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Checks and balances, private information, and the  
credibility of monetary commitments

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**Checks and balances, Private Information,  
and the Credibility of Monetary Commitments**

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**Abstract: Checks and balances, Private Information, and the Credibility of Monetary Commitments**

Philip Keefer and David Stasavage

We argue that the effectiveness of central bank independence and of exchange rate pegs in solving credibility problems is contingent on two factors: political institutions and information asymmetries. However, the impact of these two factors differs. We argue that the presence of one institution, multiple political veto players, should be crucial for the effectiveness of central bank independence, but should have no impact on the efficacy of exchange rate pegs. In contrast, exchange rate pegs should have a greater anti-inflationary impact when it is difficult for the public to distinguish between inflation generated by policy choice and inflation resulting from exogenous shocks to the economy. Such information asymmetries between the public and the government, however, do not increase the efficacy of central bank independence. Empirical tests using newly developed data on political institutions provide strong support for these hypotheses.

## 1. Introduction

Positive models of monetary policy have focused on the fundamental difficulty that governments can encounter in establishing the credibility of their policy commitments: after governments have announced their monetary policy and the public has taken actions that rely on that policy, such as signing wage contracts, governments may have an incentive to increase the rate of inflation *ex post*. Attempts to solve this credibility problem are complicated by two information asymmetries: the public may have little information about policy maker preferences and therefore about the incentives of policy makers to renege on any policy commitments they make; and the public may not be able to observe policy maker actions, thereby making it more difficult for the public to detect whether policy makers have adhered to an announced policy. Considerable research has investigated the use of central bank independence and exchange rate pegs as instruments that governments might use to establish policy credibility. This paper addresses two related puzzles that have received less attention in the literature: why is it more costly for politicians to revoke central bank independence or fixed exchange rates than to abandon more simple commitments, such as a promise to maintain a specific rate of inflation? And why does the presence of an independent central bank or a pegged exchange rate deliver more information to the public than simple policy announcements?

To answer these questions, we first investigate whether the presence of multiple veto players in government makes it more difficult for governments to renege on exchange rate pegs or central bank independence. We next consider whether the public finds it easier to observe government policy actions when an exchange rate peg or central bank independence has been adopted. We find that the effectiveness of central bank independence in solving credibility problems depends on the presence of multiple veto players in government.

Following earlier contributions, we show that independent central banks enhance the credibility of monetary policy to the extent that there are multiple veto players in government.<sup>1</sup> However, we argue that central bank independence does not improve the public's ability to observe policymaker actions.

In contrast, we suggest that the effectiveness of exchange rate pegs in solving credibility problems *does not* depend on the number of veto players in government. Instead, following arguments made by Canavan and Tommasi and Herrendorf, we argue that the primary contribution of exchange rate pegs is to make it easier for the public to judge whether a policymaker has deviated from a previously announced commitment.<sup>2</sup> In other words, they help reduce the information asymmetries between government and the public. Exchange rate pegs should therefore have a larger anti-inflationary effect in contexts where it would otherwise be difficult for the public to observe policy maker actions.<sup>3</sup>

Our empirical results strongly support these propositions; they are robust to alternative specifications emphasizing the effect of democratic institutions more generally on monetary commitments. These findings are also general: we obtain them using a sample that includes both developed and developing countries (78 in total) over the period from 1975 to 1994.

Our investigation has direct implications for the question posed by Bernhard, Broz and Clark: if commitment mechanisms like central bank independence unambiguously improve general welfare, why do all countries not adopt them?<sup>4</sup> One possible answer is that the social welfare function assumed in the literature incompletely reflects the social tradeoffs

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<sup>1</sup> See Lohmann (1998), Moser (1999) and Keefer and Stasavage (2000).

<sup>2</sup> Canavan and Tommasi (1997) and Herrendorf (1998).

<sup>3</sup> On the idea that exchange rate pegs provide a more transparent form of commitment see also Broz (2002).

<sup>4</sup> Bernhard, Broz and Clark (2002). See also Bernhard (1998), Maxfield (1997), (Broz, 1999), Clark and Maxfield

between inflation and economic growth. If institutional reforms such as central bank independence reduce social welfare in some countries, governments would be naturally reluctant to embrace them. The institutional and information hypotheses that we analyze offer a different answer to the question: even if central bank independence increases social welfare, commitment mechanisms like central bank independence may simply not work.

The remainder of the paper is organized as follows. We first consider the conditions under which central banks and exchange rate pegs will increase credibility of monetary policy in a world of complete information. We then consider the conditions under which these two instruments provide more information about the preferences of policy makers than do the underlying policies enacted by policy makers. The influence of political institutions is analyzed in both sections. We then present cross-country empirical tests of several propositions and evaluate the robustness of the findings.

## **2. Political institutions and monetary commitments**

### ***Central bank independence and political institutions***

In the canonical contribution on central bank independence, Rogoff argued that delegation to an independent central bank might solve the time consistency problem in monetary policy and be welfare-improving.<sup>5</sup> The crucial implicit assumption in this work is that the central bank acts with irreversible, full autonomy. If, however, central bank decisions are no more difficult for political actors to override than are economic policies themselves, independent central banks may do little to prevent *ex post* renegeing on inflation commitments. Instead of solving the time consistency problem, central bank independence would merely displace it, as governments would have an incentive to first announce central bank

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(1997), and Bernhard and Leblang (1999).



independence and subsequently renege on this commitment.

Central bank independence could be protected from override by constitutional guarantees. The precise effect of constitutional guarantees is clarified by Lohmann: legal central bank independence is likely to make a difference for policy outcomes if a larger number of veto players is required to revise a central bank's statute than would be required to make a change in monetary policy if the government had regained discretionary control over policy.<sup>6</sup> For example, if monetary policy under discretion were set by the executive alone, but revisions of the central bank charter required the agreement of both the executive and the legislature, delegation to an independent central bank could increase the credibility of monetary policy<sup>7</sup>

However, it is not evident in practice that a greater number of political actors is required to consent to changes in a central bank charter than is required to change monetary policy in the absence of an independent central bank. The central bank charters of most countries are laws voted by legislatures rather than inscribed in constitutions; thus central banks are no less vulnerable, in principle, to having their actions or independence overturned by political authorities than would be the case with other types of legislation. Moreover, as the literature on legislative control of bureaucratic institutions emphasizes, failure to observe frequent changes in central bank statutes is an unreliable indicator of independence, since if the threat of a statutory revision is credible, central banks will face incentives to modify their

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<sup>5</sup> Rogoff (1985)

<sup>6</sup> Lohmann (1998). More generally, comparative research on political institutions and policy making has demonstrated that it is more difficult to pass laws in countries where decision making is divided between multiple veto players, whether a separate executive and legislature in the case of presidential systems, or multiple parties within a coalition government within parliamentary systems (for a recent comprehensive discussion, see Tsebelis (2002).

Whether credibility actually increases also depends on the preferences of the different veto players.

policies to avoid revision.<sup>8</sup>

It might be argued that only the executive, rather than the executive and legislature, has full control of monetary policy if there has been no decision to delegate. However, this is not always accurate. In a coalition government, the party controlling the finance ministry may nominally have full control of monetary policy, but in practice other coalition members can threaten to leave the coalition when confronted with finance ministry actions to which they are strongly opposed. Likewise, in a presidential system the legislature also exerts influence on monetary policy making to the extent there are spillovers from fiscal policy to monetary policy. Thus, in practice a similar number of actors may be required to consent to changes in central bank laws as would be required to consent to changes in monetary policy in the absence of an independent central bank.

The important question that remains, therefore, is how delegation of policy making authority to an independent agency can make a difference for policy when the number of veto players required to overturn delegation and to change monetary policy is the same. In earlier work, we address this question by comparing the effects of delegation under a variety of institutional arrangements.<sup>9</sup> We expand the classic Barro-Gordon model to investigate how monetary policy outcomes depend on the number of veto players in a political system and on whether there has been a prior decision to delegate to an independent central bank.

In the case where there has not been a prior decision to delegate and monetary policy is set directly by government, the order of moves in the game is as follows: first the public establishes its inflation expectations, then a random supply shock occurs, then monetary

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<sup>8</sup> See, especially, Weingast and Moran (1983).

<sup>9</sup> See Keefer and Stasavage (2000). Moser (1999) has also considered this question. His model assumes that under checks and balances, with no delegation, policy outcomes are the result of a simple bargain between the veto players, and he then shows that delegation by multiple political actors can lead to lower inflation expectations than would prevail in the absence of an independent central bank.

policy is chosen. If there is only one veto player then that veto player sets policy unilaterally. If there are two veto players then one of the two players is assumed to have the agenda power to make a “take it or leave it” offer to the other player. If the offer is refused, then the default outcome is determined by the wage contracts signed by the public. Earlier we have shown that the policy the veto players select depends on whether the more or less inflation-averse veto player has agenda control.<sup>10</sup> It also depends on whether expected inflation is higher than the preferred inflation outcome of the less inflation-averse political actor, lower than the preferred inflation of the most inflation-averse actor, or between the two, each case resulting in the two actors agreeing to a different inflation outcome.

Outcomes may differ significantly if there has been a prior decision to delegate to a central bank. In this case the game proceeds as follows.

1. The public establishes inflation expectations and signs wage contracts
2. A random supply shock occurs
3. The central bank chooses monetary policy
4. The veto player(s) decide whether to override the central bank – a decision to which both must agree, by definition. If all veto player(s) do not agree to override, then the inflation rate chosen by the central bank prevails and the game ends.
5. If the veto player(s) decide to override the central bank, then they choose a new policy as in the case where there is no central bank.

In this model the central bank has agenda-setting power yet, unlike other models of monetary delegation, it is possible for politicians to override the central bank. As a result, the

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<sup>10</sup> Keefer and Stasavage (2000).

relationship between political actors and the central bank in our earlier work reflects the logic of “agency drift” models of legislative control over bureaucratic institutions.<sup>11</sup> When there are two veto players, the key difference between monetary policy made under discretion (without CBI) and monetary policy made under delegation (CBI) is the change in the default outcome that confronts the political decision makers.

In the case without CBI the default outcome is the rate of inflation which results from the price increases written into wage contracts by the private sector. Under delegation, in contrast, if veto players are unable to agree to override the central bank, the default outcome is the rate of inflation chosen by the central bank. Knowing this, the central bank has an incentive to choose a rate of inflation which is override-proof. More specifically, if we assume that the central bank is more averse to inflation than any veto player, then it will choose a rate of inflation which leaves the most inflation-averse veto player no worse off than if the two veto players overrode the central bank and subsequently agreed on a new rate of inflation.

One of the core predictions from the model in Keefer and Stasavage is that central bank independence can only have an effect on inflation outcomes if there are multiple veto players in government.<sup>12</sup> To see this consider first what options face a central bank that has been granted control of monetary policy in a political system with only one veto player. Any attempt to pursue a lower rate of inflation than that preferred by the single veto player would be overridden. As a result, when there is only one veto player in government, inflation outcomes will be identical regardless of whether there has been a prior decision to delegate. In contrast, when political power is divided between multiple veto players then a prior

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<sup>11</sup> See McCubbins, Noll and Weingast (1987) and Epstein and O’Halloran (1999)

<sup>12</sup> Keefer and Stasavage (2000).

decision to delegate to an independent central bank can have a significant impact on inflation outcomes. Provided that veto players do not share the same preferences, the central bank can now successfully implement a policy which one veto player would prefer to override, as long as a second veto player would refuse to override. The end result is that the inflation outcome will be different from the outcome in the case where there has not been a prior decision to delegate, and veto players must bargain over the inflation rate. This leads to our first main proposition.

*Proposition 1: Central bank independence is more effective as an anti-inflationary device when there are multiple veto players in government*

This basic result, that the effect of central bank independence will be greater when there are multiple veto players, would also hold under a variety of assumptions different from those used in Keefer and Stasavage.<sup>13</sup> For example, if we assumed that veto players bore some exogenous political cost from deciding to override, then delegation to a central bank could have an effect on outcomes even when there was only one veto player, but the effect of CBI would still be larger when there are multiple veto players in government. In the second half of the paper, we present tests of the following proposition that emerges from this discussion.<sup>14</sup>

### ***Exchange rate pegs and political institutions***

Exchange rate pegs are widely believed to serve as a form of credible commitment, because adopting a peg reduces the ability of a government to conduct an independent

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<sup>13</sup> Keefer and Stasavage (2000).

<sup>14</sup> In our empirical tests we assume, as is conventional, that central bankers on average have conservative

monetary policy. As is well-known, to the extent that foreign assets are substitutable for domestic assets, a country's money supply - and hence its inflation rate - are exogenously determined from the point of view of the policy maker. All a government need do to establish such a peg is to declare that it is willing to sell foreign currency for domestic currency at a fixed rate. If private actors believed that the exchange rate peg is immutable, their domestic inflation expectations would then simply equal expected world inflation. As shown by Obstfeld, however, if a policy maker has a standard Barro-Gordon model loss function, then she would have an *ex post* incentive to devalue - to abandon the peg - in order to generate a higher rate of inflation.<sup>15</sup>

Obstfeld suggests that exchange rate pegs may nonetheless increase monetary policy credibility if devaluation imposes additional political costs on governments. To model this possibility he simply adds a parameter to the policy maker's utility function that represents the exogenous costs that the policy maker confronts if she abandons the peg.<sup>16</sup> This solution parallels the assumption made by Rogoff regarding the irrevocability of central bank independence.<sup>17</sup> As with that assumption, it is not clear why governments that abandon exchange rate pegs suffer larger political costs than governments that renege on more simple policy pledges to maintain a specific rate of inflation or to maintain a specific rate of money growth.<sup>18</sup>

Since institutional factors appear to be a crucial foundation of the efficacy of central bank independence, one might first ask whether the presence of multiple veto players in

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preferences with regard to output-inflation tradeoffs.

<sup>15</sup> Obstfeld (1996).

<sup>16</sup> Inclusion of this additional parameter also generates the possibility of multiple equilibria, an issue we do not discuss here.

<sup>17</sup> Rogoff (1985).

<sup>18</sup> See the observation by Persson and Tabellini (1994) p.17.

government also ensures the effectiveness of a pegged exchange rate in reducing expected inflation. Three examples suggest that this is unlikely to be the case.

First, it is common in the literature to assume that countries peg their currencies to the currencies of foreign countries with inflation much lower than their own. This pegging strategy implies that domestic inflation under the exchange rate peg could be lower than the minimum level of inflation acceptable to even the most inflation-averse domestic government veto player. Following the logic in the model of Keefer and Stasavage, such inflation outcomes would be overturned by domestic political veto players, no matter how many veto players there are.<sup>19</sup> Under these conditions a peg would fail to serve as a form of credible commitment, regardless of whether there are checks and balances in government.

A second crucial point is that pegs are often established by the executive branch alone, without legislative approval. If abandoning a peg is also a matter only of executive discretion, we reach a similar conclusion: no matter how many veto players are present in government, the peg will not reduce inflation expectations because the decision to abandon the peg will be the prerogative of a single veto player.

Third, even if it is the case that foreign inflation outcomes are not extremely low and the introduction of a peg is a decision of both the legislature and the executive branch, checks and balances may still not improve the efficacy of the peg, and may in fact detract from it, by making it more difficult for government to respond to shocks that threaten the peg. Take a case where economic circumstances are such that government intervention is necessary to avoid *de facto* devaluation and abandonment of the peg. Under these circumstances, the default outcome under a peg – *de facto* devaluation – converges to that under a flexible exchange rate (where the same circumstances would lead to a depreciation). A peg could

come under threat whenever economic circumstances trigger an outflow of foreign reserves and those reserves are scarce. Any exogenous shock that increases domestic inflation would trigger such an outflow. Under these conditions, if foreign reserves are scarce and a country is exposed to inflationary shocks, a pegged exchange rate leads to nearly the same outcome as a flexible exchange rate in the absence of countervailing government action. Under these conditions even in the presence of checks and balances, the pegged exchange rate will do little to "tie the hands" of policy makers.<sup>20</sup>

Several institutional variations have been omitted from the foregoing discussion. Their introduction does not fundamentally change the analysis, however. For example, what if the responsibility for defending an exchange rate peg is assigned to an independent central bank or, even more stringently, what if a currency board arrangement is established by law? In this case it would be the independence of the bank or the legal status of the currency board which provides the commitment and not the peg itself.<sup>21</sup> Similarly, it is sometimes the case that governments attempt to make pegs credible by giving a central bank the right to refuse a request by the government for monetary financing of a fiscal deficit. This makes it difficult for government to entertain fiscal policies that would trigger a loss of foreign exchange under a peg. Again, in this case it would be the presence of central bank independence which secures policy credibility and not the peg, *per se*. These arguments therefore suggest a second testable hypothesis that emerges from this analysis.

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<sup>19</sup> Keefer and Stasavage (2000).

<sup>20</sup> Since we have restricted our attention here to the case of exchange rate pegs with full convertibility, we do not consider the possibility that a government would deal with a problem of scarce reserves by imposing exchange controls. This option might preserve a peg, but since it would also allow the government to regain control of the domestic money supply, it would also imply that the peg was no longer effective as a commitment device.

<sup>21</sup> It should also be noted that in many cases where independent central banks have operational responsibility for managing a peg, the decision whether to maintain or abandon the peg remains the prerogative of the finance ministry. We think an anonymous referee for alerting us to this consideration.



*Proposition 2: Exchange rate pegs are not more effective as anti-inflationary devices when there are multiple veto players in government.*

### **3. Monetary commitments and information asymmetries**

Attempts by governments to establish credibility for their monetary policies are further complicated by asymmetric information. First, the public may be uncertain about the relative importance which government veto players give to inflation stabilization vs. output stabilization, and therefore government incentives to renege on their monetary policy commitments. Second, the public may observe policy maker actions imperfectly, because policy makers have incomplete control of inflation.<sup>22</sup> In particular, the public may find it difficult to determine the extent to which observed inflation results from deliberate governments actions, or whether it is instead due to the realization of exogenous shocks that are beyond government control. Uncertainty about preferences creates incentives for policymakers to take actions that “signal” their preferences to the public. Imperfect control of inflation makes these signals more difficult for the public to interpret. Central bank independence and pegged exchange rates have both been identified in the literature as tools that governments can use to send more reliable signals about their policy preferences and actions.

#### ***Central bank independence and private information***

Maxfield has argued that many recent efforts to increase central bank independence can be explained as attempts by governments to signal policy preferences.<sup>23</sup> The government announces the creation of an independent central bank and claims that it is staffed by inflation-averse individuals. If the public subsequently observes high inflation, it understands

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<sup>22</sup> See Canzoneri (1985).

<sup>23</sup> Maxfield (1997).

that this cannot be consistent with the planned inflation of a conservative central bank. The public is therefore likely to believe that high inflation is due to meddling by the government. This could make the adoption of an independent central bank a potentially valuable signal.

The difficulty with this logic is that it does not clearly demonstrate why central bank independence has greater signaling value than do other types of policy announcements. The government could just as easily announce a particular inflation or monetary growth target at the beginning of the period, and the public could draw the same conclusions after observing final inflation.

One reply to this argument is that central bank independence might make it easier for the public to observe political interference in monetary policy decisions. However, Broz argues that it is the transparency of a political system which makes such actions observable, not central bank independence *per se*.<sup>24</sup> Just as importantly, governments do not need to undertake the very visible action of revoking the charter of a central bank or replacing a central bank governor in order to pressure central banks to pursue a more generous monetary policy. They can instead exercise more subtle and less visible forms of pressure, ranging from reducing the resources of the central bank to social ostracism of the central bank leadership.

It might also be the case that central bank independence improves the problem of imperfect observability of policy. Here, however, recent literature has suggested that it is not independence that improves observability of policy, but instead the extent to which central banks, independent or not, are transparent in their operations and procedures.<sup>25</sup>

It might finally be the case that within some institutional frameworks, central bank

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<sup>24</sup> Broz (2002).

<sup>25</sup> See Faust and Svensson (2001); Chortareas, Stasavage, and Sterne (2001); and Stasavage (2001).

independence has more signaling value than in others.<sup>26</sup> We know from the earlier argument that government interference in central bank decision making is more difficult in the presence of checks and balances. However, the key issue in a signaling context is whether, under checks and balances, meddling with central bank decisions is easier for the public to detect. There are a number of reasons to suspect that this might be the case. For example, override of a central bank may require a legislative act that is more public than would be a simple instruction from a President to a *dependent* central bank. Competing political actors inside government may have a greater incentive to register public complaints about the treatment of the central bank when it has been granted legal independence. We leave to further work the more rigorous exploration of this issue, however. Still, even in these cases, it would be difficult to argue that the effectiveness of central bank independence derives primarily from such signaling benefits rather than from the straightforward notion that multiple veto players hinder excessive meddling in central bank decisions.

Central bank independence is likely, then, to be a weak response to the problems of asymmetric information in monetary policy. Whether or not asymmetric information is severe should therefore have little impact on the efficacy of central bank independence in reducing inflation, giving rise to our third testable proposition.

*Proposition 3: Central bank independence will not be more effective in reducing inflation when it is more difficult for the public to observe policy maker actions.*

### ***Exchange rate pegs and private information***

Deviation from exchange rate pegs is transparent and for that reason pegging can potentially be more effective than central bank independence in overcoming problems of

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<sup>26</sup> Clark and Maxfield (1997) also emphasize the importance of examining the institutional context.

private information in monetary policy.<sup>27</sup> In particular, abandonment of a peg may be a more transparent indicator of inflationary government practices than is either a high rate of growth of the money supply (which may be generated by an unanticipated change in the money multiplier) or a high rate of inflation (which may result from a shock to money demand). Pegging the exchange rate can avoid the uncertainties surrounding the connection between unobserved government policy and observed final inflation, allowing the public to better infer the preferences and actions of government actors.<sup>28</sup>

Canavan and Tommasi and Herrendorf have formalized this argument using somewhat different models.<sup>29</sup> Both models provide a rigorous explanation of previous empirical findings showing that countries that have adopted fixed exchange rate pegs have lower inflation than others. However, the specific predictions of these models have not been empirically tested. The basic conclusion of both is that pegging should be more effective in environments in which it is difficult for the public to distinguish the contribution of government policy to inflation. Canavan and Tommasi show that inflation should be lower the greater is the precision with which the public can observe the contribution of the government's policy action to final inflation. Since in their model the point of pegging the exchange rate is to increase this precision, if precision is high to begin with (in the absence of a peg), we would expect the peg to have little impact on inflation.

As with central banks, we can also ask whether the effect of pegs in solving problems

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<sup>27</sup> See Broz (2002).

<sup>28</sup> The principal exception to this argument concerns devaluations that are triggered by circumstances such as herd behavior on the part of investors or other actions beyond the control of governments. Such factors might reduce the extent to which exchange rate pegs provide a transparent indicator of government actions. It is also important to note that while exchange rate pegs may be transparent, intermediate exchange rate regimes such as those which allow the exchange rate to fluctuate within a band are less likely to be so. Frankel, Schmukler, and Servén (2000) have shown that in practice it may take considerable time for markets to distinguish between these intermediate regimes and a float.

<sup>29</sup> Canavan and Tommasi (1997) and Herrendorf (1999).

of private information is dependent on the presence of multiple veto players in government. It is evident that abandoning a peg that was previously established is as visible to the public when there are multiple veto players as when there is only one. The signaling value of the peg does not, therefore, change. The question of whether pegs are more or less likely to be adopted under checks and balances is the more important and complex one, exceeding the bounds of this paper.<sup>30</sup>

This argument, then, yields our fourth and final proposition, that pegged exchange rates are likely to reduce inflation rates because they reduce information asymmetries. They should therefore have their greatest impact on inflation when the public has the greatest difficulty discerning government policy contributions to inflation outcomes, due for example to volatility of money demand. We test all four propositions in Section 4.

*Proposition 4. Exchange rate pegs are more effective in reducing inflation when it is more difficult for the public to observe policy maker actions.*

#### **4. Empirical tests**

In order to test our propositions, we examine economic and political determinants of inflation in a sample of 78 countries covering the period 1975-1994. This choice of time period is determined by the end of the Bretton Woods era and sample size is determined by data availability. Our empirical tests follow the specifications used in recent papers investigating the effect of monetary institutions on inflation outcomes.<sup>31</sup> Because the institutional variables with which we are concerned change with relatively low frequency, we follow the majority of recent papers in the literature by investigating period averages. We report results both from cross-section regressions (averaging values for each country over the

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<sup>30</sup> See Bernhard and Leblang (1999)

<sup>31</sup> See Franzese (1999), Hall and Franzese (1998), Campillo and Miron (1996) and Cukierman, Webb, and

entire period) and from cross-section time-series regressions where variables are averaged across five-year time periods.

### ***Presentation of data***

We use inflation as our dependent variable, following the logic that where the inflation bias due to time-consistency problems is higher, so also is average inflation. In order to control for the effect of countries with extremely high levels of inflation, we use the log of the inflation rate.<sup>32</sup>

To measure central bank independence we use the index developed by Cukierman, Webb, and Neyapti (1992), since this is the one indicator which covers a sample of both OECD and non-OECD countries. It is based on sixteen different characteristics of central bank statutes, such as provisions for monetary policy decisions, resolution of conflicts between central bank and government, and provisions for replacing the central bank governor. While Cukierman, Webb, and Neyapti's original dataset runs only up to 1989, more recent studies have compiled updated information on central bank independence and in some cases data on new countries.<sup>33</sup>

The IMF's Annual Report on Exchange Arrangements and Exchange Restrictions presents information on exchange rate pegs.<sup>34</sup> We have classified countries according to those which adopt some form of a nominal exchange rate peg (peg = 1) and those which do not. This covers countries which peg their currency to a single other currency and those which peg to a basket of currencies. Countries that allow a very limited amount of nominal

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Neyapti (1992).

<sup>32</sup> Based on CPI data from the IMF, *International Financial Statistics*

<sup>33</sup> See in particular Cukierman, Miller and Neyapti (1998). Note that the *de facto* indicator that they have developed of central bank independence, rates of central bank governor turnover, are not appropriate for our tests, since we are precisely interested in the extent to which legal prescriptions prevent this sort of intervention.

<sup>34</sup> See Ghosh et al. (1995). We have updated this dataset to cover the period 1990-94.

exchange rate flexibility (as in the European Monetary System) are also classified as having pegged regimes. We opt for this binary classification (peg vs. no peg), because economic theory does not offer firm predictions about the extent to which some types of pegs might be more effective than others.<sup>35</sup>

This study also uses newly developed cross-country data on political institutions. Keefer has developed a measure of checks and balances in government, based on objective indicators assembled by Beck et al.<sup>36</sup> The index counts the number of veto players present in a political system, including both what Tsebelis has called “constitutional” veto players as well as “partisan” veto players.<sup>37</sup> For presidential systems checks counts the number of veto players, counting the executive and legislative chamber(s) separately only if they are controlled by different parties. For parliamentary systems, checks counts the number of parties in the government coalition, based on the assumption that individual coalition members will enjoy veto power over policy. The index is modified to take into account the fact that certain electoral rules (closed list vs. open list) affect the cohesiveness of governing coalitions.<sup>38</sup> Since the probability that at least one actor prefers the status quo is likely to increase at a decreasing rate with the number of veto players counted by checks, we use a log version of check, *log check*, in our regressions.

Testing of the informational propositions 3 and 4 requires variables that capture the

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<sup>35</sup> Though as previously mentioned economic theory does offer reasons to believe that these pegs might be more effective as anti-inflationary devices than would regimes where the exchange rate is allowed to fluctuate within a wider band.

<sup>36</sup> Keefer (2002) and Beck et al. (2001).

<sup>37</sup> Tsebelis (1995).

<sup>38</sup> For presidential systems, *checks* is the sum of 1 for the president and 1 for each legislative chamber. The value is increased by 1 if an electoral competition index developed by Bates, Ferree, and Singh is greater than 4 (out of a possible 7). Also, in closed list systems where the president's party is the 1st government party, the legislature is not counted. For parliamentary systems, *checks* is the sum of 1 for the prime minister and 1 for each party in the governing coalition. If elections are based on a closed list system and the prime minister's party is the 1st government party, then this sum is reduced by one. As for presidential systems, the value of *checks* is

public's difficulty in distinguishing between inflation generated by government policy and inflation generated by exogenous shocks. We use several different proxy measures for the public's uncertainty, achieving significant results with all of them.

The first measure we use to proxy for the degree of uncertainty about the policymaker's intended rate of inflation is instability in a country's money multiplier, as suggested by both Canavan and Tommasi and by Herrendorf. We use the variable *volatility M2/M0*, the standard deviation of the ratio of broad money (M2) to base money (M0), as our first measure of uncertainty about the policymaker's intended rate of inflation. The idea is that the government or central bank controls base money directly, but inflation outcomes also depend upon changes in broad money that are in part beyond the central bank's control. When the money multiplier is volatile, the public faces a larger challenge in inferring monetary policy intentions from inflation outcomes.<sup>39</sup>

The second measure of the noise that interferes with the public's ability to infer government policy is the volatility of the terms of trade. The variable *volatility tot* measures the standard deviation of the annual change in a country's capacity to import as a share of national income.<sup>40</sup> The capacity of a country to purchase imports out of its exports can increase either because the world prices of a country's imported goods have fallen relative to those of its exports, or because a country has experienced a positive supply or income shock so that it can afford more imports (for example, if its costs of production have exogenously declined). Under a flexible exchange rate, both shocks have implications for domestic prices.

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modified upwards by 1 if the value of the index for electoral competition is greater than 4.

<sup>39</sup> In our section considering the robustness of our results we also ask whether including volatility in the money multiplier as an explanatory variable creates a simultaneity bias in our regressions.

<sup>40</sup> *World Development Indicators CD-ROM*. The terms of trade adjustment variable that we use equals capacity to import less exports of goods and services. Data are in constant local currency. We preferred this to a more standard terms of trade measure, (price of exports / price of imports) largely because of data availability, but also because the extent to which terms of trade shocks affect domestic inflation depends not only on the size of



Consequently, the larger the *volatility tot* measure, the larger are the shocks that make it difficult to judge what a policymaker's intended rate of inflation was, and the larger the impact that we would expect the introduction of a peg to have on inflation.<sup>41</sup>

The third proxy we use to gauge the public's difficulty in observing planned inflation is the quality of a country's economic data. As Herrendorf argues, when a country's consumer price statistics are known to include frequent errors, it is more difficult for the public to assess the true rate of inflation and therefore more difficult to extract the intended rate of inflation from the officially reported rate of inflation.<sup>42</sup> The introduction of a peg has a larger impact on the precision with which the public can assess government policy when CPI data is of poor quality, and therefore should have a larger downward impact on inflation. The quality of a country's consumer price index data cannot be measured directly, but there are indicators available which are designed to measure the overall quality of a country's economic statistics. The Penn World Tables data set constructed by Summers and Heston includes a measure of data quality, *grade*, which is based on results of United Nations surveys. A higher value for *grade* indicates more reliable data.

In addition to the institutional and informational variables, the regressions include three further variables to control for determinants of inflation that are unrelated to the theoretical arguments in the paper. First, there are both strong theoretical and empirical reasons to believe that political instability is causally linked with inflation. In order to measure political instability with improved precision, we have developed a new variable *political instability*, based on information in the database reported in Beck, et al., which for each

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the shocks, but also on the degree of openness of an economy.

<sup>41</sup> It is interesting to note here that governments with volatile terms of trade will face an acute dilemma, because if exchange rate pegs have a greater anti-inflationary impact in countries with more volatile terms of trade, governments which peg will also find it more difficult to achieve real exchange rate adjustments, and this cost will be greater the more volatile are terms of trade.

country and each period measures the fraction of all veto players who were replaced from the period earlier. In authoritarian systems with only one veto player this amounts to measuring the rate of government turnover. In systems with more than one veto player, however, this variable captures the possibility that governments might frequently change, but some coalition partners might be present in several successive governments.

Following Romer we also include a measure of openness based on the argument that incentives for policy makers to generate surprise inflation should be weaker in countries which are more open to trade.<sup>43</sup> The variable *openness* is measured in the standard manner as the sum of exports plus imports, divided by a country's GDP.

(Table I here)

We also include the log of real GDP per capita as a control variable. Poorer countries tend to have less well developed tax systems, and under these conditions governments have an increased incentive to rely on seignorage for revenue. A further rationale is that some of our institutional variables are highly correlated with levels of income. Including *log GDP* in the specification addresses concerns that our political and informational variables are merely proxying for overall levels of development between countries.

### ***Testing propositions 1 & 2***

We evaluate our first and second propositions by using a model with interaction terms, which allows the marginal effect of central bank independence and exchange rate pegs on inflation to vary with the extent of checks and balances. The general form of our

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<sup>42</sup> Herrendorf (1998).

<sup>43</sup> Romer (1993).

regressions is as follows.

$$\log inflation = \alpha + \beta_1 CBI + \beta_2 peg + \beta_3 CBI \times \log check + \beta_4 peg \times \log check + \beta_5 openness + \beta_6 instability + \beta_7 lngdp + \beta_8 \log check + \varepsilon$$

Proposition 1 predicts that the interaction term  $CBI \times \log check$  has a negative coefficient while the interaction term  $Peg \times \log check$  is predicted in Proposition 2 to be insignificant. The net effect of central bank independence, given by  $\beta_1 + \beta_3 * \log check$  should be negative at high levels of checks and balances. In contrast, proposition 2 does not deliver a firm prediction about whether the net effect of pegging,  $\beta_2 + \beta_4 * \log check$ , should be positive or negative at high levels of checks and balances.

Regressions 1 and 2 in Table II report results of baseline regressions that do not include interaction terms. In both regressions the estimated anti-inflationary effect of adopting an exchange rate peg is both statistically and economically significant. In contrast, in both samples the coefficient on CBI is actually positive and significant, suggesting that higher central bank independence is actually associated with higher rates of inflation when one controls for other determinants. This is a strong indication that legal central bank independence on its own is, on average, unlikely to deliver anti-inflationary credibility.

Regressions 3 and 4 test our propositions about the effect of political institutions on the credibility of monetary commitments. In both regressions the coefficient on the interaction term  $CBI \times checks$  is negative and statistically significant at the 5 percent level. The substantive results of the regressions are also consistent with Proposition 1. Based on the estimates in regression 3 in a parliamentary system with a three party coalition ( $\log check=1.6$ ) an increase of 0.2 in  $CBI$  (equivalent to moving from the 25<sup>th</sup> percentile to the 75<sup>th</sup> percentile in the sample) would be associated with a 31 percent decrease in the annual rate of inflation. The effect of the same increase in central bank independence in a parliamentary system with a

single party majority ( $\log check=1.1$ ) would actually be an *increase* in inflation of 48 percent.

To provide a better visual impression of our findings, Figure II shows the estimated effect on log inflation of a 0.2 increase in CBI at different levels of  $\log check$  (based on regression 3). The solid line represents the estimated effect, the two dotted lines represent the boundaries of the 90% confidence interval, and the horizontal line represents 0 change in inflation.<sup>44</sup> The evidence suggests that increased central bank independence has a negative effect on inflation only in the set of countries with relatively high levels of checks and balances (within the highest quartile of our sample).

(Table II here)

Regressions 3 and 4 in Table II suggest that exchange rate pegs may actually be less rather than more effective as anti-inflationary commitments when there are multiple veto players in government. This result is consistent with proposition 2. The interaction term  $peg \times checks$  is positive in both regressions and significantly in the case of the cross-sectional estimation. In both regressions the estimated effect on inflation of adopting an exchange rate peg is negative for nearly all sample values of checks and balances (the maximum value of  $\log check$  is 2.07). However, the magnitude of this effect is much smaller in countries where there are multiple veto players in government.

(Figure I here)

Taken together, the above results provide support for the idea that the structure of

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<sup>44</sup> Since the effect of a change in CBI here depends on both  $B_1$  and  $B_3$ , we calculated the standard error of the effect using a formula which takes into account both the variance of each individual coefficient and their

political institutions plays an important role with regard to monetary commitments and that this effect varies dramatically depending upon the type of monetary commitment under consideration. While central bank independence is likely to have a bigger increase on credibility in political systems with multiple veto players, the opposite may well occur with exchange rate pegs.

### ***Testing propositions 3 & 4***

If central banks or exchange rate pegs help governments credibly commit because they are transparent, then their anti-inflationary effects should be greatest in countries where it is particularly difficult for the public to distinguish between inflation attributable to deliberate government decisions and inflation attributable to exogenous shocks. We have argued that exchange rate pegs should exhibit this characteristic, but that central bank independence is unlikely to be an informative signal. As with propositions 1 and 2, these propositions can best be tested in a model with interaction terms, which follows the specification below.

We use three different proxies for the ability of the public to distinguish the contribution of government policy to final inflation outcomes: the Summers and Heston grade for data quality (*grade*), instability of the money multiplier (*volatility M2/M0*), and a variable capturing instability in terms of trade (*volatility tot*). Based on proposition 3, we predict that the interaction term *peg x grade* should have a positive sign (since data quality is higher in countries where the value of *grade* is high), while the interaction terms *peg x volatility tot* and *peg x volatility M2/M0* should be negative. We again report results from both cross-section regressions and from regressions based on 5-year period averages.

$$\log inflation = \alpha + \beta_1 CBI + \beta_2 peg + \beta_3 CBI \times \log check + \beta_4 information\ variable + \beta_5 peg \times$$

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covariance.

*information variable* +  $\beta_6$  *openness* +  $\beta_7$  *instability* +  $\beta_8$  *lngdp* +  $\beta_9$  *log check* +  $\varepsilon$

(Table III here)

The results in Table III suggest that exchange rate pegs are more effective as anti-inflationary commitments under conditions where data quality is poor and there is significant economic volatility which makes it more difficult for the public to observe government policy choices. In regressions 1 and 2 the interaction term *peg x grade* is positive and highly significant, as predicted. The economic significance of the peg effect is also quite large. Based on regression 2, for a country with a Summers and Heston grade for data quality equivalent to the 25<sup>th</sup> percentile of the sample (1.7), adopting an exchange rate peg is estimated to result in a 62 percent reduction in the annual rate of inflation. A country with a grade for data quality equivalent to the 75<sup>th</sup> percentile would, in contrast, be predicted to experience a 45 percent increase in annual inflation.

In regressions 3-6 coefficients on the interaction terms for *peg x volatility tot* and *peg x volatility M2/M0* are negative as predicted and generally highly significant. Once again, these results are also substantively significant. For example, based on the estimates in regression 6 the effect of adopting an exchange rate peg would be a 32 percent drop in inflation for a country with relatively low volatility in its money multiplier (0.27, the value for the 25<sup>th</sup> percentile), while the effect for a country with high volatility (1.01, the value for the 75<sup>th</sup> percentile) would be a 55 percent drop in annual average inflation. We provide a visual display of the estimated effect of adopting an exchange rate peg in Figure III, below, which shows that effect of a peg, (together with the estimated 90% confidence interval) at different levels of money multiplier volatility (based on regression 6 in Table III). The horizontal line

represents 0 change in log inflation.

(Figure II here)

In stark contrast with our results with regard to exchange rate pegs, the effect of central bank independence does not seem to vary significantly with the extent of either terms of trade volatility or volatility in a country's money multiplier. The coefficients  $CBI \times volatility_{M2/M0}$  and  $CBI \times volatility_{tot}$  are not statistically significant in regression 3-6. The results with regard to data quality are more mixed. While as our theory predicts, the interaction term  $CBI \times grade$  is not significant in regression 1, it is significant in regression 2.

## 5. Robustness of the results

Several issues might affect the robustness of our results: our institutional variables may proxy for more general features of political systems; the significance of the results may be exaggerated by autocorrelation; and finally, the results may be biased by the endogeneity of central bank independence to inflation.

The first problem is whether our institutional variables are measuring the phenomena we claim, or whether they might in fact be capturing more general features of political systems, such as levels of democracy or levels of income. The simple correlation between the variable *democracy* from the Polity III dataset and our variable *checks* is fairly high (0.52), and the simple correlation between our measure of data quality (*grade*) and *democracy* is even higher (0.74). Similar conclusions might be drawn from the high correlation of *grade* and *checks* with per capita income.<sup>45</sup>

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<sup>45</sup> The simple correlations of our two other information variables *volatility\_{tot}* and *volatility\_{M2/M0}* with either *log GDP* or *democracy* did not exceed 0.35, and so we do not consider the possibility that these specifications are

The alternative hypothesis to test then would be whether the effect of central bank independence and of exchange rate pegs varies with levels of democracy or income, instead of with the number of veto players or the extent of economic volatility. To this alternative against our own propositions we used the *J*-test methodology developed by Davidson and Mackinnon.<sup>46</sup> This test involves estimating the two specifications to be compared and then re-estimating each specification while including the fitted values from the alternative model as an explanatory variable in each regression.<sup>47</sup> The *t*-statistic on the fitted values can be interpreted as a test of the null that the alternative specification (e.g., the specification using *democracy* or income) *would not* add explanatory power to the existing model. One can then repeat the test while reversing the variables which are considered as the "null" and as the "alternative". The reason for doing this is that it is common with *J*-tests comparing two specifications A and B to find that one rejects the null when A is the null and B is the alternative, but that one also rejects the null when B is the null and A is the alternative. In this case one can conclude that each specification adds explanatory power to the other (or in other words that neither specification "encompasses" the other).

Table IV below reports results of *J*-tests where we tested regression 4 from Table II and regression 2 from Table III against two alternative specifications. The first alternative involved replacing the relevant institutional or informational variable with the Polity III measure *democracy*. The second alternative specification involved replacing the relevant institutional or informational variable with log per capita GDP. The test statistics are significant in most cases at the 1 percent level and in all but one case at the 10 percent level of confidence. We find, first, that all of the specifications using our institutional and

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picking up effects due to levels of GDP or democracy.

<sup>46</sup> Davidson and Mackinnon (1981).



informational variables add explanatory power to regressions using only *democracy* and *log per capita GDP* (using the 10 percent level as a cutoff). We can therefore reject the hypothesis that our institutional and informational variables are simply proxies for more general phenomena.

(Table IV here)

However, in three out of four cases, specifications using only *democracy* or *log per capita GDP* also add explanatory power to our existing specifications from Tables II and III. The exception here is regression 2 from Table III where we clearly reject the hypothesis that *democracy* adds explanatory power to the *grade* specification. These findings suggest that more general features of democracy or levels of income may also have an influence on the effectiveness of central bank independence or exchange rate pegs as commitment mechanisms.

We also considered whether our statistical tests might be affected by serial correlation of error terms. Standard Lagrange multiplier tests detected autocorrelation in our five-year period regressions. Using a Prais-Winsten regression rather than ordinary least squares would be one way to deal with this problem. However, using this technique depends upon accepting the restriction that the autoregressive process influencing each of the variables in our regression is identical. Standard testing procedures strongly reject this restriction. As a result, we have chosen to retain our OLS estimates. Although autocorrelation is present and difficult to address in the five-year data, it is nevertheless the case that our cross-section results, by definition not subject to autocorrelation, are also significant.

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<sup>47</sup> For an application of J-test methodology to compare alternative political economy hypotheses see Franzese

As a final robustness test, we also considered the possibility that there might be biases in our results due to the endogeneity of certain explanatory variables. This could involve the endogeneity of legal central bank independence to past levels of inflation. In the case of central bank independence, Granger causality tests failed to establish that current levels of *CBI* were “Granger-caused” by lagged levels of log inflation. It could also involve simultaneity bias, such as that created by shocks that affect both *CBI* and *log inflation* within the same time period. Volatility in the money multiplier (*volatility M2/M0*) might also be subject to this problem. Logically, simultaneity bias is unlikely to be responsible for our results. For such biases to explain the results in Tables II and II, for example, omitted variables or shocks would have to be such that they made the interaction of pegs and volatility significant, but not the interaction of central bank independence and volatility; similarly, they would have had to generate a significant estimate of the interaction of checks and central bank independence, but not of pegs and central bank independence. In any case, however, a Hausman specification test did not reject OLS estimates from Table II when compared with estimates which instrumented for current values of central bank independence with past values. In the case of volatility in the multiplier *volatility M2/M0*, a Hausman specification test also failed to reject the consistency of the OLS estimates.

## **Conclusion**

In this paper we have attempted develop and test several new hypotheses about the anti-inflationary effect of central bank independence and exchange rate pegs across different institutional and informational contexts. Theory provides a strong reason for believing that while central bank independence will prove more effective as a commitment mechanism in

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(1999).

countries with multiple veto players in government, the credibility of exchange rate pegs will not be increased by these multiple veto players. We reach an opposite conclusion with regard to the effect of central bank independence and exchange rate pegs in different informational contexts. In economically volatile conditions, where it is more difficult for the public to distinguish inflation deliberately generated by government from inflation created by unanticipated economic shocks, the anti-inflationary effect of central bank independence will be unchanged while the effectiveness of exchange rate pegs will be significantly enhanced. Cross-country tests using newly developed data provide strong support for both our institutional and our informational propositions.

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**Table I: Summary statistics**

<b>Variable</b>	<b>No. obs.</b>	<b>mean</b>	<b>std. dev.</b>	<b>min.</b>	<b>max.</b>
<i>log inflation</i>	277	-2.02	1.43	-5.39	3.90
<i>CBI</i>	297	0.35	0.13	0.10	0.82
<i>log check</i>	293	0.95	0.48	0	2.08
<i>peg</i>	297	0.53	0.41	0	1
<i>grade</i>	266	2.43	1.04	1	4
<i>volatility M2/M0</i>	226	1.07	2.45	.02	27
<i>volatility tot</i>	258	0.02	0.03	0	0.16
<i>political instability</i>	289	0.15	0.14	0	0.68
<i>openness</i>	279	68.4	52.4	10	394
<i>log GDP</i>	275	8.06	1.62	4.57	10.7

Table II: CBI, exchange rate pegs, and political institutions

depvar: log inflation	(1)	(2)	(3)	(4)
Constant	1.15 (0.91)	0.33 (0.62)	-0.33 (1.61)	-0.56 (0.66)
<i>openness</i>	0.001 (0.003)	-0.002 (0.002)	0.001 (0.00)	-0.003 (0.002)
<i>log GDP</i>	-0.36 (0.11)	-0.27 (0.12)	-0.37 (0.10)	-0.26 (0.11)
<i>political instability</i>	1.52 (1.52)	1.34 (0.40)	0.43 (1.46)	1.21 (0.41)
<i>CBI</i>	2.14 (1.03)	1.84 (0.48)	10.3 (4.15)	5.15 (1.75)
<i>peg</i>	-2.07 (0.61)	-0.84 (0.20)	-4.50 (1.11)	-1.33 (0.56)
<i>log check</i>	-0.04 (0.54)	-0.36 (0.19)	1.73 (1.62)	0.54 (0.51)
<b><i>CBI x log check</i></b>			<b>-7.58</b> <b>(3.91)</b>	<b>-3.20</b> <b>(1.50)</b>
<b><i>peg x log check</i></b>			<b>2.05</b> <b>(0.95)</b>	<b>0.44</b> <b>(0.38)</b>
<b>R<sup>2</sup></b>	0.40	0.29	0.46	0.30
<b>N</b>	78	258	78	258
<b>p-value for Chi-sq.</b>	p<0.01	p<0.01	P<0.01	p<0.01

OLS with White's heteroskedastic consistent standard errors for regressions 1 and 3 reported in parentheses. Regressions 2 and 4 are estimated using panel corrected standard errors.



Figure I: estimated effect of 0.2 increase in CBI  
(at different levels of log check)

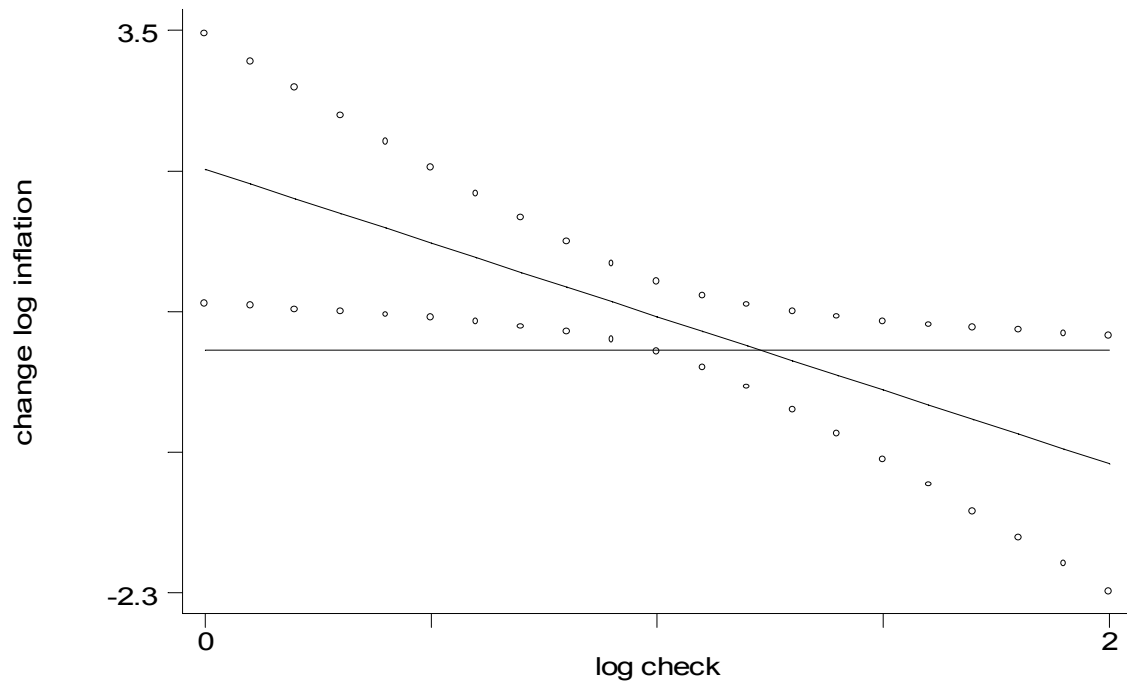
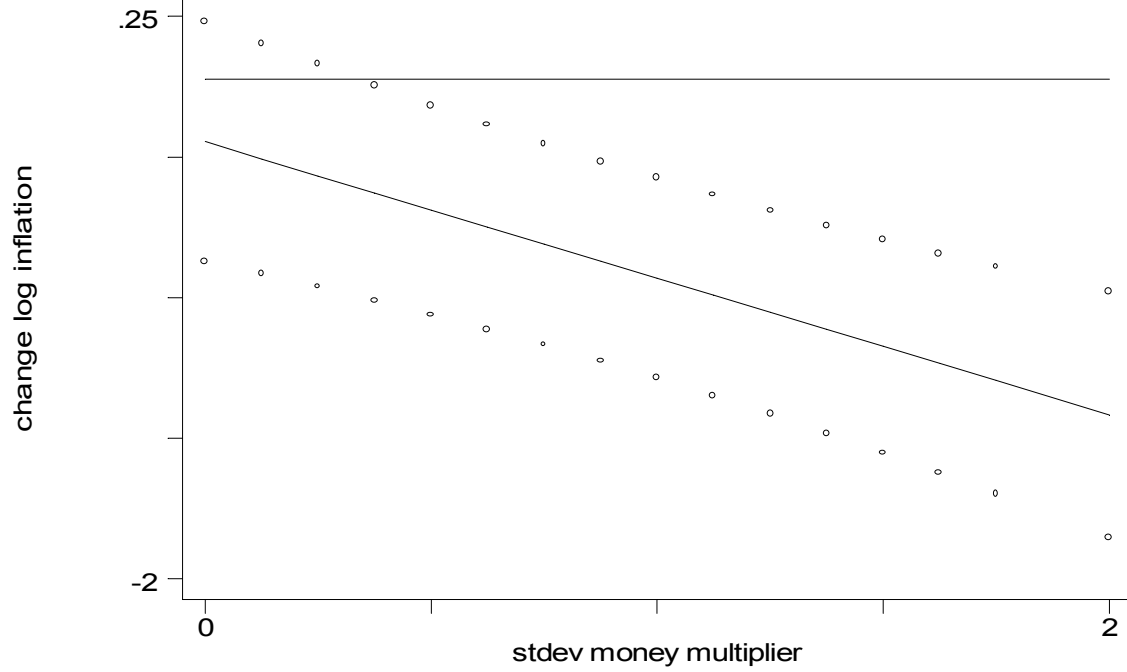


Table III: CBI, exchange rate pegs, and information

depvar: log inflation	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-3.09 (1.16)	-2.17 (0.47)	-3.03 (1.36)	-1.68 (0.70)	-1.50 (1.75)	-1.52 (1.01)
<i>openness</i>	-0.01 (0.002)	-0.01 (0.001)	-0.002 (0.002)	-0.004 (0.002)	0.002 (0.004)	-0.001 (0.002)
<i>log GDP</i>	0.26 (0.14)	0.18 (0.03)	-0.22 (0.11)	-0.19 (0.09)	-0.37 (0.15)	-0.29 (0.12)
<i>political instability</i>	-0.43 (1.07)	0.82 (0.44)	0.87 (1.44)	1.16 (0.33)	0.43 (1.72)	1.14 (0.44)
<i>CBI</i>	10.2 (2.96)	6.56 (1.45)	10.2 (4.26)	5.12 (2.13)	10.2 (4.80)	6.15 (1.46)
<i>peg</i>	-3.37 (0.93)	-2.14 (0.52)	-1.43 (0.63)	-0.47 (0.28)	-2.04 (1.16)	-0.24 (0.24)
<i>log check</i>	2.96 (1.15)	0.76 (0.61)	2.82 (1.39)	0.94 (0.60)	2.59 (1.82)	0.80 (0.43)
<i>CBI × log check</i>	-7.37 (3.20)	-2.40 (1.63)	-8.20 (4.01)	-3.58 (1.65)	-7.73 (4.64)	-3.65 (1.43)
<i>grade</i>	-1.20 (0.49)	-0.73 (0.21)				
<i>peg × grade</i>	<b>0.90</b> <b>(0.27)</b>	<b>0.68</b> <b>(0.12)</b>				
<i>CBI × grade</i>	<b>-0.79</b> <b>(1.00)</b>	<b>-1.26</b> <b>(0.48)</b>				
<i>volatility tot</i>			27.1 (22.0)	22.2 (22.9)		
<i>peg × volatility tot</i>			<b>-39.2</b> <b>(15.9)</b>	<b>-24.0</b> <b>(10.9)</b>		
<i>CBI * volatility tot</i>			<b>14.1</b> <b>(78.5)</b>	<b>-0.33</b> <b>(45.3)</b>		
<i>volatility M2/M0</i>					0.15 (0.29)	0.72 (0.23)
<i>peg × volatility M2/M0</i>					<b>-0.05</b> <b>(0.30)</b>	<b>-0.55</b> <b>(0.18)</b>
<i>CBI × volatility M2/M0</i>					<b>-0.15</b> <b>(0.48)</b>	<b>-0.42</b> <b>(0.47)</b>
<b>R<sup>2</sup></b>	0.65	0.45	0.56	0.34	0.32	0.34
<b>N</b>	67	247	74	246	62	202
<b>p-value for Chi-sq.</b>	p<0.01	p<0.01	p<0.01	p<0.01	p<0.01	p<0.01

OLS with White's heteroskedastic consistent standard errors for regressions 1 and 3 reported in parentheses.  
Regressions 2, 4, and 6 are estimated using panel corrected standard errors.

Fig II: estimated effect of an exchange rate peg  
(at different levels of volatility)



**Table IV: J-tests against alternative specifications**

<b>regression</b>	<b>null hypothesis</b>	<b>Alternative hypothesis</b>	<b>p-value</b>
<b>Table II 4</b>	log check democracy	Democracy log check	p=0.00 p=0.08
<b>Table III 2</b>	grade democracy	Democracy Grade	p=0.54 p=0.00
<b>Table II 4</b>	log check log per cap. GDP	log per cap. GDP log check	p=0.00 p=0.09
<b>Table III 2</b>	grade log per cap. GDP	log per cap. GDP Grade	p=0.00 p=0.00