

# Competing and Complementary Explanations of Monetary Regime Choice

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In recent years there has been a growing interest in the effects of monetary institutions on macroeconomic policy and performance. Scholars have sought to document the correlates of central bank independence and the effect of exchange rate choice. Only recently, however, has there been much attention given to the attempt to explain the variance in institutional forms that is observed across time and across countries.

Those explanations of the choice of monetary institutions that do exist tend to share the following characteristics. First, they either discuss the creation of an abstract commitment technology or explain the creation of one specific institutional form (policy rules, fixed exchange rates, an independent central bank, etc.). Second, they view the choice of institutions from the standpoint of a benevolent social planner seeking an efficient solution to a commitment problem. The first characteristic of these models makes it difficult to explain the specific combination of monetary institutions chosen in a particular time and place. The second characteristic makes it difficult to explain why - if these institutions are welfare enhancing - they are not universally adopted. Alongside these models, a number of recent empirical papers (many written by contributors to the current volume) have produced findings concerning the political determinants of central bank independence and fixed exchange rate commitments. These determinants include lobbying by sectoral interests, the degree of political transparency, the nature of the electoral system, and the number and type of veto players. I present decision theoretic and game theoretic models of the simultaneous choice of the exchange rate regime and the degree of central bank independence by a survival-maximizing incumbent making trade-offs between efficiency and distributional concerns. The implications of these models are then explored in an attempt to highlight complementary and reconcile competing claims in the empirical literature about the political determinants of monetary commitment technologies.

In this paper, I will attempt to use the knowledge learned about the effects of these institutions to explain a series of stylized facts about the incidence of particular institutional forms. Specifically, the stylized facts to be explained are:

1. Some incumbents
  - a) make monetary commitments by enhancing central bank independence and or pegging their exchange rates, but
  - b) others do not
2. Some incumbents that make monetary commitments
  - a) honor these commitments, except in extraordinary circumstances, but,
  - b) others renege on their commitment quite easily.

In an effort to explain these stylized facts, I will present a decision-theoretic model in the next section. In the second section of the paper I present a complete information game of commitment. The conclusion compares the two models and considers some of the empirical implications of such comparisons.

## 1 A Decision-Theoretic Model

Given that the choice of exchange rate regime and the degree of central bank independence are analytically distinct, there are four possible monetary policy regimes, each of which have been observed since the end of the Bretton Woods period. Table 1 displays the alternative monetary regimes in a two by two matrix with a stylized classification of observations from OECD countries in the post-Bretton Woods era.

//table 1 about here//

The decision-theoretic model in this section of the paper is meant to explain the choices concerning institutional change that face policymakers operating under these alternative regime structures.

To begin, I will assume that decision-makers have a set of beliefs about the equilibrium outcomes associated with various institutional arrangements, and that these beliefs are consistent with the empirical findings of Clark and Hallerberg (2000) and Clark (Forthcoming). These findings can be summarized as follows:

1. Central bank Independence (CBI) deters electoral cycles in monetary policy, but not fiscal cycles (Clark & Hallerberg 1999)
2. Fixed exchange rates, with mobile capital, deter monetary cycles, but not fiscal cycles. (Clark & Hallerberg 1999).
3. Flexible exchange rates, with mobile capital, deter fiscal cycles, but not monetary cycles. (Clark & Hallerberg 2000).
4. When the central bank is independent, capital mobility *encourages* opportunistic cycles in growth and unemployment when the exchange rate is fixed.

I assume that policymakers place some positive value on generating electoral cycles in macroeconomic variables through the use of monetary policy ( $M$ ), but also place value on retaining the ability to manipulate fiscal policy ( $F$ ).

The degree of central bank independence and the exchange rate regime are considered to be the objects of choice, but changing institutions is costly ( $C_r^D > 0$  and  $C_r^I > 0$  where  $C_r^I$  and  $C_r^D$  are the costs of changing the international and domestic institutions, respectively, necessary to establish regime  $r$ ). Thus, a typical incumbents' objective function can be characterized as follows :

$$U(R) = M + F - C_r^D - C_r^I \quad (1)$$

where  $r$  indexes the monetary policy regime. Since the decision-maker believes that institutions constrain the political control of the economy in a manner consistent with the empirical findings summarized above,  $M$  and  $F$  can be thought of expected utilities that range from zero to 1 depending on the institutional context that the incumbent is operating in. Specifically,  $M$  equals zero when the central bank is highly independent and/or when fixed exchange rates are combined with highly mobile capital (regimes B,C, and D in Table 1), and is positive otherwise; and  $F$  equals zero when capital is mobile and the exchange rate is allowed to fluctuate (regimes A and C in Table 1) and is positive otherwise. Table two summarizes the pay-offs incumbents receive from maintaining each of the four sets of institutional combinations.

Note that, if the empirical results related to the consequences of each institutional combination are accurate, from the standpoint of aiding the survival maximizing incumbent - and before considering the costs of institutional change - the existence of cases employing regime C presents an anomaly. Why would incumbents forfeit both avenues to electoral benefits if institutions that provide them are available? This question is particularly interesting in light of the fact that it is precisely regime C that is the "orthodoxy" being recommended by the IMF to developing countries around the world.<sup>1</sup>

//table 2 about here.

Before pursuing this question, it is appropriate to consider the costs of switching institutions. Since the costs of institutional change may be substantial, the incumbent's assessment of the existing institution and its alternatives will be sensitive to the institutional starting point. Accordingly, I will examine the choice confronting policymakers from the standpoint of four different institutional endowments beginning with the absence of both constraints.

## 1.1 Institutional choice given flexible exchange rates and a dependent central bank (Regime A)

When central bank independence is low, incumbents are in a powerful position when negotiating with central bankers over the setting of interest rates and

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<sup>1</sup>I thank Shanker Satyanath for this observation.

other monetary policy instruments. In the limiting case of zero independence, central bankers are the obedient agents of the government, whose policy preferences are frictionlessly transformed into actions. Thus, incumbents confront no domestic check on their ability to use monetary and fiscal policy for electoral purposes. However, according to the Mundell Fleming approach to the balance of payments, fiscal policy is rendered ineffective when capital is mobile and the exchange rate is fixed. Thus, when central bank independence is low and exchange rates are allowed to fluctuate (Regime A), as was the case, for example, in the UK between 1971 and 1992, incumbents should be able to use monetary policy, but not fiscal policy, for electoral purposes. Thus, a decision to retain this institutional structure produces a pay-off equal to the benefits of monetary policy performance for electoral purposes:

$$U(A) = M \tag{2}$$

Note, to simplify the present analysis, it is assumed that maintaining the status quo regime involves no cost. Institutional costs will come into play only when incumbents decide to change regime structures. For example, suppose incumbents confronting a dependent central bank were considering the adoption of a fixed exchange rate. In the current framework, such a change would mean a loss of the ability to manipulate monetary policy for electoral purposes, but it would allow them to control fiscal policy for these purposes. But it would also involve the costs of making the commitment to fixed exchange rates - both in terms of the "up front" costs of building institutional capacity for managing the exchange rate interventions necessary for maintaining an exchange rate parity and/or negotiating admission to an international exchange rate regime as well as the "back-end costs" that can be expected to be incurred if the exchange rate commitment turns out to be unsustainable. Thus, the expected utility of a change to a fixed exchange rate system when the central bank is dependent is:

$$U(\Delta B) = F - C_B^I \tag{3}$$

and incumbents can be expected to opt for such a change when ( 3) is greater than (2), that is, when the benefits of controlling fiscal policy are greater than the benefits of controlling monetary policy, net of the cost of pegging the exchange rate.

Similarly, we can consider the decision to build central bank independence in the absence of fixed exchange rates (Regime C). Once again, the incumbent compares what she believes to be available to her under the new regime, including the cost of switching regimes with what she expects to continue to receive under existing arrangements. Consequently, the creation of central bank independence by a country with regime A institutions will occur only if  $-C_C^D > M$ , which, according to the above assumptions would never be the case. Thus, the only motivation for building central bank independence, when exchange rates

are flexible, would have to come from some benefits associated with adopting the institution that are not captured in our model up to this point.

Finally, we should consider the possibility of an incumbent choosing to replace Regime A with a regime in which the central bank is independent and the exchange rate is fixed (Regime D). Once again, the incumbent must give up control of monetary policy in exchange for the benefits of controlling fiscal policy, but she must pay both the cost of building central bank independence and the cost of establishing a pegged exchange rate. Specifically, she will move to regime D if and only if:

$$F - C_D^I - C_D^D > M \tag{4}$$

The current model suggests that if countries find themselves operating under a monetary regime with flexible exchange rates and a dependent central bank, there will be no incentive to adopt central bank independence without changing the exchange rate regime. It also suggests that a change in the exchange rate regime will occur under these circumstances only if the electoral benefits of controlling fiscal policy are greater than the benefits of controlling monetary policy and the costs of changing institutions is relatively small. Finally, the choice between adopting regime B and regime D depends on whether the the difference between adopting two commitment devices and adopting just a pegged exchange rate.

## 1.2 Institutional choice given fixed exchange rates and a dependent central bank (Regime B).

The decisions incumbents face are quite different when viewed from a different starting point. When Regime B (the case of fixed exchange rates and a dependent central bank) is the status quo, as it has been in the Nordic countries since the break up of Bretton Woods, incumbents can use fiscal policy to manipulate the macroeconomy for electoral purposes but can not engineer pre-electoral macroeconomic expansions through the use of monetary policy. Their utility for the status quo arrangement, therefore, is:

$$U(B) = F \tag{5}$$

and a change to a floating exchange rate is expected when:

$$M - C_A^I > F \tag{6}$$

that is, when the expected benefits of effecting macroeconomic outcomes through monetary policy net of the the cost of institutional change is greater than the expected utility of controlling fiscal policy.

From the current starting point, a shift towards central bank independence would be expected if

$$F - C_C^D > F \quad (7)$$

which is never the case under present assumptions. Finally, a simultaneous change of both international and domestic institutions, (that is, substituting an independent central bank for a fixed exchange rate) would yield

$$U(\Delta C) = -C_B^D - C_D^I \quad (8)$$

which, by assumption, is less than is available under the status quo.

When Regime B is the starting point, one change in regime is plausible under the current assumptions. When the expected utility of engaging in pre-electoral macroeconomic expansions is high, relative to the costs of institutional change, a shift to a floating exchange rate becomes increasingly likely.

### 1.3 Institutional choice given flexible exchange rates and an independent central bank (Regime C).

When Regime C (flexible rates and an independent central bank) is the starting point, as in the US since 1971, the incumbents believe they can not manipulate monetary policy for electoral purposes. Hence, the expected utility they attach to the institutional status quo is

$$U(C) = 0 \quad (9)$$

A switch to Regime A (i.e. a reduction in central bank independence) would yield :

$$U(\Delta A) = M - C_A^D \quad (10)$$

Consequently, we could expect attacks on central bank independence when the magnitude of expected benefits from full control of macroeconomic policy instruments is greater than the magnitude of the costs of destroying central bank independence. (i.e. when ).

A switch to regime D (i.e. an adoption of a fixed exchange rate) would yield

$$U(\Delta D) = F - C_D^I \quad (11)$$

which could be expected to occur only when this quantity was greater than zero. Finally, a decision to simultaneously reduce central bank independence and adopt a fixed exchange rate (a switch to regime B) would yield

$$U(\Delta B) = F - C_B^I - C_B^D \quad (12)$$

and so, such a change can be expected to occur only when this quantity is greater than zero.

Thus, the current model allows for three possible institutional changes when the status quo is a regime consisting of flexible exchange rates and a highly independent central bank. When the benefits associated with the manipulation of monetary policy for electoral purposes is high relative to the cost of reducing central bank independence, a shift to regime A is likely. On the other hand, when the utility attached to gaining control of fiscal policy is high relative to the cost of fixing the exchange rate, a shift to regime D is expected. Finally, if the value of controlling fiscal policy is larger than the costs of both fixing the exchange rate and decreasing central bank independence then a shift to regime D is possible. Note that the conditions for change to each of these changes from the status quo of Regime C are not mutually exclusive. Thus, in some cases it would be necessary to compare the alternatives to the status quo to each other to predict which, from the set of regimes preferred to the status quo, is the one that would be chosen.

#### 1.4 Institutional choice given fixed exchange rates and an independent central bank (Regime D).

As was the case under Regime C, when Regime D is the starting point (i.e. when exchange rates are fixed and the central bank is highly independent), as has typically been the case in Austria, incumbents recognize that they can not effectively manipulate monetary policy for electoral reasons, but they can manipulate fiscal policy. Thus, they expect to receive  $U(D) = F$  in equilibrium. A reduction in central bank independence (i.e. a switch to Regime B) yields

$$U(\Delta D) = F - C_D^D \quad (13)$$

and such a change is expected when  $C_D^D < 0$ , which is contrary to the model's assumptions. Given a highly independent central bank, a decision to allow the currency to float (i.e. a switch to Regime C) does not produce the ability of the government to control monetary policy, but forfeits control over fiscal policy, and so, could only occur if  $F < 0$ , or  $C_C^I < 0$  both of which are contrary to the assumptions of the model. Thus, a shift from Regime D to either Regime B or C would be anomalies from the standpoint of this model.

Only a decision to simultaneously reduce central bank independence and allow the exchange rate to float is consistent with the current model. As in a change from Regime D to Regime B, the incumbent gives up control over fiscal policy when deciding to float, but, unlike a shift to regime B, the elimination of central bank independence now makes the use of monetary policy for electoral purposes possible. This potential benefit to the incumbent, of course, comes

with the cost of changing both institutions, so a change from Regime D to Regime A is expected when

$$M - C_A^I - C_A^D > F \tag{14}$$

Thus, once Regime D becomes the status quo, there is only one change consistent with the current model - a simultaneous abandonment of the fixed exchange rate and attack on the independence of the central bank.

Table 2 summarizes the conditions that are necessary and sufficient to induce a change in each of the logically possible structures. The above decision-theoretic model leads to some important insights, but it also has serious limitations. First, it points out that the conditions for regime change are strongly conditioned by the starting point of the analysis. Compare, for example, the case of the decision to adopt a fixed exchange rate under alternative assumptions

//Table 2 about here //

about the degree of central bank independence. When central bank independence is already high, a shift to fixed exchange rates occurs if the expected utility of operating under a fixed exchange rates merely exceeds the costs of changing regimes. When central bank independence is low, however, the opportunity costs of controlling monetary policy for electoral purposes must also be met. A second insight from the decision-theoretic model is that the choice of institutions is closely related to whether incumbents prefer to pursue their electoral goals through monetary policy or fiscal policy. Third, the decision-theoretic model points to the crucial role played by the costs of institutional design. These costs figure prominently in every hypothesized regime change and warrant further attention. Finally, it should be noted that there is a marked asymmetry in the direction of change implied by this model. But the asymmetry is not what one might expect. In the absence of the model, one might conjecture - as much of the existing literature does - that since central bank independence and fixed exchange rates each constrain the use of monetary policy, Regime A is, in some way, the natural environment of survival maximizing incumbents and it is only deviations from this environment that require explanation. By incorporating the effects of capital mobility and exchange rate regime choice, on both monetary and fiscal policy, however, the model emphasizes the fact that at least one instrument is always out of the reach of incumbent politicians. Thus, the adoption of a fixed exchange rate need not be seen as a puzzling act of forbearance by otherwise profligate incumbents. Rather, it could be seen as a calculated move by survival maximizing incumbents that believe (for reasons not explored here) fiscal policy is a sufficiently more effective electoral tool than monetary policy to warrant the cost of institutional change. Even better, when survival maximizing incumbents confront an independent central bank and attempt to "tie one's hands" by adopting an exchange rate peg might better be seen as an attempt by elected official to tie the hands of a central bank it can not control and regain national fiscal policy autonomy for electoral purposes.

Where the asymmetry arises is that while the theoretically feasible changes away from Regime C are numerous, there are no conditions consistent with the assumptions of the model that should lead incumbents to adopt Regime C. Thus, central bank independence, in the absence of a fixed exchange rate, is (again, from the standpoint of the decision theoretic model) an anomaly. In fact, our stylized facts suggest that cases of high levels of central bank independence (in the OECD) are typically accompanied by the maintenance of fixed exchange rates. The exceptions are the United States, Canada, and Australia. Both the decision theoretic model, and the stylized facts, therefore, both suggest that the adoption of central bank independence may be tied to the maintenance of fixed exchange rates. Perhaps (as the model suggests) central bank independence does not have much to offer the survival maximizing incumbent, but, rather, is a joint product of their attempts to establish fixed exchange rates. Alternatively, perhaps central bank independence yields benefits to politicians that are unrelated to the ability to manipulate monetary and fiscal policy for electoral purposes and, so, are not captured in the model as specified up to this point.

An alternative explanation for the existence of central bank independence in the absence of fixed exchange rates is that institutions are born in conjunctural moments when historically rare factors come into play and exceptional forces are visited upon existing institutions, leaving in their wake new institutions that may persist because of the costliness of institutional change (Krasner 1988). This view of institutions can, if one is not careful, lead to "catastrophic reasoning" (Gould 19??). One way of avoiding the dangers of catastrophic reasoning is to clearly identify the benefits that the institutions in question might provide and then attempt to understand why, at particular moments in time, politicians were able to seize these benefits by engaging in institutional change. I will briefly discuss some of the potential benefits in the next section.

## **1.5 THE POTENTIAL BENEFITS OF MONETARY COMMITMENT DEVICES**

There are substantial literatures on the pros and cons of central bank independence and fixed exchange rates written by economists. While this literature is quite useful in helping one think about the benefits incumbents might attach to these institutional forms, it is important not to take the conclusions of these literatures at face value. Most examinations of the benefits and costs of these institutional forms view these from the standpoint of some social welfare function. To confuse the benefits that theorists say accrue to society when it adopts these institutions with the way they benefit incumbent politicians is to implicitly assume that politicians' welfare is coterminous with society's. While the notion of policymakers as "benevolent social planners" who have the same utility function as society may be a useful heuristic in welfare economics, it is less useful as a starting point for developing a positive model of institutional choice.

Thus, I will attempt to be careful in specifying the reasons why the purported benefits of these institutions may actually influence the institutional preferences of incumbent politicians.

## 1.6 Institutions as "Fixed-Frozen Preferences"

One reason why incumbents may adopt a fixed exchange rate or a highly independent central bank is that they believe that these institutions, in equilibrium, will increase the likelihood that the sort of macroeconomic outcomes they, or their powerful constituents, prefer will be produced. Typically, these institutions are thought to encourage price stability, and so, inflation averse politicians (or, incumbents with inflation averse constituencies) may derive a benefit from constructing these institutions - either because it will help them achieve their policy goals or because it makes it more likely that successor governments with different policy goals will produce more desirable outcomes. For example, if we start with a Hibbsian view of the partisan sources of macroeconomic policy, central bank independence or fixed exchange rates may be an institutional mechanism for "hard-wiring" the policy preferences of right-wing governments. If this is indeed the case, then that would lend support to the argument that institutions are reducible to the preferences of the actors that inhabit them - unless it can be shown that the costs of institutional change are sufficiently high that institutions persist even when they no longer serve the interests of political actors in the manner just mentioned.

Parties may also have preferences over institutional forms that derive from their ability to compete on particular issues. Parties perceived to have a comparative advantage in the provision of price stability may have disincentive to adopt a peg (Milesi-Ferretti 1995).

In addition to partisan sources of institutional preferences, central bank independence and fixed exchange rates may have sufficient distributional implications that sectoral interests, not necessarily associated with a particular party, may be mobilized in support of their adoption. Frieden (1991, 1997) discusses the distributional implications of exchange rate stability, and Clark (1997), Maxfield (1994) and Posen (1993) consider the sectoral implications of central bank independence. Frieden (1991) argues that export-oriented producers of tradeable goods and international traders and investors have a preference for fixed exchange rates. Maxfield and Posen argue that central bank independence serves the interest of the financial sector, while Clark argues the corollary that proponents of central bank independence are likely to encounter their strongest opposition from asset specific sectors. One source of benefits for incumbents adopting central bank independence or fixed exchange rates, therefore, is the political support of asset holders in sectors that would benefit from the policies associated with them.

The common theme running throughout these arguments is that incumbents benefit from adopting these institutional mechanisms because they help them

produce policies that are favored by powerful constituencies. The adoption of the institution is driven by distributional concerns. It is possible, however, that the benefits incumbents derive come from general welfare benefits associated with the institution. I turn to this possibility next.

## 1.7 The Advantages of Tied Hands

A standard argument for the benefits of fixed exchange rates and/or central bank independence is that these institutions help policymakers overcome the "time consistency problem" which creates an "inflationary bias" when monetary policy is under the discretionary control of policymakers. A time consistency problem is said to exist whenever an ex ante optimal plan is not viewed by policymakers as optimal when it is time to implement it (Kydland and Prescott 1977). Policymakers in such circumstances are unable to resist the temptation to enact a policy that is consistent with their optimal plan. An institutional fix is the only way out of this inter-temporal dilemma. A mechanism, much like the ropes that bound Ulysses to the mast and the wax that shielded the ears of his oarsmen from the song of the sirens, must be constructed to force the policymakers to implement the optimal plan. Kyldand and Prescott (1977) and Barro and Gordon (1983) advocate the adoption of a policy rule that would require the policymakers to act according to the optimal plan at each moment in time.

What they do not explain, however, is why the ex ante existence of such a rule would change the ex post behavior of the policymaker. Rogoff (1985) argues that appointing a "conservative central banker" (i.e. one who's opposition to inflation is more severe than society's (or the median voter's)) can act as a functional equivalent to replacing policymaker discretion with a rule. When this conservative central banker responds, as Kydland and Prescott predict, to the time consistency problem by implementing a policy that is more inflationary than was planned, he inadvertently produces the policy that is most preferred by society. Walsh (1995) proposes a mechanism by which the central banker is induced to adopt a policy in accordance with the optimal plan. The central banker, upon appointment, will be forced to sign a contract specifying rewards and/or punishments to be meted out by his or her political principle, who judges the central banker's performance according to the yardstick of an optimal plan contained in the contract.

These institutional fixes are reasonable responses to the time consistency problem as originally formulated, but the original formulation of the problem contained a key assumption, the relaxation of which calls into question the feasibility of each of the institutional fixes. In order to establish the generality of the time consistency problem, Kydland and Prescott, and others that followed, started with the assumption that the policymaker in question has precisely the same goals as society in general. In effect, they were saying, "even if we found ourselves in the enviable position of having leaders that wanted only what was best for us, discretionary policy could not produce optimal outcomes." While this made for a "hard case" for the existence of time consistency problems, it

made for an "easy case" for their solution. If the existing institutional arrangement leads the benevolent dictator to behave in a sub-optimal manner, it is reasonable to expect the benevolent dictator to design an institution that removes such "perverse" incentives. If "central bank independence" can be conceived as embodying, or at least facilitating, such institutional fixes, its occurrence can be explained as a rational response to the time consistency problem.

This, of course, raises the question as to why central bank independence occurs in some places and times and not in others (stylized facts 1a and 1b). One answer is that policymakers are not always benevolent. If we relax the assumption that policymakers are benevolent, then the institutional fixes for the time consistency problem appear less compelling as explanations for the existence of these institutions. If, for example, a policymaker might privately benefit from policies that are socially sub-optimal, then there may not be a good reason to design his or her way out of the time consistency problem. Indeed, when bequeathed socially optimal situations such as Rogoff's conservative central banker or Walsh's "optimal contract" a less than benevolent policymaker might engage in some "free lancing." If, for example, a political principle benefits from an inflation rate higher than that which is socially optimal, he or she is not likely to punish a central banker that produced more inflation than the optimal contract specified. He or she might even dismiss a conservative central banker. If this is the case it is not at all clear why ex ante commitments to act in ways that would not be equilibrium behavior in the absence of the commitment mechanism are credible. This is particularly important because the benefits flowing from the institutions are present only when the adoption of the institution convinces private actors that policymakers will act in a particular way in the future. And if this is true, then both genuine reformers and opportunists are likely to make public displays of such commitments. Thus, while the process of institutional design is a process of commitment, the effectiveness of those commitments is closely related to whether the declaration of the commitment actually conveys the intended information to the relevant audiences. Thus, creating central bank independence or making an exchange rate commitment is as much a problem of signaling as it is commitment. Consequently, the complete information model in the next section may move us toward answering some of these questions, but will not be sufficient to answer many important questions.

## **2 CREDIBLE COMMITMENTS: A COMMITMENT MODEL**

The time consistency problem associated with monetary policy occurs because in the absence of institutional mechanisms that constrain their choices, monetary policymakers have incentives to engage in actions that are inferior to outcomes that might be achieved in the absence of such temptations. Lohmann (1992) reviews a host of time consistency problems related to macroeconomic policy choice, all of which share a similar dynamic. Private actors are thought to

condition their behavior on the behavior of policymakers in a way that creates incentives for policymakers to announce policy plans ex ante that they will be tempted to alter ex post. Because capitalists condition their employment and investment decisions, and workers condition their wage claims, on inflationary expectations, and policymakers can induce increases in output if inflation exceeds these expectations, they have an incentive to make pronouncements about "hard money" policies ex ante and adopt "soft money" policies ex post. Similarly, governments can generate seignorage revenue by creating inflation, but only to the extent that private actors are willing to hold currency and such willingness is inversely related to inflationary expectations. A similar process is at work for nominally denominated government bonds. Finally, the same dynamic has been applied to the exchange rate - governments do not want to undermine confidence in the currency, but they may be tempted to devalue in order to stimulate growth and employment.

These situations all share a similar structure. The government makes a pronouncement at time  $t_0$  that is intended to influence the behavior of private actors at time  $t_1$  but the government has incentives to renege on said pronouncement at time  $t_2$ . The government and the private sector have a shared interest in the sense that they are both best off when the government makes the commitment, the private actor believes the commitment and acts on it, and the government lives up to the commitment. Unfortunately, absent an institutional mechanism to tie the hands of the government a pareto inferior outcome results. Figure 1 represents this set of problems as an extensive form game. The government chooses between one of the four regimes in the decision theoretic model above, three of which involve at least one commitment technology. If the government adopts a regime involving a commitment technology the (representative) private sector actor chooses whether to respond to this commitment (with either optimal levels of investment, wage restraint, or whatever the case may be), and then the government decides whether or not to honor its commitment. If the government chooses regime A, which does not involve a monetary commitment technology, the status quo persists - the incumbent government retains control over monetary policy and the private sector allocates its assets at the socially sub-optimal level appropriate to the absence of the commitment technology and, as a consequence, receives its status quo pay-off. In addition, the private sector is assumed to receive this status quo pay-off whenever it plays  $\tilde{R}$  (outcomes 4,5,8,9,12,13). The private sector's most preferred outcome results when the government creates a commitment technology that it views as sufficiently credible that it responds with the socially optimal allocation of its assets and the government honors that commitment (outcomes 2,6,10). Its least preferred outcome is when it responds to a government commitment with socially optimal allocation, only to find that the government has reneged on that commitment (outcomes 3,7,11).

The pay-offs for the government are similar to the ones in the decision theoretic model above in the sense that they receive the benefits associated with manipulating monetary and fiscal policy for electoral purposes when institutions allow them to appropriate these benefits (as discussed above). There are two

important differences in the pay-offs to the government however. First, if the government receives some benefit  $B$  if it makes a monetary commitment and the private sector responds with the socially optimal allocation of its assets. Second, the pay-offs attempt to capture the fact that the government, effectively, has two opportunities to choose the institutions under which it will operate - once before the private sector actor allocates her assets and once after. Thus, if the government, chooses to fix the exchange rate by building regime 2, it decides, after observing the behavior of the private sector whether to honor that commitment. Note that the benefit that the government receives for making a commitment depends on whether it can induce the desired change in the behavior of the private sector (i.e. whether  $P$  plays  $R$ ) and is unrelated to whether or not it honors that commitment. The decision to honor its commitment, however, influences the government's pay-off in the following two ways. First, there is a cost associated with not honoring its commitment - this ex post cost ( ${}_pC$ ) can be thought of as the cost of changing institutions - from those implied by the ex ante commitment to something else (in this case it will assumed that failure to honor a commitment leads to a reversion to Regime A). Alternatively, the cost of defection can be thought of in terms of lost reputation.

## 2.1 Equilibrium Behavior

There are numerous sub-game perfect equilibria to the complete information game. Rather than catalogue them, I will state general conditions that determine equilibrium behavior in the following proposition. I will then discuss at some length the implications of these conditions for the selection of alternative commitment technologies.

**Definition 1** *Let a commitment technology be credible if a government that adopts it at  $t_0$  has an incentive to honor it at  $t_2$ .*

**Proposition 2** *All strategy combinations that meet all of the following conditions are sub-game perfect:*

Credibility conditions

*The private sector actor plays  $r$  if and only if the regime is credible. If a regime involving a commitment technology ( $B, C$ , or  $D$ ) is not credible, the government will not choose it.*

Superiority condition 1

*A regime involving a commitment technology will not be chosen if the outcome it produces, when the private sector responds to it and it is honored, does not yield a higher expected utility than Regime A.*

Superiority condition 2

*A regime involving a commitment technology will not be chosen unless it produces, when the private sector responds to it and it is honored, an outcome with a higher expected utility than any other credible regime*

*Discussion. Credibility Conditions.* When a regime involving a commitment technology is selected and the private sector actor responds with the socially optimal allocation of assets (i.e. plays  $r$ ), it receives its most preferred outcome if the government honors the commitment technology and its worst outcome when it does not. The private sector actor, however, can guarantee itself an intermediate outcome ( $sq$ ) by not responding to the government's commitment. It is easy to see, therefore, that under complete information the government plays  $r$  if and only if it expects the commitment to be honored. Regime B is credible if the costs associated with breaking a commitment to a fixed exchange rate are greater than the difference between the benefits of regaining control over monetary policy and the benefits of retaining control of fiscal policy:

$${}_P C_B^I > M - F \quad (15)$$

Since control over both fiscal and monetary policy are alienated under Regime C, for it to be credible, it would have to be the case that

$${}_P C_C^D > M \quad (16)$$

That is, it must not be the case that the benefits of regaining control over monetary policy outweigh the cost of dis-assembling central bank independence. Finally, since defecting from Regime D involves the simultaneous breaking of exchange rate commitments and the dissolution of central bank independence, this regime is credible when

$${}_P C_D^D + {}_P C_D^I > M - F \quad (17)$$

The incentives to engage in ex post opportunism varies from regime to regime, but are always independent of B (the benefits of adopting the commitment technology) and  ${}_A C$  (the ex ante costs of adopting the commitment technology). In contrast, the incentive to honor commitments will always be decreasing in the utility the government places on the control over monetary policy for electoral purposes ( $M$ ), which can be thought of as the temptation to defect, and increasing in the ex post cost of making the commitment ( ${}_P C_r$ ), which can be thought of as the punishment for defecting. In addition, when the monetary commitment technology involves a fixed exchange rate (i.e Regimes B and D), the decision to engage in ex post opportunism will also be increasing in the expected utility of retaining control over fiscal policy ( $F$ ) which can be thought of as the reward for honoring the commitment. Note, that when the utility of controlling fiscal policy exceeds the utility of controlling monetary policy, there is no incentive to engage in ex post opportunism, even when the cost of defection equals zero. When this is the case it is not clear why a commitment technology is needed. Thus, when credibility is not a question, the independent cause effect of institutional commitments may be zero.

While credibility directly influences equilibrium play, it does not fully determine it. This is true for two reasons. First, it is necessary, but not sufficient.

If the ex ante costs of building an institution are sufficiently high, relative to the benefit accruing from the institution, that institution will not be chosen even if the conditions for credibility are met. Thus, while ex ante costs are irrelevant at the government's last move (which can be thought of as the policy implementation stage), they can be important at its first move (or, the institutional design stage). But ex post costs are also important at the start of the game. If these costs are not sufficiently high to make commitments credible, then the government will choose regime A (when the private sector actor plays  $\tilde{r}$  and the government plays  $\tilde{H}$ , the government receives  $M$  plus some costs if it makes a commitment and  $M$  if it does not, since costs are assumed to be strictly negative, it pays not to make a commitment that will not be believed).

Put differently, under complete information, credibility is required for a regime change to be feasible, but it does not necessarily make regime change desirable. Consider for example, the case where a regime  $r$  is credible. That institution will be chosen only if the pay-off it is expected to produce is greater than a) the expected pay-off without a commitment; and b) the expected pay-off of every other credible regime. I will first address the superiority of each regime to the no-commitment outcome (*superiority condition 1*) and then move on to consider which regime is chosen if more than one is credible and preferred to the no-commitment outcomes (*superiority condition 2*). To facilitate cross-regime comparison's I will assume that  $B, F$ , and  ${}_A C_r^I, {}_A C_r^D$  are constant across regimes.

*Superiority Condition 1.* The government prefers the outcome expected under a credible regime B to the no-commitment outcome if

$$B_B - {}_A C_B^I > M - F \quad (18)$$

the outcome expected under a credible regime C to the no-commitment outcome if

$$B_C - {}_A C_C^I > M \quad (19)$$

and the outcome expected under a credible regime D to the no commitment outcome if

$$B_D - {}_A C_D^I - {}_A C_D^D > M - F \quad (20)$$

As with the incentives to engage in ex post opportunism, the incentive to choose a credible commitment technology over the non-commitment regime is decreasing in the utility of controlling monetary policy and - when fixed exchange rates are involved - increasing in the utility of controlling fiscal policy. Unlike the question of honoring commitments, ex post costs are not important in deciding between credible regimes, but ex ante costs and the benefits generated by the commitment technology are. Specifically, the propensity to choose

a commitment technology over the non-commitment regime is increasing in the benefits created by the regime, net of the costs of creating the regime.

*Superiority Condition 2* If more than one regime satisfies both *superiority condition 1* and the credibility condition, the government would simply choose the most preferred outcome. In a pair-wise comparison between Regimes B and C, the government would always choose the former ( $B_r + F - {}_A C_r^I > B_r - {}_A C_r^I$  is always true since it reduces to  $F > 0$  which is true by assumption). In a comparison between Regimes B and D, the government would choose the former when  $B_r + F - {}_A C_r^I > B_r + F - {}_A C_r^I - {}_A C_r^D$ , that is, when  $0 < {}_A C_r^D$  - which is also true by assumption. Thus, given the general parametric assumptions of the model, Regime B (fixed rates and a dependent central bank) is chosen whenever it is credible and *superiority condition 1* is satisfied (see table 3).

In contrast, the satisfaction of the relevant credibility and superiority conditions is not sufficient to produce Regime C in equilibrium. First, because, if given the choice between a credible Regime B and credible Regime C, the government would always choose the former, Regime B must not be credible ( ${}_P C_B^I < M - F$ ) for Regime C to be considered. Second, because regime D is credible whenever Regime C is, the later is only chosen when the outcome it is expected to be produced is preferred to the outcome expected under Regime D (i.e.  $F < {}_A C_r^D$ ).<sup>2</sup>

////Table 3 about here ///

Similarly, satisfaction of the credibility and superiority conditions are not sufficient to produce Regime D. As with Regime C, because the government prefers the outcome produced by a credible Regime B to a credible Regime D, Regime D will not be chosen if Regime B is credible. Thus,  ${}_P C_B^I < M - F$  is necessary for the government to choose Regime D. In addition to these necessary conditions, one of the following conditions must also be true. Either Regime D must be preferred to Regime C ( $F > {}_A C_r^D$ ), or Regime C must not be credible  ${}_P C_C^D < M$ .

Finally, a word should be said about the conditions under which Regime A (flexible exchange rates and a dependent central bank) will be chosen. There are many different conditions that can produce Regime A, but they can be summarized as follows. Regime A occurs if and only if it is not the case that both

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<sup>2</sup> Thus, assuming all regimes are credible and are preferred to the no-commitment outcome, two complete preference orderings are possible under the current assumptions. If the benefits of controlling monetary policy are large compared to the cost of building central bank independence ( $F > |{}_A C_r^D|$ ) then the government's preferences over institutions can be summarized as follows:

Regime B > Regime D > Regime C  
 while if the cost of building central bank independence exceeds the benefits of controlling fiscal policy, the government's preference ordering over credible institutions is  
 Regime B > Regime C > Regime D

the credibility condition and *superiority condition 1* related to each institution is satisfied for at least one of the commitment regimes (B, C or D).

### 3 EMPIRICAL IMPLICATIONS

The complete information game, which (unlike the decision theoretic model) includes intrinsic benefits associated with commitment technologies deemed credible by the private sector, is consistent with each of the stylized facts related to the existence of each of the four possible regime types, and the explanation for cross-national variance in regime type would rest with differences in 1) the utility actors derive from controlling monetary, versus, fiscal policy for electoral purposes; 2) the benefits associated with making credible commitments; 3) the costs associated with institutional change - both those related to the creation of the commitment technologies (ex ante costs) and those associated with deviating from those commitments (ex post costs).

The complete information game theory model is consistent with the observation that states do sometimes honor their monetary commitments. What it can not explain, in the sense that no equilibrium includes such behavior, is why states might make commitments to monetary technologies and then not live up to them. Of course, defection from a regime at time  $t_2$  could be interpreted as simply a matter of choosing of a new regime (in this case a move from a commitment regime to a no-commitment regime) brought on by a change in the underlying parameters necessary to support the commitment regime in question. Alternatively, such defection could be the result of strategic behavior made possible by asymmetries in information. It is possible to write down a limited information model where the private sector is less than perfectly informed about the preferences of the government in which defection occurs as part of a semi-separating equilibrium, but doing so is beyond the scope of this paper.

Both the decision theoretic model and the game theoretic model suggest that the decision to adopt a monetary commitment technology is sensitive to the context in which it is made. Thus, the incentives to enhance central bank independence are different when the exchange rate is pegged than when it is allowed to fluctuate and the incentives to peg the exchange rate are different when the central bank is independent than when it is not. While both the degree of central bank independence and the nature of the exchange rate regime are, ultimately, the product of human choice, the historical record suggests that changes in the degree of central bank independence are quite rare. It is, therefore, reasonable to infer that the factors that determine the degree of central bank independence are relatively stable across time. Consequently, progress toward understanding the determinants of fixed exchange rates might be possible if we take the degree of central bank independence as given and ask what factors would be expected to influence the choice of the exchange rate regime. In this section of the paper I will, therefore, examine the model's predictions about the determinants of exchange rate regime choice when the

central bank is independent and when it is not.

The evaluation of the results of the models presented in this paper, both in terms of static statements about the conditions necessary to support particular regimes in equilibrium and in terms of how changes in the costs and benefits of institutions might produce changes in regimes, requires finding empirical referents for at least some of the terms in the Government's utility function. A full treatment of this question is beyond the scope of the current paper, but I will offer a few comments in an attempt to encourage empirical applications.

### 3.1 The Electoral Salience of Fiscal and Monetary Policy

As noted above, fixed exchange rates (Regimes B and D) are rendered less credible and less valuable (to the incumbent) compared to the no-commitment regime when actors place a high value on controlling monetary policy for electoral purposes, but they are rendered more credible when the incumbent places a high value on controlling fiscal policy for electoral purposes. Consequently, any factor that effects the desire to engineer macroeconomic expansions for electoral purposes does not necessarily influence the choice of the exchange rate regime.

Let us examine the situation where central bank independence is absent first. Under such circumstances the decision to peg the exchange rate amounts to a change from regime A to regime B. Bernhard and Leblang (1999) argue that domestic political institutions that raise the expected utility of being in government (such as majoritarian electoral laws and a committee system that grant low opposition influence on policy) should render incumbents more reluctant to fix the exchange rate and thereby forfeit control over monetary policy instruments that can be used to survive in office. The model in this paper, however, assumes that while pegging the exchange rate leads to an erosion of monetary policy autonomy it enhances fiscal policy autonomy. Thus, if as Bernhard and Leblang argue, an increase in the utility of holding office induces in actors a desire to retain control over the instruments that can help them survive in office, both  $M$  and  $F$  should be larger in majoritarian systems than in proportional representation systems and larger in systems with committee systems that grant little influence over policy to parties that are out of government. And since  $F$  and  $M$  appear on both sides of the conditions that need to be satisfied if a change from regime A to regime B is to occur, the choice of exchange rate regime should be unrelated to such factors when central bank independence is low.

The situation is different, however, when the incumbents are considering an exchange rate peg in the presence of an independent central bank. Under such circumstances survival-maximizing incumbents have nothing to lose by adopting an exchange rate peg - under flexible exchange rates and an independent central bank national fiscal policy autonomy is absent and the central bank controls monetary policy. A switch to a fixed exchange rate does not sacrifice control over monetary policy (they can't lose what they don't have) and it increases national fiscal policy autonomy - which they can use for electoral purposes with impunity since the loss in monetary policy autonomy reduces the

ability of the independent central bank to prevent/punish them for doing so. Thus, if an increase in the desire to hold office pushes  $M$  and  $F$  up it makes the credibility, superiority 1 and superiority 2 conditions for regime C more difficult to satisfy, has no net influence on the credibility and superiority 1 conditions for regime D, and makes superiority condition 2 for regime D easier to satisfy. When the central bank is independent the net effect, therefore, of an increase in the desirability of holding office is to *increase* the propensity to peg the exchange rate.

The current model, therefore, yields predictions that run contrary to Bernhard and Leblangs argument and evidence. They expect, and find, a positive association between institutions that increase the desirability of holding office and the propensity to peg the exchange rate, the model in this paper predicts that such institutions should be unrelated to the propensity to peg when the central bank is independent and associated with a *decreased* propensity to peg when the central bank is independent. I will discuss the reason why I believe they find evidence of an unconditional relationship between these domestic institutions and the choice of exchange rate regime below.

Budgetary institutions (such as strong finance ministers and target zones) that inhibit the use of fiscal policy for electoral purposes (Hallerberg and von Hagen 1997) could also be used as proxies for the expected utility of controlling fiscal policy. Goodhart (1998) finds that the institution of a strong finance minister (which would decrease  $F$  in the current model, and, thereby by make fixed exchange rate regimes both less desirable and less credible) is associated with a propensity to choose flexible exchange rates. This is entirely consistent with the model in this paper - as  $F$  decreases, the conditions that need to be satisfied for regimes B and D to be chosen will be more difficult to satisfy whether the central bank is independent or not.

Because tax cuts and spending packages can be more easily aimed at geographically concentrated political targets than changes in interest rates and the money supply, fiscal policy may be more useful than monetary policy in influencing the voting behavior of finely targeted constituencies. If this is true one would expect governments operating in electoral systems with small district magnitudes to place a greater weight on controlling fiscal policy (relative to monetary policy) than governments where district magnitude is large. As a consequence, the credibility and superiority 1 conditions for regimes B and D would all be easier to satisfy so we would expect fixed exchange rates to be more prevalent when district magnitude is small - again, whether the central bank is independent or not.

### **3.2 Ex Ante Costs of Regime Change - network externalities, executive legislative relations**

As noted above, the ex ante cost of building a monetary commitment technology will influence whether the resulting regime will be preferred by incumbents to

some alternative regime, but will never influence the propensity of incumbents to abide by that regime (and therefore, will not influence the credibility of the regime). Thus, ex ante costs are in many ways the "flip side" of the benefits of regime choice already discussed. There are a few factors however, that may be easier to conceptualize as costs of one regime rather than benefits of another.

The creation of a fixed exchange rate regime, for example, requires the development of the administrative capacity to intervene in foreign exchange rates in order to manage the currency's value. It is difficult however, to estimate this cost or to imagine correlates of these costs that might be used as indicators, except, perhaps for the demonstrated capacity to perform such functions in the recent past. There may also be external factor that may influence the cost of managing a fixed exchange rate. Cohen (1998) emphasizes the "network externalities" that are created when trading partner's share a commitment to a fixed exchange rate. Thus, the greater the number of countries that maintain fixed exchange rates, the lower the costs of anyone country doing so. In addition, functions (often associated with the presence of a hegemon) such as the existence of a relatively stable reserve currency to which one may peg, the existence of a lender of last resort, mechanisms for macroeconomic policy coordination, etc. may reduce the costs of maintaining a fixed rate.

The creation of an independent central bank requires the development of mechanisms that will allow elected officials to retain some degree of oversight over monetary policy. The literature on Congressional oversight of executive agencies in the U.S. (McCubbins and Schwartz 1984) could be used to develop better conceptualizations of these costs for comparative research, but the propensity for such delegation to take place in other issues may be an indication of the prior development of such mechanisms. Thus, something like the "independence of the civil service" or "professionalization of the bureaucracy" may be of use here.

### **3.3 Ex Post Costs of Regime Change - veto players**

Finally, we turn our attention to the costs incurred by incumbents when they renege on a commitment to forebear from the use of monetary policy for electoral purposes by pegging the exchange rate or restricting their ability to direct the central bank to change interest rates or the money supply. One obvious, but difficult to measure, cost in engaging in such behavior is the damage it does to one's reputation. Future commitments are likely to be viewed as less credible if current commitments are not honored. From the standpoint of survival maximizing incumbents, however, the reputation cost argument has a few difficulties. First, if re-election does not occur, it is not clear the incumbent has a (political) future to worry about. While it may make it difficult for future policymakers to make similar commitments, the fates of future policy-makers are not part of the current model. That said, a politician that defects from an existing commitment and is re-elected does have a future to worry about and, so, would incur some reputational cost in the next term.

A different, but not entirely unrelated, way to think about the cost of defec-

tion arises when one realizes that the failure to honor a commitment requires a change in the institutional status quo. Central bank independence, for example, is typically created by legislation that is not easily repealed. Similarly, the decision to devalue a pegged currency is the sort of decision that, in the absence of adequate parliamentary support, can spell downfall for a government. Building support for a change in the status quo is likely to be costly - actors in a position to block change are likely to make demands on government actors seeking to bring about a change in exchange for their support. Consequently, the larger the number of veto players, the more costly such changes will be.

As Tsebelis (1995) points out, the number of veto players is related to several factors including the existence of a president, a second legislative body, or coalition partners capable of blocking government action. Whatever the source of this veto power, if it is costly to overcome, the current model suggests that it will make each of the commitment technologies more credible and, therefore, can be expected to facilitate, to some extent, their adoption. Since the number of veto players is closely related to the number of parties in the governing coalition, we would expect fixed exchange rates and independent central banks to be more common in countries with multiparty coalition governments. Since we know from Duverger's Law that the number of parties is closely tied to the electoral system, this may explain why Bernhard and Leblang (1998) find evidence for a relationship between fixed exchange rates and proportional representation despite the fact that the current model predicts otherwise. While they find evidence of such a link, proportional representation may, in their tests, be acting as a proxy for the number of parties. Goodhart (1998) finds evidence of a positive association between the number of parties and fixed exchange rates and claims, but does not present evidence to demonstrate, that this relationship holds up even after "the institutional variables from Bernhard and Leblang" (p.15) are controlled for. Though multicollinearity may make it difficult, future empirical tests should attempt to find new ways to distinguish between these competing explanations.

Note that I qualified the statement above that monetary commitment technologies will be correlated with the number of veto players. I said this relationship held only "to some extent" because a careful look at Table 3 shows that the relationship between ex post costs and regime adoption is, at times, complicated. An increase in the cost of allowing a currency to fluctuate ( $^P C_r^I$ ) after a commitment to a peg (as in Regime B) always makes that commitment more credible and therefore increases the likelihood that Regime B will be chosen. Similarly, an increase in the cost of impinging on the independence of the central bank ( $^P C_r^D$ ) must be high if promises to respect independence are to be credible. But, this is only the case where if Regime B is not credible, for if Regime B is credible, then Regime B will be chosen and, therefore, an increase in the credibility of Regime C will have no effect.

## 4 Conclusion

The rather simple, complete information models in this paper accomplish two things. First, they generate explanations about why survival maximizing incumbents might be willing to choose institutions that constrain their ability to use certain policy instruments for electoral purposes. Second, these models suggest that central bank independence may occur, in large part, because it increases the credibility of fixed exchange rates commitments. Finally, the models provide a mechanism for comparing and synthesizing many of the varied explanations of the choice of monetary commitment technologies that exist in the literature. Not surprisingly, however, these complete information models, however, do not do a very good job of explaining the conditions under which incumbents will fail to honor monetary commitments.

Both the decision theoretic and game theoretic models are capable of explaining the choice of a fixed exchange rate regime, which forces incumbents to relinquish control over monetary policy, even when the incumbent cares only about being re-elected. The social benefits of monetary commitment technologies are not part of the incumbent's utility function in the decision theoretic model and fixed exchange rates can occur in the game theoretic model even when these benefits are absent. Such an explanation is possible because the model recognizes that while the choice of fixed exchange rates means the loss of monetary policy autonomy, it also means enhanced of fiscal policy autonomy. In the previous section I pointed to some empirical implications of the argument that the choice of fixed exchange rates is driven, in part, by the desire of some incumbents to use fiscal rather than monetary policy for electoral purposes.

Both models also suggested that the conditions under which survival maximizing incumbents would prefer a monetary commitment regime involving central bank independence might be quite rare. This is because, unlike fixed exchange rates, central bank independence does not compensate the loss of control over monetary policy for electoral purposes with the ability to control fiscal policy. Instead, an explanation for the creation of central bank independence must rely on the creation of broader benefits (the relevance, of which, to the survival maximizing incumbent must be explained) or the role it might play in enhancing the credibility of a fixed exchange rate regime.

Although the operationalization of the parameters in these models is by no means trivial, both models also suggest new empirical tests and shed new light on some existing findings. Most importantly, these models can be interpreted quite generally and, therefore, invite the comparison and integration of existing partisan, sectoral, and institutional explanations for the choice of monetary commitment technologies.

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