{ and } \pi^* = \pi^T \text{ for } \lambda = 1 \text{ and } \forall \theta_R > 0 \text{ QED.}$$

**Proof of Claim 1:** Substituting the optimal IT rule  $\pi^{T*}$  in  $\pi^*$  and then substituting the resulting expression as well as  $y^*$  in the government's loss function in (1) and taking expectations yields after

algebra the expected losses under IT:  $E(L^{IT}) = \frac{1}{2} \left\{ (\bar{y})^2 \frac{\theta_G^2 + \lambda(1 + \theta_G)}{\theta_G^2} + \sigma_\varepsilon^2 \frac{\lambda + \theta_G}{1 + \theta_G} \right\}$ . Since

$\lambda = 1$  for a non-regulatory central bank,  $E(L^{IT}) = \frac{1}{2} \left\{ (\bar{y})^2 \frac{\theta_G^2 + 1 + \theta_G}{\theta_G^2} + \sigma_\varepsilon^2 \frac{1 + \theta_G}{1 + \theta_G} \right\}$  which after

simplification is  $E(L^{IT}) = \frac{1}{2} \left\{ (\bar{y})^2 \left(1 + \frac{1 + \theta_G}{\theta_G^2}\right) + \sigma_\varepsilon^2 \right\}$ . Taking the difference between  $E(L^{IT})$  and

$E(L^G)$  leads after algebra to  $E(L^{IT}) - E(L^G) = \frac{(\bar{y})^2}{\theta_R^2} - \sigma_\varepsilon^2 + \sigma_\varepsilon^2 \frac{\theta_R}{1 + \theta_R}$ . Since  $\theta_R \rightarrow \infty$  under a

right-leaning incumbent, we get  $E(L^{IT}) - E(L^G) = -\sigma_\varepsilon^2 < 0$  which  $\Rightarrow E(L^{IT}) < E(L^G)$  **QED**.

**Proof of Claim 2:** From the proof of proposition 1  $\pi^* = \pi^T$  under a right-leaning incumbent and a non-regulatory central bank and from lemma 2  $\pi^{T*} = -\frac{\bar{y}}{\theta_R}$ . Since  $\pi^* = \pi^T$  and  $\pi^{T*} = -\frac{\bar{y}}{\theta_R}$ ,

$\pi^* = -\frac{\bar{y}}{\theta_R}$  which  $\Rightarrow \pi^* < 0$  under IT **QED**.

**Calculation of Interaction Effect:** Since the transition models are estimated via Probit, we have the normal cdf for the probit model:  $F(u) = \Phi(\beta_1 x_1 + \beta_2 x_2 + \beta_3 x_1 x_2 + \mathbf{X}\beta)$  where  $x_1$  is the continuous variable *Partisanship*,  $x_2$  is the dummy *Separate*,  $x_1 x_2$  the interaction term *Partisanship* x *Separate*,  $\mathbf{X}$  the vector of controls and  $f(\cdot)$  is the pdf. Following Ai and Norton (2003), the formula for calculating the interaction effect of a continuous variable (*Partisanship*) and a dummy variable (*Separate*) is:

$$\frac{\Delta \frac{\partial F(u)}{\partial x_1}}{\Delta x_2} = (\beta_1 + \beta_{12}) f\{((\beta_1 + \beta_{12})x_1 + \beta_2 + \mathbf{X}\beta)\} - \beta_1 f(\beta_1 x_1 + \mathbf{X}\beta)$$

where  $\Delta x_2$  is the discrete

difference of  $x_2$ . From Ai and Norton (2003: 125), the standard error of the above estimated interaction

effect is found by applying the delta method, which is  $\mu_{12} \sim N\left(\frac{\partial}{\partial \beta'} \left\{ \frac{\Delta^2 F(u)}{\partial x_1 \Delta x_2} \right\} \Omega_\beta \frac{\partial}{\partial \beta} \left\{ \frac{\Delta^2 F(u)}{\partial x_1 \Delta x_2} \right\}\right)$  and

the asymptotic variance of the estimated interaction effect is estimated consistently by

$$\sigma_{12} = \frac{\partial}{\partial \beta'} \left\{ \frac{\Delta^2 F(u)}{\partial x_1 \Delta x_2} \right\} \hat{\Omega}_\beta \frac{\partial}{\partial \beta} \left\{ \frac{\Delta^2 F(u)}{\partial x_1 \Delta x_2} \right\}$$

where  $\hat{\Omega}_\beta$  is the consistent covariance estimator of  $\hat{\beta}$ . The  $t$ -

*statistic* –which tests the null that the interaction effect is zero for given  $\mathbf{X}$  is--  $t = \mu_{12} / \sigma_{12}$ .

**Table 1: Countries in Global Sample, 1987-2003**

OECD		Non-OECD	
Australia	(South) Korea	Argentina	Peru
Austria*	Luxembourg*	Brazil	Philippines
Belgium*	Mexico	Bulgaria	Russia
Canada	Netherlands*	Chile	South Africa
Czech Republic	New Zealand	China	Thailand
Denmark	Norway	Colombia	
France*	Poland	Costa Rica	
Finland*	Portugal*	Egypt	
Germany*	Spain*	Honduras	
Greece*	Sweden	India	
Hungary	Switzerland	Indonesia	
Iceland	Turkey	Israel	
Ireland*	United Kingdom	Malaysia	
Italy*	United States	Nigeria	
Japan		Pakistan	

\* Denotes EMU country (dropped after 1998)

**Table 2: Inflation Targeting Countries (as of 2003)**

Country	Adoption Date		Country	Adoption Date
Australia	June 1993		Mexico	Jan. 1995
Brazil	June 1999		New Zealand	Dec. 1989
Canada	Feb. 1991		Norway	Mar. 2001
Chile	Sept. 1990		Peru	Jan. 2002
Colombia	Oct. 1999		Philippines	Jan. 2002
Czech Rep.	Dec. 1997		Poland	Sept. 1998
Finland	Feb. 1993		S. Africa	Feb. 2000
Hungary	June 2001		Spain	Jan. 1995
Iceland	Mar. 2001		Sweden	Jan. 1993
Israel	Dec. 1991		Thailand	May 2000
Korea	Apr. 1998		U.K.	Oct. 1992

Source: Truman (2003)

**Table 3:** Markov Transition Model Results For Global Sample

Covariates	Model 1		Model 2		Model 3	
	$\beta_0$	$\beta_1$	$\beta_0$	$\beta_1$	$\beta_0$	$\beta_1$
GDP Growth variability	.035*** (.011)	.031*** (.012)	.045*** (.020)	.040** (.019)	.039*** (.015)	.058*** (.014)
Real Interest Rate	.050*** (.022)	.059*** (.021)	.043*** (.020)	.057*** (.022)	.061*** (.022)	.055*** (.021)
Nominal Interest rate	.068 (.074)	-.065 (.092)	.073 (.058)	-.062 (.049)	.050 (.062)	-.069 (.070)
Trade Openness	.038 (.144)	-.071 (.088)	.060 (.118)	-.075 (.073)	.022 (.145)	-.058 (.087)
REER variability	.039*** (.018)	.032*** (.010)	.020*** (.008)	.024*** (.007)	.043*** (.012)	.035*** (.014)
NEER variability	.024 (.028)	-.031 (.030)	.023 (.020)	-.035 (.028)	.035 (.030)	-.025 (.032)
Current Account	-.022** (.011)	-.036** (.017)	-.055* (.030)	-.072* (.041)	-.045** (.018)	-.038** (.019)
CBI	.030 (.071)	.039 (.050)	.029 (.020)	.033 (.042)	.031 (.026)	.044 (.031)
Partisanship x Separate	.151*** (.049)	.138*** (.037)	.103*** (.036)	.142*** (.040)	.132*** (.036)	.114*** (.045)
Partisanship	.021* (.012)	.032* (.018)	.034* (.019)	.022* (.013)	.023* (.014)	.024* (.014)
Separate Central Bank	.051* (.030)	.045* (.024)	.043* (.027)	.040* (.024)	.041* (.022)	.055* (.033)
Veto players	-.050 (.046)	-.033 (.037)	-.047 (.033)	-.038 (.042)	-.040 (.039)	-.025 (.032)
Inflation	.047*** (.021)	.040** (.015)	.038*** (.018)	.043*** (.018)	.032*** (.014)	.030*** (.012)
Polity IV	.039 (.075)	.022 (.055)	.035 (.034)	.031 (.036)	.033 (.028)	.018 (.020)
GDP per capita	.046 (.035)	.063 (.088)	.038 (.026)	.058 (.040)	.029 (.020)	.030 (.042)
Real GDP gap			.054 (.041)	.042 (.039)		
Financial depth			.019 (.020)	.033 (.042)		
Floating exch. Rate (defacto)	.028*** (.011)	.039*** (.016)	.021** (.010)	.032*** (.009)		
Constant	.250*** (.059)	.212*** (.040)	.209*** (.065)	.190*** (.061)	.308*** (.075)	.325*** (.072)
Log Likelihood	-306.41		-324.51		-404.50	
Pseudo $R^2$	0.61		0.62		0.45	
Jt. Test $H_0 : \gamma = 0 \quad \Pr > \chi^2$	28.22(.000)		35.40 (.000)		29.21 (.000)	
Smith-Blundell (p-value)	.657		.614		.514	
N	809		764		809	

**Notes:** \*\*\*, \*\*, \*: 1%, 5% and 10% levels of significance. Numbers in parentheses are robust standard errors adjusted for potential within country clustering.

**Table 4:** Predicted Change in Probability of Inflation Targeting Reported as Percentage

	<i>Predicted Change</i>
<b>Panel A: Global Sample</b>	
1 Std. deviation in increase in Partisanship with Separate CB changing from 0 to 1 and controls <b>X</b> held at mean	32.9% (4.16)***
1 Std. deviation in increase in Partisanship with Separate CB=1 and controls <b>X</b> held at mean	35.2% (3.92)***
<b>Panel B: OECD Sample</b>	
1 Std. deviation in increase in Partisanship with Separate CB changing from 0 to 1 and controls <b>X</b> held at mean	35.7% (2.56)***
1 Std. deviation in increase in Partisanship with Separate CB=1 and controls <b>X</b> held at mean	36.9% (2.90)***
<b>Panel C: Non-OECD Sample</b>	
1 Std. deviation in increase in Partisanship with Separate CB changing from 0 to 1 and controls <b>X</b> held at mean	25.2% (5.15)***
1 Std. deviation in increase in Partisanship with Separate CB=1 and controls <b>X</b> held at mean	27.3% (4.14)***

**Notes:** \*\*\*, \*\*, \*: 1%, 5% and 10% levels of significance. Numbers in parentheses are t-statistics for estimated effect of interaction derived using the formula in Ai and Norton (2003).

**Table 5:** Robustness Results

	OECD sample		Non-OECD sample	
	<b>Model 4</b>		<b>Model 5</b>	
<b>Covariates</b>	$\beta_0$	$\beta_1$	$\beta_0$	$\beta_1$
GDP Growth variability	.047*** (.015)	.058*** (.019)	.032*** (.012)	.040*** (.018)
Real Interest rate	.067** (.023)	.051*** (.019)	.063 (.060)	.061 (.057)
Nominal Interest rate	.038*** (.015)	.021 (.012)	.104 (.116)	-.112 (.099)
Trade Openness	.034 (.029)	-.095 (.086)	.037** (.022)	.049** (.028)
REER variability	.035*** (.011)	.031*** (.012)	.021 (.045)	.026 (.021)
NEER variability	.041 (.077)	-.020 (.030)	.044 (.035)	.040 (.039)
Current Account	-.032*** (.010)	-.039*** (.018)	.027 (.048)	.021 (.020)
CBI	.041 (.040)	.065 (.052)	.059 (.067)	.052 (.065)
Partisanship x Separate	.153*** (.031)	.172*** (.060)	.079*** (.036)	.092*** (.038)
Partisanship	.028* (.016)	.021* (.012)	.042* (.023)	.041* (.022)
Separate Central Bank	.024* (.014)	.019* (.011)	.028 (.031)	.030 (.022)
Veto players	-.032 (.034)	-.030 (.034)	.012 (.09)	-.036 (.054)
Inflation	.032*** (.014)	.035*** (.014)	.042*** (.020)	.059*** (.024)
Polity IV	.033 (.030)	.031 (.032)	.056 (.032)	.045 (.037)
GDP per capita	.030 (.028)	.018 (.020)	.021 (.019)	.044 (.031)
Floating exch. rate (de facto)	.034*** (.011)	.037*** (.011)	.049*** (.018)	.054*** (.025)
Constant	.290*** (.089)	.316*** (.078)	.157*** (.045)	123** (.038)
Log Likelihood	-380.47		-288.12	
Pseudo $R^2$	0.37		0.53	
Jt. Test $H_0 : \gamma = 0$ $\Pr > \chi^2$	29.87 (.000)		26.44 (.000)	
Smith-Blundell (p-value)	.431		.547	
N	440		369	

**Notes:** \*\*\*, \*\*, \*: 1%, 5% and 10% levels of significance. Numbers in parentheses are robust standard errors adjusted for potential within country clustering.

**Table 6:** 2<sup>nd</sup> Stage (Outcome) Equation From Heckman model

	<b>Model 6</b> Global sample	<b>Model 7</b> OECD sample	<b>Model 8</b> Non-OECD
Lag Inflation	.2039*** (0.0614)	.1568*** (.0324)	.4126*** (.0361)
GDP per capita	-.0189*** (.0067)	-.0317*** (.0099)	-.0616*** (.0115)
Trade Openness	-.0151 (.0477)	-.0120 (.0631)	.0193 (.0514)
Polity IV	.0081 (.0096)	.0185 (.0141)	.0704 (.0910)
Partisanship	-.1212* (.0685)	-.1405* (.0734)	-.0825* (.0519)
Lambda(Inflation Target)	-.1320*** (.0542)	-.1170*** (.0501)	-.1544*** (.0439)
Log(money growth)	.0689*** (.0184)	.0771*** (.0240)	.0342*** (.0067)
Separate CB	-.0129* (.0074)	-.0183* (.0102)	-.0147* (.068)
CBI	-.0170 (.0198)	-.0137 (.0218)	-.1046 (.1894)
Liquid Liabilities/GDP	-.0151 (.0477)	-.0237 (.0303)	-.0131 (.0514)
Central Govt. spending/GDP	.0012 (.0219)	-.1028 (.0815)	.0239 (.0482)
Constant	.1071*** (.0121)	.5433*** (.0155)	.1215*** (.0631)
$\rho$	.27*	.36*	.18*
Adjusted $R^2$	.371	.382	.496
$N$	809	440	669

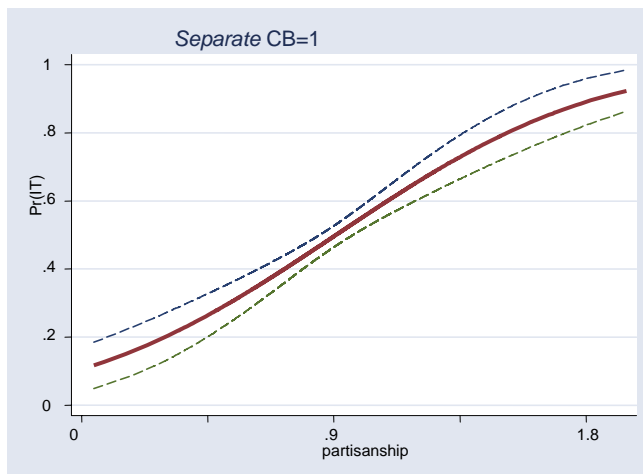
\*\*\*, \*\*, \*: 1%, 5% and 10% levels of significance. Numbers in parentheses are PCSEs; outcome equation in models 6,7 and 8 are estimated with fixed effects.

**Table 7:** Average treatment effect of Inflation Targeting (Non-Parametric estimates)

	Nearest-Neighbor	Stratification
<b>Panel A: Global Sample</b>		
Treatment Effect of IT on Inflation (percentage)	-5.27 (-4.41)	-6.05 (-5.94)
<b>Panel B: OECD sample</b>		
Treatment Effect of IT on Inflation (percentage)	-4.88 (-5.70)	-5.21 (-4.65)
<b>Panel C: Non-OECD sample</b>		
Treatment Effect of IT on Inflation (percentage)	-6.97 (-4.28)	-7.23 (-5.01)

**Notes:** Figures in parentheses are t-statistics obtained from bootstrapped standard errors.

**Figure 1:** Substantive Effect of *Partisanship* x *Separate*



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