

# EXCHANGE RATE REGIMES AND FISCAL DISCIPLINE: THE ROLE OF CAPITAL CONTROLS\*

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## Abstract

The influence of exchange rate regimes on fiscal discipline has long been debated exploiting the classic dichotomy of fixed vs. flexible exchange rate regimes assuming perfect capital mobility. In the case of many emerging and developing countries, however, the role of capital controls cannot be neglected. This paper offers both theoretical arguments and empirical evidence regarding the influence of capital controls on fiscal performance.

In a theoretical model in which the fiscal policy is endogenously determined by a non-benevolent fiscal authority, capital controls induce politicians to have higher fiscal deficits than under fixed and flexible regimes operating under perfect capital mobility. The model also shows that fiscal differences across exchange rate regimes become more significant the more shortsighted politicians are, and the higher is the importance politicians assign to fiscal policy.

Empirical analysis confirms that capital controls lead to larger primary deficits than fixed and flexible regimes operating under perfect capital mobility, even after controlling for different sources of ERR endogeneity. The evidence also shows that such fiscal differences are more important during presidential pre-electoral years and in the face of natural disasters. We also illustrate the empirical relevance of insulation properties under capital controls as well as the importance of using *de facto* ERR classifications as opposed to *de jure* ones.

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# 1. Introduction

The influence of exchange rate regimes (ERRs) on fiscal discipline has long been debated in both academic environments and policy makers' circles, especially given the importance of this relationship for emerging and developing countries. There is a vast theoretical literature addressing this issue and an inconclusive and relatively scarce empirical literature.

The theoretical literature discusses the influence of ERRs on fiscal discipline exploiting the classic dichotomy of fixed vs. flexible ERRs and assuming perfect capital mobility. Conventional wisdom –represented by papers like Aghevli et al. (1991) and Giavazzi and Pagano (1988)– emphasizes the strong disciplinary properties of fixed regimes by stressing the deterrent effect that the fear of fixed exchange rate collapse has over fiscal authorities. However, more recent and widely cited papers by Tornell and Velasco (1998, 2000), take issue with the previous perspective by considering political economy arguments. Tornell and Velasco find that lax fiscal policies have political costs in terms of inflation under both regimes. The difference is the intertemporal distribution of these costs: under flexible regimes they manifest immediately through the exchange rate, while under fixed regimes they become evident only when the exhaustion of reserves makes the fixed regime collapse. If the fiscal authority is impatient, flexible regimes provide more fiscal discipline by forcing the cost to be paid up-front.

The empirical studies that analyze whether fixed regimes induce more fiscal discipline than flexible arrangements recognize that ERR endogeneity is the most important limitation and difficulty. Tornell and Velasco (2000) argue that the Sub-Saharan Africa sample they use provides a sort of “natural experiment,” since the choice of ERR in these countries was based on colonial history and not on political or economic considerations. This statement would be correct for the Communauté Financière d’Afrique (CFA) countries, which maintained a fixed exchange rate with the French franc from 1948 until 1994, only if their connection to France did not also allow them to have a better position in credit markets, or if CFA countries were not different from non-CFA economies in other respects that could be relevant for fiscal discipline. Further, Tornell and Velasco’s instrument is only available for a limited number of countries and time span. Fatás and Rose (2001) remark that endogeneity could be relevant for currency boards, but not so much for currency unions. However, Fatás and Rose stress that their “results are best viewed as correlations rather than causal statements.” Alberola and Molina (2004) argue that endogeneity is not an issue since the choice of the sample “is done taking into account the more or less explicit attempt of using the exchange rate peg as stabilizing device.” This fact not only does not guarantee the absence of endogeneity issues, but on the contrary, might suggest the opposite since it could imply that the choice of the regime is a response to fiscal performance. Therefore, a more appropriate treatment of the ERR endogeneity is an open subject in the literature.

Both conventional wisdom and Tornell and Velasco assume perfect capital mobility, even though capital controls are pervasive in emerging and developing countries. Diverse forms of capital controls have been a common phenomenon in many emerging and developing countries during the 70s and 80s. While less dominant in the 90s and early 2000s, unrestricted capital flows seem to be the exception rather than the rule.<sup>1</sup> Using the Reinhart and Rogoff (2004) ERR classification for 23 emerging markets, we find that more than 60 percent of this sample had some sort of capital controls during the 70s and 80s and about 20 percent still had them in the 90s and early 2000s. Due to this quantitative importance and because capital controls change completely the way in which the adjustment and transmission mechanisms occur, we analyze in this paper both theoretically and empirically the influence of capital controls on fiscal

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<sup>1</sup>Some recent examples of capital controls include Malaysia in 1998, Argentina in 2002 and Venezuela in 2003.

performance.

We develop a standard optimization model with price flexibility, and a political economy framework and structure similar to that employed by Tornell and Velasco (1998), but allowing for capital controls. Following the impossible trinity diagram and other papers (Flood and Marion, 1982; Obstfeld, 1984) we identify three ERRs: fixed and flexible exchange rates under perfect capital mobility and capital controls. The economy is inhabited by a representative private agent blessed with perfect foresight and a government composed of a fiscal authority and a central bank. The model does not analyze the choice of ERRs; it only compares fiscal performance under alternative monetary and capital flows policies. The central bank can precommit to follow a particular ERR only for a finite period of time; after that, regimes are abandoned and the central bank must adjust inflation to ensure that the government's budget constraint is satisfied, similar to Sargent and Wallace (1981). This setup captures the idea that stabilization plans are subject to "temporariness" or "imperfect credibility" as described in Calvo (1991) and Drazen and Helpman (1987). The private agent chooses how much to consume and how much money to hold. The fiscal authority decides the level of net fiscal transfers that the public receives in a lump sum manner. The fiscal authority has the proclivity to spend more than socially desirable, possibly because such spending provides political power or prestige. The politician in charge of the budget also internalizes the private agent's objective function, but might discount the future at a different rate. We show that capital controls induce higher fiscal deficit than fixed and flexible regimes operating under perfect capital mobility in the periods before the stabilization plan reaches its end. We also show that fiscal differences across ERRs become more significant the more shortsighted politicians are, and the higher is the importance politicians assigns to fiscal policies.

The theoretical argument is quite simple:

- Under *fixed* regimes, the necessity of financing fiscal deficits leads to a fall in reserves or an increase in debt. When the situation gets unsustainable, the exchange rate collapses and the inflation cost becomes tangible. Policymakers can enjoy fiscal deficit and low inflation today at the cost of high inflation in the future.

- Under *flexible* regimes, the need for financing fiscal deficits augments future expected monetization, creating an increase in current prices. This occurs because the desire to reduce money holdings in the future creates pressures on the exchange rate market today, which in the absence of central bank intervention effectively increases the current exchange rate and the price level. Therefore, fiscal deficit is paid for with current and future inflation.

- Under *capital controls*, the necessity of financing fiscal deficits also increases future anticipated monetization and, consequently, reduces desired future money holdings. The latter change creates excess demand for bonds, which due to the presence of capital controls, reduces the current domestic real interest rate. This last factor increases today's consumption, which boosts fiscal deficit. That is to say, capital controls boost current consumption as private agents attempt to reduce their real balances because of the expected inflation tax. Politicians can enjoy fiscal deficit, low inflation and a *consumption boom* today, at the cost of high inflation and a *consumption hangover* in the future.

The basic point of Tornell and Velasco's papers is that if inflation is costly for the fiscal authorities, flexible regimes provide tighter fiscal discipline than fixed regimes by forcing the costs to be paid up-front. We argue that capital controls induce even higher fiscal deficit than fixed regimes while the stabilization plan lasts. This occurs because capital controls enable free-spending politicians to enjoy the same temporary low inflation as fixed regimes, as well as a temporary consumption boom which is regarded as desirable by impatient politicians.

This temporary consumption boom induces politicians to engage in higher fiscal deficits *in the periods before the stabilization plan collapses*. We also show that fiscal differences across ERRs become more important the more shortsighted politicians are, and the higher is the importance politicians assign to fiscal policies.

Using a sample of 23 emerging markets for the period 1970-2001 and the *de facto* Reinhart-Rogoff ERR classification, we confirm that capital controls lead to larger primary deficits than fixed and flexible regimes operating under perfect capital mobility, even after controlling for different sources of ERR endogeneity. Our findings also support Tornell and Velasco's core prediction that fixed regimes induce less discipline than flexible arrangements under perfect capital mobility. Using presidential pre-electoral data we also show that fiscal differences across ERRs become more significant as politicians become more impatient. Using natural disasters data we show that fiscal differences across ERRs become more significant the higher is the importance politicians assign to fiscal policy. We also illustrate the empirical relevance of insulation properties under capital controls as well as the importance of using *de facto* ERR classifications as opposed to *de jure* ones (the IMF classification).

This paper is at the crossroads of two main strands of the literature: the literature on capital controls and the literature on the influence of ERRs on fiscal discipline. Existing models of capital controls focus on their implications for a myriad of variables, but treat fiscal activity as exogenously given (Calvo, 1989; Guidotti and Végh, 1992). In contrast, the model proposed in this paper endogenously determines fiscal policy by including an optimizing fiscal authority. Previous studies that analyze the influence of ERRs on fiscal behavior use models with endogenous fiscal determination, but assume perfect capital mobility (Tornell and Velasco, 1998 and 2000; Sun, 2003). Instead, we analyze fiscal incentives under capital controls. This paper is also related to the literature that documents and analyzes the consumption boom and bust observed under temporary stabilization programs (Calvo and Végh, 1993; Reinhart and Végh, 1995).

The rest of the paper is structured as follows. In Section 2 we present the model, in section 3 we show the empirical results and in Section 4 we make some final remarks.

## 2. The model

In this section we develop a theoretical model with a political economy framework and structure similar to that employed by Tornell and Velasco (1998), but allowing for capital controls. For comparison purposes, we also reproduce Tornell and Velasco's results under fixed and flexible regimes operating under perfect capital mobility. The rest of this section is organized as follows. First, we describe the main features of the model and explain the behavior of the real domestic interest rate under capital controls. Finally, we solve the model and provide the main results regarding fiscal policy under alternative ERRs.

### 2.1. Set up

The economy is inhabited by a government consisting of a fiscal authority (FA) and a central bank (CB), and a representative private agent (PA) blessed with perfect foresight. We consider a small endowment economy that lasts two periods: 1 and 2.<sup>2</sup> Following the impossible trinity diagram and other papers (Flood and Marion, 1982; Obstfeld, 1984) we identify three ERRs: fixed and flexible exchange rates under perfect capital mobility and capital controls. Under

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<sup>2</sup>We will refer to the time before the world starts as period 0. Policy announcements will be made at this time.

capital controls there is no private capital mobility and we model the domestic real interest rate  $\rho_t$  explicitly by introducing dual (or legal parallel) exchange rates (Flood and Marion, 1982; Obstfeld, 1984; Guidotti and Végh, 1992). A dual regime is an exchange rate arrangement in which a market-determined exchange rate, typically applying to financial transactions (financial exchange rate), coexists with one fixed exchange rate for current account transactions (commercial exchange rate). While this dual regime represents a particular form of capital control -which nevertheless has been one of the most common varieties of capital controls after the collapse of Bretton Woods (Guidotti and Végh, 1992; Xu, 2002)- the idea is to isolate the essential features introduced by the presence of capital controls for the transmission of monetary and fiscal policies. Henceforth, the terms “dual exchange rates” and “capital controls” will be used interchangeably. Alternatively, we could also think that illegal parallel (or black) foreign exchange rate markets could endogenously appear as a consequence of extensive capital controls (Kiguel and O’Connell, 1997; Reinhart and Rogoff, 2004). For simplicity we also assume that the world real interest rate  $r$  remains constant.

There is one tradable good which is used as the numeraire. Assuming that the law of one price holds and normalizing the foreign price level at one, we obtain that the nominal exchange rate (the commercial exchange rate under dual regimes) is equal to the domestic price level, i.e.  $E_t = P_t$ . Hence inflation and nominal devaluation rates are  $\pi_t \equiv (P_t - P_{t-1})/P_t = (E_t - E_{t-1})/E_t$ .<sup>3</sup> The freely floating financial exchange rate operating under capital controls is denoted as  $Q_t$ . For notational purposes, variables in capital letters are expressed in terms of the domestic currency (i.e. nominal terms), while small letters are used for variables expressed in terms of the numeraire (i.e. real terms). There exist two assets: domestic currency, denoted by  $M_t$ , and internationally traded bonds held by both the PA,  $f_t$ , and the government,  $b_t$ . We also assume that assets are chosen at the end of period  $t$  and carried over into period  $t + 1$ .

### 2.1.1. Sequence of actions

In period 0 the CB announces its ERR policies, and subsequently the FA announces the net fiscal transfers that will occur in the future,  $\tau_1$  and  $\tau_2$ . Right after these news, the PA rearranges her portfolio from  $(m_{0-}, f_{0-})$  to  $(m_0, f_0)$ .<sup>4</sup>

During period 1 the PA selects consumption  $c_1$  and  $m_1$ , her desired real balances for period 2. The FA does not make any decision in periods 1 or 2.<sup>5</sup>

When period 2 arrives, the government repays its outstanding debt, the CB redeems the value of outstanding real balances, and the PA uses all her accumulated wealth and income to consume  $c_2$  and pay the inflation tax.

### 2.1.2. The central bank’s alternative monetary and capital flows policies

As in Tornell and Velasco, we assume that the CB’s monetary and capital flows policies are exogenous, and are not the result of any optimization problem. We assume that the CB can

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<sup>3</sup>Under our definition, the inflation rate is bounded above by one, and can directly be interpreted as a tax rate.

<sup>4</sup> $m_{0-}$  and  $f_{0-}$  refer to the initial asset conditions. In order to make a consistent comparison across ERRs, it is necessary to offset the government’s extra revenue capacity that occurs in period 0 as a result of any unanticipated jump in the exchange rate. To guarantee that, we require that under flexible regimes and capital controls the government acts “honestly” in the sense of Auernheimer (1974). That definition of honesty rules out capital levies (or transfers) inflicted in the private sector through unanticipated changes in the price level or the exchange rate. The remedy suggested by Auernheimer requires that the government instantaneously sells (or buys) the necessary money balances to prevent prices from jumping.

<sup>5</sup>We assume that the FA can commit to the announcements made in period 0 to avoid well known inconsistency issues, which are not the main subject of the paper. See Sun (2003) for a treatment of this subject.

precommit to an independent monetary policy that ignores the behavior of the FA only for a finite period of time, period 1 in our model.<sup>6</sup>

- Under *fixed* regimes, the CB sets the nominal devaluation rate of period 1 equal to zero (i.e.  $\pi_1 = 0$ ), and the nominal money supply become endogenous.<sup>7</sup> There is perfect capital mobility.

- In a *flexible* regime the CB sets the growth rate of nominal money in period 1 equal to zero (i.e.  $\mu_1 \equiv (M_1 - M_0)/M_1 = 0$ ), and the exchange rate becomes endogenous.<sup>8</sup> There is perfect capital mobility.

- Under *capital controls* the CB sets the nominal devaluation rate of the commercial exchange rate for period 1 equal to zero (i.e.  $\pi_1 = 0$ ) and the growth rate of nominal money in period 1 equal to zero (i.e.  $\mu_1 \equiv (M_1 - M_0)/M_1 = 0$ ).<sup>9</sup> The CB does not intervene in the financial exchange market and there is no private capital mobility (i.e.  $f_0 = f_1$ ); however, it sells [buys] foreign bonds for [with] money for current account purposes. The financial exchange rate and real domestic interest rate become endogenous.

In period 2, as in Sargent and Wallace (1981), inflation must adjust to ensure that the government's budget constraint is satisfied. We also assume that capital controls are abandoned (i.e.  $Q_2 = E_2$ ). Therefore, it makes no difference what the ERR is in period 2.

In other words, period 1 can be thought of as the interval of time in which the stabilization plan is sustained, and period 2 as the time in which the “bomb explodes” and the stabilization plan reaches its end. For this reason, and since all regimes “explode” in period 2, we effectively observe the performance of each regime as such under relatively “tranquil” conditions in period 1. This issue is very important not only from a theoretical point of view but also from an empirical perspective as we will remark later.

### 2.1.3. Real domestic interest rate

One crucial implication of abandoning the perfect capital mobility assumption is that the real domestic interest rate  $\rho_t$  becomes endogenous and does not necessarily coincide with the world real interest rate  $r$ . Under a dual exchange rate system, the principal on foreign bonds must be acquired at the financial exchange rate  $Q_t$  but the interest income (a current account item) must be repatriated at the commercial exchange rate. Therefore, the domestic real interest rate equals

$$1 + \rho_t = \frac{q_{t+1}}{q_t} \left( 1 + \frac{r}{q_{t+1}} \right), \quad (1)$$

where  $q_t \equiv Q_t/E_t$  may be interpreted as the real price of bonds in the domestic economy. Thus, the return on bonds in the domestic economy also includes capital gains [losses] associated with the depreciation [appreciation] of the financial exchange rate relative to the commercial one. Since we assume  $Q_2 = E_2$  we can use equation (1) to write  $\rho_1$  as

$$\rho_1 = \frac{E_1}{Q_1}(1 + r) - 1. \quad (2)$$

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<sup>6</sup>The assumption of finite precommitment to an independent ERR is not based on the idea that CBs are independent of government's influence. It aims to capture the idea that stabilization plans are subject to “temporariness” or “imperfect credibility” problems as described in Calvo (1991) and Drazen and Helpman (1987).

<sup>7</sup>Similar qualitative results hold if devaluation rate differs from zero.

<sup>8</sup>Similar qualitative results hold if the growth rate of nominal money differs from zero.

<sup>9</sup>Similar qualitative results hold if the growth rate of nominal money or devaluation rate differ from zero.

Therefore, a positive [negative] exchange rate premium is associated with a real domestic interest rate lower [higher] than  $r$ . As it will become clear later, this is the key element driving our results under capital controls.

#### 2.1.4. The private agent's budget constraints and objective function

We assume that the PA receives an exogenous endowment income  $y$  of tradable goods in periods 1 and 2. The PA's budget constraint for period 1 under perfect capital mobility is

$$(1+r)f_0 + m_0 + y + \tau_1 = c_1 + \pi_1 m_0 + m_1 + f_1, \quad (3)$$

while under capital controls it is

$$\frac{Q_1}{E_1} f_0 + r f_0 + m_0 + y + \tau_1 = c_1 + \pi_1 m_0 + m_1 + \frac{Q_1}{E_1} f_1. \quad (4)$$

For period 2, the budget constraint is the same under both perfect capital mobility and capital control because we assume  $Q_2 = E_2$ :

$$(1+r)(f_1 + m_1) + y + \tau_2 = c_2 + (r + \pi_2)m_1. \quad (5)$$

Combining (3) and (5) we obtain the PA's intertemporal budget constraint under perfect capital mobility:

$$(1+r)f_0 + (1+r)m_0 + y \left( \frac{2+r}{1+r} \right) + \tau_1 + \frac{\tau_2}{1+r} = c_1 + (r + \pi_1)m_0 + \frac{c_2}{1+r} + \frac{(r + \pi_2)m_1}{1+r}, \quad (6)$$

which has the usual interpretation that the present value of expenditures must equal the present value of income.

Combining (4) and (5) we obtain the PA's intertemporal budget constraint under capital controls:

$$\left( \frac{1}{1+\rho_1} + r \right) f_0 + (1+r)m_0 + y \left( \frac{2+\rho_1}{1+\rho_1} \right) + \tau_1 + \frac{\tau_2}{1+\rho_1} = c_1 + (r + \pi_1)m_0 + \frac{c_2}{1+\rho_1} + \frac{(\rho_1 + \pi_2)m_1}{1+\rho_1}. \quad (7)$$

The PA's objective is to maximize

$$\ln(c_1) + \left( \frac{\epsilon}{\epsilon-1} \right) m_0^{\frac{\epsilon-1}{\epsilon}} + \left( \frac{1}{1+r} \right) \left[ \ln(c_2) + \left( \frac{\epsilon}{\epsilon-1} \right) m_1^{\frac{\epsilon-1}{\epsilon}} \right], \quad (8)$$

where  $\epsilon \in (0, 1)$  to guarantee that the economy is always on the upward-sloping side of the Laffer curve.<sup>10</sup> Note that the objective function involves  $m_0$  and  $m_1$  instead of  $m_1$  and  $m_2$ , because the former notation refers to real money balances prevailing in periods 1 and 2 respectively. Without loss of generality, we select logarithmic expressions for consumption utility in order to get nice solutions in the case of capital controls.

<sup>10</sup>This assumption guarantees that inflation tax revenue is increasing in inflation.

### 2.1.5. The government's budget constraints and objective function

We present the consolidated accounts of both the FA and CB. The government's budget constraint for period 1 under perfect capital mobility and capital controls (since under capital controls  $f_1 = f_0$ ) is

$$b_1 + \tau_1 = (1+r)b_0 + m_1 - m_0 + \pi_1 m_0, \quad (9)$$

Given the assumption  $Q_2 = E_2$  the budget constraint for period 2 is the same under perfect capital mobility and capital controls:

$$m_1 + \tau_2 = (1+r)b_1 + \pi_2 m_1. \quad (10)$$

Combining equations (9) and (10) the government's intertemporal budget constraint under perfect capital mobility and capital controls is

$$\tau_1 + \frac{\tau_2}{1+r} = (1+r)(b_0 - m_0) + m_0(r + \pi_1) + \frac{m_1(r + \pi_2)}{1+r}, \quad (11)$$

which has the usual interpretation that the present value of expenditures must equal the present value of revenues.

The FA's objective is to maximize

$$\alpha \left[ \ln(\tau_1) + \beta \ln(\tau_2) \right] + (1-\alpha) \left[ \ln(c_1) + \left( \frac{\epsilon}{\epsilon-1} \right) m_0^{\frac{\epsilon-1}{\epsilon}} + \beta \left[ \ln(c_2) + \left( \frac{\epsilon}{\epsilon-1} \right) m_1^{\frac{\epsilon-1}{\epsilon}} \right] \right], \quad (12)$$

where  $\beta$  is the FA's subjective discount factor, and  $\alpha \in (0, 1)$ . Without loss of generality, we select logarithmic expressions for the utility of net fiscal transfers in order to get nice solutions in the case of capital controls. It is worth making two points about this function. First, government transfers give utility, possibly because they provide political power or prestige. This factor carries a weight of  $\alpha$  in the FA's objective function. Second, the FA also internalizes the PA's objective function with a weight  $(1-\alpha)$ , but the FA's discount factor  $\beta$  does not necessarily match that of the PA, which equals  $1/(1+r)$ .<sup>11</sup> Hence, an impatient FA with direct incentives to engage in fiscal transfers (i.e.  $\alpha > 0$  and  $\beta < 1/(1+r)$ ) would not only be delighted to have a *fiscal party* but would also like the PA to have a *consumption party*. The term *fiscal party* [*consumption party*] refers to an intertemporal profile in which the level of fiscal transfers [consumption] in period 1 is bigger than in period 2.

Combining equations (6) and (11) or (7), (11) and  $f_1 = f_0$  we obtain the economy's resource constraint under perfect capital mobility and capital controls:

$$(1+r)(b_0 + f_0) + y \left( \frac{2+r}{1+r} \right) = c_1 + \frac{c_2}{1+r}. \quad (13)$$

Given that the government consumes nothing, the present value of consumption simply equals the present value of national income, including the initial net foreign assets of the economy.

## 2.2. Solution to the private agent's problem

Now we solve the PA's problem under perfect capital mobility and capital controls.

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<sup>11</sup>Sun (2003) proves that the distortions exogenously assumed in the proposed objective function can be rationalized from a microfoundation point of view through fragmented fiscal policymaking. The interaction among the fiscal authorities or interest groups over time generates the intrinsic desire to spend more than socially optimal ( $\alpha$  parameter) because of competitive externality (intra-temporal distortion), and higher impatience of the fiscal authority ( $\beta$  parameter) due to tragedy of commons (inter-temporal distortion).

### 2.2.1. Solution to the PA's problem: The perfect capital mobility case

The PA optimizes with respect to  $c_1$ ,  $c_2$ ,  $m_0$  and  $m_1$  to maximize (8) subject to (6), taking as given  $\tau_1$ ,  $\tau_2$ ,  $\pi_1$  and  $\pi_2$ . The optimal conditions under perfect capital mobility (*pcm*) are

$$c_{1,pcm}^* = c_{2,pcm}^*, \quad (14)$$

$$m_{0,pcm}^* = c_{1,pcm}^* \epsilon (r + \pi_1)^{-\epsilon}, \quad (15)$$

$$m_{1,pcm}^* = c_{2,pcm}^* \epsilon (r + \pi_2)^{-\epsilon}. \quad (16)$$

Condition (14) implies that consumption is constant across both periods. Combining this last equality with (13), consumption equals permanent income  $\bar{c}$  for both periods, where

$$\bar{c} = \left( \frac{(1+r)^2}{2+r} \right) (b_0 + f_0) + y. \quad (17)$$

### 2.2.2. Solution to the PA's problem: The capital controls case

The PA optimizes with respect to  $c_1$ ,  $c_2$ ,  $m_0$  and  $m_1$  to maximize (8) subject to (7), taking as given  $\tau_1$ ,  $\tau_2$ ,  $\pi_1$ ,  $\pi_2$  and  $\rho_1$ . The optimal conditions under capital controls (*cc*) are

$$\frac{c_{1,cc}^*}{c_{2,cc}^*} = \frac{1+r}{1+\rho_1}, \quad (18)$$

$$m_{0,cc}^* = c_{1,cc}^* \epsilon (r + \pi_1)^{-\epsilon}, \quad (19)$$

$$m_{1,cc}^* = c_{2,cc}^* \epsilon (\rho_1 + \pi_2)^{-\epsilon}. \quad (20)$$

Condition (18) indicates that consumption might not be the same in both periods. Specifically, the ratio ( $c_{1,cc}^*/c_{2,cc}^*$ ) equals one if  $\rho_1 = r$ , and is a decreasing function of  $\rho_1$ ; consumption is higher when it is cheaper.

Substituting equation (18) into (13) and considering (17), we have that

$$c_{1,cc}^* = \bar{c} \left[ \frac{(2+r)(1+r)}{(2+r)(1+r) + (\rho_1 - r)} \right], \quad (21)$$

$$c_{2,cc}^* = \bar{c} \left[ \frac{(2+r)(1+\rho_1)}{(2+r)(1+r) + (\rho_1 - r)} \right]. \quad (22)$$

To understand further the intertemporal distortion of consumption under capital controls we define

$$Distortion(c_1) = \left| c_{1,cc}^* - \bar{c} \right|, \quad (23)$$

$$Distortion(c_2) = \left| c_{2,cc}^* - \bar{c} \right|. \quad (24)$$

Combining (21), (22), (23) and (24) we find that  $Distortion(c_1)(1+r) = Distortion(c_2)$ , so that  $Distortion(c_1) < Distortion(c_2)$  whenever  $\rho_1 \neq r$ . That is to say, the impact of any difference between  $\rho_1$  and  $r$  on consumption is more pronounced for  $c_{2,cc}^*$  than for  $c_{1,cc}^*$ . For example, if  $\rho_1 < r$ , then  $c_{1,cc}^*$  is higher than the permanent income  $\bar{c}$  while  $c_{2,cc}^*$  is lower than  $\bar{c}$  by an even greater margin. In other words, when  $\rho_1 < r$ , the PA experiences a *consumption boom* in period 1 ( $c_{1,cc}^* > \bar{c}$ ) and a *severe consumption hangover* in period 2 ( $c_{2,cc}^* \ll \bar{c}$ ).

### 2.3. Endogenous determination of fiscal policy

Now we focus on the FA's optimization problem under alternative ERRs by solving the Ramsey planner's problem.

#### 2.3.1. Endogenous determination of fiscal policy: Fixed regime case

The benefit of increasing fiscal transfers derives from the direct increase in the FA's utility, while the cost originates from the lower real balances held by the PA in period 2. The FA effectively chooses  $\tau_1$ ,  $\tau_2$ , and  $m_1$  to maximize (12) subject to (11), (6), (14), (17),  $\pi_1 = 0$  and  $\pi_2 = \bar{c}m_1^{-1/\epsilon} - r$  from (16). Combining the optimal conditions we obtain

$$\tau_{1,fixed}^* = \frac{1}{(1+r)\beta} \tau_{2,fixed}^*, \quad (25)$$

$$\tau_{1,fixed}^* = \frac{1}{(1+r)\beta} \left( \frac{\alpha}{1-\alpha} \right) \left( \frac{1-\epsilon}{\epsilon} \right) c_{1,pcm}^*, \quad (26)$$

$$\tau_{2,fixed}^* = \left( \frac{\alpha}{1-\alpha} \right) \left( \frac{1-\epsilon}{\epsilon} \right) c_{2,pcm}^*. \quad (27)$$

Equation (25) states that the intertemporal pattern of transfers depends only on the discount and interest rates. Equations (26) and (27) also indicate that there is a positive relationship between consumption and fiscal transfers. This occurs because of the positive association between the marginal utility of FA's transfers and the marginal utility of PA's consumption. In other words, all else being equal, the FA increases [decreases] fiscal transfers as consumption increases [decreases]. However, because there is consumption smoothing under perfect capital mobility, this factor does not play an active role in the intertemporal pattern of fiscal transfers. The Ramsey planner's problem uniquely determines  $\tau_{1,fixed}^*$ ,  $\tau_{2,fixed}^*$ ,  $m_{1,fixed}^*$ ,  $\pi_{2,fixed}^*$ .

#### 2.3.2. Endogenous determination of fiscal policy: Flexible regime case

The benefit of increasing fiscal transfers derives from the direct increment in the FA's utility, while the costs originate from the lower real balances held by the PA in periods 1 and 2. This forces the FA to consider the effect that fiscal transfers have, not only on money demand in period 2, but also in period 1. The FA effectively selects  $\tau_1$ ,  $\tau_2$ ,  $m_0$  and  $m_1$  to maximize (12) subject to (11), (6), (14), (17),  $\mu_1 = 0$ ,  $\pi_1 = \bar{c}m_0^{-1/\epsilon} - r$  from (15),  $\pi_2 = \bar{c}m_1^{-1/\epsilon} - r$  from (16) and  $m_1(1-\mu_1) \equiv m_0(1-\pi_1)$  from the definition of real balances. Combining the optimal conditions we have

$$\tau_{1,flex}^* = \frac{1}{(1+r)\beta} \tau_{2,flex}^*, \quad (28)$$

$$\tau_{1,flex}^* = \frac{1}{(1+r)\beta} \left( \frac{\alpha}{1-\alpha} \right) \left( \frac{1-\epsilon}{\epsilon} \right) c_{1,pcm}^* \left( \frac{1+x\beta(1+r)}{1+x} \right), \quad (29)$$

$$\tau_{2,flex}^* = \left( \frac{\alpha}{1-\alpha} \right) \left( \frac{1-\epsilon}{\epsilon} \right) c_{2,pcm}^* \left( \frac{1+x\beta(1+r)}{1+x} \right), \quad (30)$$

where  $x \equiv \left( \frac{1}{\beta} \right) \left( \frac{r+\pi_1^*}{r+\pi_2^*} \right) \left( \frac{1}{(1+r)+[(1-\epsilon)/\epsilon](r+\pi_1^*)} \right)$ . Equation (28) indicates, identically to fixed regimes, that the intertemporal profile of transfers depends only on the rates of discount and interest. Once again, (29) and (30) also imply a positive relation between consumption and fiscal transfers. Nevertheless, since  $c_{1,pcm}^* = c_{2,pcm}^* = \bar{c}$ , this effect plays no role in the intertemporal pattern of transfers for flexible regimes. The Ramsey planner's problem uniquely determines  $\tau_{1,flex}^*$ ,  $\tau_{2,flex}^*$ ,  $m_{0,flex}^*$ ,  $m_{1,flex}^*$ ,  $\pi_{1,flex}^*$ ,  $\pi_{2,flex}^*$ .

### 2.3.3. Endogenous determination of fiscal policy: Capital controls case

As under fixed regimes, the benefit of increasing fiscal transfers derives from the direct increase in the FA's utility, while the cost originates from the lower real balances held by the PA in period 2. However, as long as the FA is more impatient than the PA, there is an extra benefit to the FA from higher fiscal transfers, coming from the increase in PA consumption in period 1 that occurs because of the decrease in the real domestic interest rate  $\rho_1$ . The real domestic interest rate,  $\rho_1$ , falls below  $r$  because of the increase in the financial exchange rate  $Q_1$ , which occurs as the PA attempts to rearrange her portfolio because of the expected inflation tax in period 2. This extra incentive for higher transfers is absent under fixed and flexible regimes because of the consumption smoothing that occurs under perfect capital mobility.

We solve the Ramsey planner's problem in which the FA effectively chooses  $\tau_1, \tau_2, c_1, c_2, m_0$  and  $m_1$  to maximize (12) subject to (11), (7),  $\pi_1 = 0, \pi_2 = c_2 m_1^{-1/\epsilon} - \rho_1$  from (20) and  $\rho_1 = (1+r)(c_2/c_1) - 1$  from (18). Combining the optimal conditions we obtain

$$\tau_{1,cc}^* = \frac{1}{(1+r)\beta} \frac{1+r}{1+\rho_1^*} \tau_{2,cc}^*, \quad (31)$$

$$\tau_{1,cc}^* = \frac{1}{(1+r)\beta} \left( \frac{\alpha}{1-\alpha} \right) \left( \frac{1-\epsilon}{\epsilon} \right) c_{1,cc}^*, \quad (32)$$

$$\tau_{2,cc}^* = \left( \frac{\alpha}{1-\alpha} \right) \left( \frac{1-\epsilon}{\epsilon} \right) c_{2,cc}^*. \quad (33)$$

Equation (31) shows that the intertemporal pattern of fiscal transfers depends on the discount rate, the world interest rate and the domestic real interest rate  $\rho_1^*$ . As in fixed and flexible regimes, the intertemporal profile of transfers depends in part upon the relative degree of impatience of the FA (i.e.  $(1+r)\beta$ ). In addition, there is another effect that is represented by the term  $(1+\rho_1^*)/(1+r)$ . This new factor captures the fact that the intertemporal ratio of the marginal utilities of private consumption is not necessarily one due to the potential discrepancy between domestic and world real interest rates. In consequence, if  $\rho_1^* < r$  then  $c_{1,cc}^* > c_{2,cc}^*$ , inducing the FA to make bigger transfers in period 1 relative to period 2. This particular intertemporal pattern of fiscal transfers occurs because the FA increases [decreases] fiscal transfers as consumption increases [decreases]. The Ramsey planner's problem uniquely determines  $\tau_{1,cc}^*, \tau_{2,cc}^*, c_{1,cc}^*, c_{2,cc}^*, m_{0,cc}^*, m_{1,cc}^*, \pi_{2,cc}^*, Q_1^*, \rho_1^*$ .

## 2.4. Comparing alternative exchange rate regimes

In this section we compare fixed and flexible regimes under perfect capital mobility and capital controls in four dimensions: overall fiscal discipline, fiscal policy before and after the stabilization plan collapses, and fiscal response to changes in the degree of impatience ( $\beta$ ) and importance of fiscal transfers ( $\alpha$ ) of the FA.

Before we proceed, we must impose an upper bound on initial government debt to guarantee government solvency and a lower bound to ensure a positive inflation tax. The lower bound is an underlying key feature of the literature that analyzes the relationship between fiscal and monetary policy in the presence of "temporariness" or "imperfect credibility" (Calvo, 1991; Drazen and Helpman, 1987). Since the upper bound for inflation is  $\pi = 1$  and the lower bound is  $\pi = 0$ , then money demands imply that government initial stock of a bonds must satisfy the

following inequalities:

$$\tau_1^u + \frac{\tau_2^u}{1+r} - (1+r)b_0 \leq \bar{c}^\epsilon \frac{1}{(1+r)^\epsilon}, \quad (34)$$

$$\tau_1^l + \frac{\tau_2^l}{1+r} - (1+r)b_0 > -\bar{c}^\epsilon \frac{1}{(1+r)r^\epsilon}, \quad (35)$$

where  $\tau_t^u = \max[\tau_{t,fixed}^*, \tau_{t,flex}^*, \tau_{t,cc}^*]$  and  $\tau_t^l = \min[\tau_{t,fixed}^*, \tau_{t,flex}^*, \tau_{t,cc}^*]$ .

#### 2.4.1. Fiscal policy

We define fiscal discipline in terms of the present discounted value of net fiscal transfers ( $pdv\tau$ ), where  $pdv\tau \equiv \tau_1 + \tau_2 (1+r)^{-1}$ . An ERR induces more fiscal discipline if it has a lower value for  $pdv\tau$ .

**Proposition 1.** *Fixed* exchange rate regimes induce less [more] fiscal discipline than *flexible* regimes if  $(1+r)\beta < 1$  [ $(1+r)\beta > 1$ ]. Both regimes provide the same fiscal discipline if  $(1+r)\beta = 1$ .

This is the result of a direct comparison of (26) and (27) with (29) and (30). Flexible regimes induce more fiscal discipline than fixed regimes when the FA is impatient (i.e.  $(1+r)\beta < 1$ ) because of the different intertemporal distribution of the inflation tax. Any necessity of financing fiscal transfers with inflation tax only lowers real money demand in period 2 under fixed regimes, while it also reduces money demand in period 1 under flexible regimes. This occurs because under rational expectations and flexible rates, higher inflation tomorrow also means higher inflation today. Thus if the FA is impatient, the higher up-front costs of inflation under flexible regimes induce the FA to reduce overall net transfers. This is the main result of Tornell and Velasco.

**Proposition 2.** *Fixed* exchange rate regimes induce more [less] net fiscal transfers than *flexible* regimes in both periods if  $(1+r)\beta < 1$  [ $(1+r)\beta > 1$ ]. Both regimes provide the same net fiscal transfers in each period if  $(1+r)\beta = 1$ .

This is the result of a direct comparison of (26) with (29) and (27) with (30). Proposition 1 indicates that fixed regimes induce less fiscal discipline than flexible regimes when the FA is impatient (i.e.  $(1+r)\beta < 1$ ). Since the intertemporal profiles of fiscal transfers are identical for both regimes -see equations (25) and (28)- it is straightforward that the level of net fiscal transfers is higher in each period under fixed than under flexible regimes when the FA is impatient.

**Proposition 3.** *Capital controls* induce, independently of the degree of impatience of the FA, more net fiscal transfers than *fixed* regimes while the stabilization plan last (period 1) and less net fiscal transfers by a greater margin when it collapses (period 2).

Combining  $m_1(1-\mu_1) \equiv m_0(1-\pi_1)$  from the definition of real balances, money demands (19) and (20) with (21) and (22) we obtain that  $\rho_1^* = r - (1+r)\pi_2^*$ . Because of assumption (35)  $\pi_2^* > 0$ ; therefore, it follows that  $\rho_1^* < r$ . From equation (2) it also implies that  $Q_1^* > E_1$ ; that is to say, the financial exchange rate is higher than the official exchange rate. These equilibrium results are key to understand the role inflation tax plays in the context of capital controls. Anticipated inflation reduces people's desire to hold money in the future. The latter change creates excess demand for bonds which, due to the presence of capital controls, increases the current financial exchange rate and reduces the current domestic real interest rate. This last

factor creates, as analyzed in section 2.2.2., a current *consumption boom* ( $c_{1,cc}^* > \bar{c}$ ) at the expense of a future *severe consumption hangover* ( $c_{2,cc}^* \ll \bar{c}$ ). Considering equations (32), (33), (26) and (27), this non constant profile of consumption induces higher net fiscal transfers in period 1 and lower net fiscal transfers by a greater margin in period 2 under capital controls than under fixed regimes (i.e.  $\tau_{1,cc}^* > \tau_{1,fixed}^*$  and  $\tau_{2,cc}^* \ll \tau_{2,fixed}^*$ ). This result is independent of the degree of impatience of the FA.

**Proposition 4.** *Capital controls* induce more net fiscal transfers than *flexible* regimes while the stabilization plan lasts (period 1) when  $(1+r)\beta \leq 1$ .

This is the direct result of propositions 2 and 3. Nothing conclusive could be said regarding the relationship of net fiscal transfers between capital controls and flexible regimes during period 2, or in period 1 when the FA is relatively patient (i.e.  $(1+r)\beta > 1$ ).

**Proposition 5.** *Capital controls* could induce more or less fiscal discipline than *fixed* or *flexible* regimes.

This is the direct result of propositions 2, 3 and 4.

The main difference between perfect capital mobility and capital controls is the mechanism by which the PA adjusts real balances. This difference is crucial for understanding equilibrium behavior in our model, since the PA would like to reduce her real balances carried to period 2 because of the expected inflation tax. Under perfect capital mobility the PA can rearrange her portfolio composition by buying or selling foreign bonds; in particular, if she wants to reduce real balances the PA can exchange money for bonds. Under *fixed* regimes the PA just changes money for bonds at the end of period 1. Under *flexible* regimes the desire to reduce money holdings carried to period 2 creates pressures on the exchange rate in period 1. Due to this pressure, and since the CB does not intervene in the exchange rate market, there is an increase in the exchange rate and positive inflation in period 1. This in turn reduces the amount of real balances the PA wishes to carry into period 1. In other words, an anticipated increase in the exchange rate in period 2 also boosts the exchange rate in period 1. Something similar happens under *capital controls*, in the sense that the exchange rate reacts in anticipation of future events. However, this anticipated behavior occurs via the financial exchange rate and not through the commercial one, which is assumed to be fixed. Because of the capital controls, any excess demand for bonds increases the value of the financial exchange rate  $Q_1^*$ . The latter change reduces  $\rho_1^*$ , inducing an increase in  $c_1^*$  and a decrease in  $c_2^*$ . This last effect tilts transfers towards period 1 at the expense of transfers in period 2.

In summary, we obtain that capital controls induce more net fiscal transfers than fixed and flexible regimes while the stabilization plan lasts (period 1). Fixed regimes induce more net fiscal transfers than flexible regimes in both periods as long as the FA is impatient -which is arguably the most realistic scenario. Nothing conclusive could be said about the ranking of transfers under alternative regimes once the stabilization plan collapse (period 2).

#### 2.4.2. Fiscal response to changes in the degree of impatience and importance of net fiscal transfers

Given the relevance of period 1 for identifying purposes, in this section we ask whether the choice of ERR influences the equilibrium response of fiscal policy to changes in the degree of impatience  $\beta$  and importance of net fiscal transfers  $\alpha$  while the stabilization plan lasts (period 1). These effects were not analyzed in Tornell and Velasco for fixed and flexible regimes.

**Proposition 6.** An increase [decrease] in the degree of impatience of the FA leads to a bigger increase [decrease] of net fiscal transfers in period 1 under *capital controls* than under *fixed* regimes, and under *fixed* regimes than under *flexible* regimes.<sup>12</sup>

When the FA is more impatient two effects can be identified:

- *Fiscal party incentive:* Since the FA’s discount factor enters into its direct utility from receiving transfers (see first term in equation (12)), while the intertemporal relative cost is given by the interest rate, a more impatient FA would be delighted to increase the *fiscal party*. This incentive is present under fixed and flexible regimes, as well as under capital controls.

- *Consumption party incentive:* A more impatient FA would also like the PA to have a consumption party (see second term in equation (12)). Under perfect capital mobility we showed that consumption is smooth over time. However, under capital controls, a more impatient FA could add fuel to the *consumption party* by increasing net fiscal transfers and, consequently, the necessity of financing those transfers with inflation in period 2. The latter effect would reduce the real domestic interest rate intensifying the *consumption party* under capital controls.

Therefore, under fixed regimes a more impatient FA benefits from increasing fiscal transfers in period 1 because of the direct increase in the FA’s utility, while the cost originates from the lower real balances held by the PA in period 2 that occurs as a consequence of increasing inflationary pressures in period 2. However, under flexible regimes there is an extra cost due to the decrease in money supply in period 1. For this reason, an increase in the degree of impatience of the FA generates more increase of net fiscal transfers in period 1 under fixed regimes than under flexible regimes. Capital controls provide a similar cost and benefit structure as fixed regimes, since inflation equals zero in period 1. However, increasing inflationary pressures in period 2 also induce the PA under capital controls to be engaged in a more distorted *consumption party* as the real domestic interest rate decreases. This last effect tilts transfers towards period 1. For this reason, an increase in the degree of impatience of the FA generates more increase of net fiscal transfers in period 1 under capital controls than fixed regimes.

**Proposition 7.** An increase [decrease] in the importance the FA assigns to net fiscal transfers leads to a bigger increase [decrease] of net fiscal transfers in period 1 under *capital controls* than under *fixed* regimes, and under *fixed* regimes than under *flexible* regimes.<sup>13</sup>

Considering the transmission mechanisms for each type of ERR described in proposition 6, an increase in the importance the FA assigns to net fiscal transfers triggers more fiscal response under capital controls than under fixed regimes, and under fixed regimes than under flexible regimes.

### 3. Empirical analysis

In this section we test the implications of our theoretical model: Capital controls induce more net fiscal transfers than fixed and flexible regimes operating under perfect capital mobility while the stabilization plan lasts or, in other words, in relatively “tranquil” times. In addition, we test Tornell and Velasco’s prediction that fixed regimes induce more net fiscal transfers than flexible regimes. We also test whether fiscal differences across ERRs become more significant the more shortsighted politicians are, and the higher is the importance politicians assign to fiscal policy.

The rest of this section is organized as follows. First, we present the econometric methodology. Second, we present the data used in our study. Third, we show our benchmark results accounting for diverse sources of potential ERR endogeneity. Fourth, using presidential pre-electoral and natural disasters data we test whether fiscal differences across ERRs become more

<sup>12</sup>Appendix A shows the proof of this proposition.

<sup>13</sup>Appendix B shows the proof of this proposition.

important the more shortsighted politicians are, and the higher is the importance the FA assigns fiscal policy. Finally, we provide some sensitivity analysis by examining insulation properties of capital controls and using alternative ERR classifications.

### 3.1. Econometric methodology

The econometric methodology should consider the following aspects:

- *Lag of dependent variable as regressor.* It is difficult to model the underlying “primitive” determinants of the level of fiscal variables like expenditures, revenues and deficits. To get around this problem, previous studies include lagged fiscal indicators as explanatory variables. Therefore, the econometric specification should be dynamic, not only because of a direct interest in the coefficient of the lagged fiscal variable itself, but also because the correct dynamic specification may be critical to recover consistent estimates of the impact of other variables of interest, such as the ERR.

- *Country-specific effects.* Heterogeneity in fiscal institutions is considered to be important in understanding diverse fiscal outcomes (Alesina and Perotti, 1996). Although some of this heterogeneity is manifested in formal organizations that can plausibly be measured, many institutions involve informal arrangements and behaviors impossible to quantify. Country-specific effects account for those unobserved determinants of the fiscal outcome that are peculiar to each country, and that do not vary over time. Plausible factors captured by such effects include political preferences, attitudes towards fiscal discipline, degree of discretion over expenditures, and transparency of procedures in the budget process. Thus the econometric specification should include country-specific effects.

- *Endogeneity of the ERR and other regressors.* The econometric technique should instrument for all potentially endogenous regressors, including the ERR. As discussed in the introduction, a more appropriate treatment of the ERR endogeneity is an open subject in the literature.

Taking into account these considerations, the dynamic panel system GMM approach developed by Blundell and Bond (1998) is appropriate, since it allows us to estimate a model such as the following:

$$y_{it} = \gamma + \alpha y_{it-1} + r'_{it}\beta + x'_{it} \lambda + \eta_i + \mu_{it} \quad i = 1, \dots, N \quad t = 1, \dots, T \quad (36)$$

where  $y_{it}$  is a measure of net fiscal transfers,  $\alpha$  is a scalar,  $r'_{it}$  of dimension  $1 \times (g - 1)$  refers to  $g$  ERR categories,  $x'_{it}$  of dimension  $1 \times k$  consists of control variables that also affect net fiscal transfers,  $\beta$  and  $\lambda$  are  $(g - 1) \times 1$  and  $k \times 1$  vectors, and  $\eta_i \sim IID(0, \sigma_\eta^2)$  and  $\mu_{it} \sim IID(0, \sigma_\mu^2)$  are jointly independent. This GMM estimator addresses the bias and inconsistency problems that arise under fixed and random effect estimators due to the joint presence of country-specific effects and a lagged dependent variable.

In our empirical model  $r_{it}$  and/or  $x_{it}$  could be endogenous. Two possible econometric strategies are available to control for such endogeneity: i) the use of external instruments in a standard instrumental variables approach or, ii) the use of internal instruments in a similar way as suggested by Blundell and Bond (1998). The latter approach would require  $E(\eta_i \Delta x_{it}) = 0$  and/or  $E(\eta_i \Delta r_{it}) = 0$  as additional moment conditions. Following Blundell and Bond (2000), constant means of the  $x_{it}$  and/or  $r_{it}$  series over time for each country would be sufficient for the validity of the preceding moment conditions. Although stationary means of some control variable might be a reasonable assumption, constant means of the ERR series is not. For this reason we use external instruments in a standard instrumental variables approach to control for ERR endogeneity.

## 3.2. Data

Our empirical study uses an annual panel data set which consists of 23 emerging market countries in the period 1970-2001.<sup>14</sup> We focus on this set of countries because they have at least 15 years of continuous fiscal data, and more importantly, because they fit our theoretical model since these countries have experienced diverse macroeconomic problems related to fiscal, inflation and debt difficulties and have “weak” central banks that recurrently finance governments via seigniorage and the inflation tax. For example, the average annual inflation rate for the whole sample is 23 percent, almost 20 percent of the observations involve foreign currency default and 35 percent have either a Stand-by Arrangement or an Extended Fund Facility IMF program.

### 3.2.1. Macroeconomic and fiscal variables

Taking into account the theoretical model, the most natural variable to capture net fiscal transfers is the central government primary fiscal deficit as a percentage of trend GDP.<sup>15</sup> One of the most notable characteristics of fiscal variables is their strong time inertia. Table 1 shows this strong positive serial correlation in a sample pooling observations across all countries, with a value close to 0.75 at a one year horizon.

*Insert Table 1 here*

We use other macroeconomic variables including the country’s position in the business cycle, terms of trade shocks, initial government debt, whether the country is experiencing a debt default or bank crisis, whether the country has an IMF program, the real LIBOR interest rate, average real GDP growth in OECD countries, percentage of total long-term debt contracted in US\$, short-term external debt as a percentage of total external debt, terms of trade volatility and trade openness.<sup>16</sup>

### 3.2.2. Exchange rate regime classification

The selection of an ERR classification is crucial for any study that aims to measure the influence of ERR on other variables. As remarked by Reinhart and Rogoff (2004), the *de jure* IMF classification can be misleading since “the gap between *de facto* and *de jure* can be vast.” Reinhart and Rogoff (2004) develop a classification that is based upon the actual evolution of the market-determined exchange rate. This classification has several advantages compared to the *de jure* IMF classification. First, it measures actual behavior as opposed to what countries claim to do. Our model is not about the role of announcements, but rather about actual behavior of exchange rates. Second, Reinhart and Rogoff create a separate category called “free falling,” which includes extreme macroeconomic distress situations associated with inflation of over 40 percent per year. This category allows us to avoid mixing the effects of regimes under modest inflation situations with those related to severe stressful circumstances. Lastly, it helps us detecting capital controls by identifying situations in which two exchange rates coexist simultaneously. In this regard, a very attractive feature of this classification is that it identifies several types of capital controls, including not only official dual exchange rate regimes, which

<sup>14</sup>The countries in the sample are Argentina, Bolivia, Chile, Colombia, Costa Rica, Dominican Republic, El Salvador, Ghana, Guatemala, India, Indonesia, Malaysia, Mauritius, Mexico, Morocco, Pakistan, Paraguay, Peru, Philippines, Tunisia, Turkey, Uruguay and Venezuela.

<sup>15</sup>We divide by trend GDP and not GDP itself because, as Kaminsky et al. (2004) argue, normalizing by GDP understates (overstates) fiscal behavior when governments pursue procyclical (countercyclical) fiscal policies.

<sup>16</sup>See the Appendix C for a complete description of all variables used in the study and their source.

nevertheless have been one of the most common varieties of capital controls after the collapse of Bretton Woods (Guidotti and Végh, 1992; Xu, 2002), but also other restrictions on the capital account that trigger endogenous black parallel markets (Kiguel and O’Connell, 1997; Reinhart and Rogoff, 2004). It is worth to remember that without considering observations classified as “free falling,” almost 40 percent of the effective sample has dual (legal or illegal) regimes.

In line with our theoretical model, we do not include observations classified as “free falling,” since we want to measure the influence of ERRs under relatively “tranquil” times and not when the bomb actually explodes. As described in Table 2, around 20 percent of potential sample observations correspond to this category. Once “free falling” observations are excluded, we match the ERRs characterization used in our theoretical model by distinguishing between unified markets and dual regimes, with the latter group representing almost 40 percent of the effective sample. Among unified markets we differentiate fixed from flexible regimes, which constitute around 50 percent and 10 percent of the sample respectively. Note that the division of observations under unified rates would differ notably if the IMF classification was used, since around 65 percent of the sample self-declare as having flexible regimes. As Table 3 shows, this occurs because most countries that claimed to follow flexible arrangements during our sample period actually fixed their exchange rates; the well known “fear of floating” phenomenon (Calvo and Reinhart, 2000).

*Insert Table 2 and Table 3 here*

It is also interesting to remark some statistics about the average duration of ERRs. The average duration of dual regimes is 7.1 years. Using Reinhart-Rogoff classification the average duration of fixed and flexible regimes working under unified rates is 8.5 and 4.6 years respectively; while they are 7 and 6.4 years when employing the IMF classification.

### 3.3. Benchmark results

In this section we examine the effects of ERRs on the fiscal deficit treating all regressors as exogenous. Columns (1) and (2) of Table 4 show the simplest OLS and panel country fixed effects regressions of fiscal deficit across ERRs in “tranquil” times.<sup>17</sup> We find that dual regimes are associated with higher fiscal deficits than fixed and flexible regimes under both approaches. Fixed regimes have on average higher deficits than flexible arrangements; however, this result vanishes when we consider the within country experience.

*Insert Table 4 here*

Columns (3) in Table 4 shows the most basic dynamic panel data model. We confirm that the fiscal deficit is highly persistent over time and that ERRs influence fiscal behavior in the manner predicted by the theoretical model in the short-run. In quantitative terms, capital controls induce fiscal deficits (as share of trend GDP) that are 0.488 percent and 1.089 percent higher than fixed and flexible regimes operating under perfect capital mobility, respectively, and fixed regimes cause deficits 0.601 percentage points higher than flexible arrangements. These differences are statistically significant at 5% level and are economically important considering that the average fiscal deficit in the sample is 1.25 percent of GDP. The long-run effect of alternative ERRs are larger due to the positive persistence in the dependent variable. In particular,

<sup>17</sup>As discussed in section 3.2.2., we proxy “tranquil” times by excluding observations classified as “free falling” by Reinhart-Rogoff classification.

fixed regimes and capital controls are associated with 3.47 percent and 3.8 percent higher fiscal deficit than flexible regimes, respectively.<sup>18</sup>

In order to test the conditional influence of ERRs on the fiscal deficit we also include other potential fiscal regressors that could be related to ERRs: i) The country’s position in the business cycle captures the procyclicality or countercyclicality of fiscal policies.<sup>19</sup> ii) Initial government debt measures the debt burden.<sup>20</sup> iii) As in Calvo and Végh (1999), the real LIBOR interest rate and average real GDP growth in OECD countries are intended to capture the world business cycle. iv) Terms of trade shocks represent another external shock that could affect fiscal performance (Lane and Tornell, 1999).

Columns (4) to (8) in Table 4 show the results of the dynamic panel strategy controlling one-at-a-time for domestic and external variables that could affect fiscal deficit. The business cycle is positively related to the fiscal deficit, which suggests procyclicality of fiscal policies. The initial debt has a negative sign; the higher the initial debt, the lower the possibility or willingness to undergo fiscal deficits. Neither terms of trade shocks nor international interest rates seem to significantly affect the fiscal deficit. The negative and significant coefficient associated with average real GDP growth in OECD countries indicates that good times in developed economies are related to lower fiscal deficits in emerging markets. When all these regressors are considered altogether, column (9) in Table 4, the results are similar but the business cycle loses its significance. For each specification, the model implications regarding the ranking of net fiscal transfers across ERRs, as well as the quantitative findings obtained in column (3) are maintained.

ERR changes over time are the primary source of identifying variation in our panel study. However, since the fiscal process is continuous and inertial by nature, some concern might exist as to whether “rapid” ERR variability truly allows us to identify the precise influence of ERRs on fiscal performance. For this reason, column (10) in Table 4 considers only observations for which the ERR remains constant for at least four years. The results are robust to this sample restriction, even though the sample size is reduced by almost 9 percent.

### 3.4. Endogeneity issues

In this section we address endogeneity of the ERR and other regressors. Initial government debt is not subject to endogeneity because it corresponds to the level of indebtedness at the end of the previous year. Because the countries included in the sample are relatively small economies, terms of trade shocks, real LIBOR interest rate and average real GDP growth in OECD countries are not subject to endogeneity issues either. Endogeneity of the business cycle term represents a reasonable concern because a positive [negative] relationship could also occur if promoting fiscal deficit drives the economy towards a boom [recession]. We control such endogeneity by using internal instruments following the system GMM approach.<sup>21</sup> Regarding ERR endogeneity we distinguish three main potential sources and different avenues to control for them.

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<sup>18</sup>The long run effect of fixed and dual regimes are given by the ratio of the ERR estimate ( $\beta^{SR}$ ) to one minus the auto-regressive coefficient. That is to say,  $\beta_{fixed}^{LR} = \beta_{fixed}^{SR} / (1 - \alpha) = 0.605 / (1 - 0.712) = 3.47$ , and similarly  $\beta_{dual}^{LR} = 3.8$ .

<sup>19</sup>Approximately 47 percent, 59 percent and 62 percent of fixed, flexible and dual regime observations are classified as recessions respectively.

<sup>20</sup>The mean level of indebtedness is similar across observations under different ERRs.

<sup>21</sup>Similar results are obtained if the first lag of GDP Cycle is used instead.

### 3.4.1. Regime classification endogeneity

The Reinhart-Rogoff classification is outcome based, in that it categorizes regimes based upon the evolution of the market-determined exchange rate. For this reason, it is likely that countries experiencing high fiscal deficits would tend to have more flexible regimes ex-post, while countries experiencing sound fiscal policies would increase their chance of sustaining fixed regimes or capital controls. Therefore, this source of endogeneity would tend to generate the appearance of higher surpluses for fixed and dual regimes than for flexible arrangements. Since the empirical results do not show this pattern, accounting for this source of endogeneity would strengthen our results.

### 3.4.2. Endogeneity due to regime choice under stress

Countries experiencing persistent fiscal deficits or other financial and debt difficulties could adopt fixed regimes as a stabilizing device, or impose capital controls to avoid the effects of a depreciation on domestic prices while maintaining some degree of control over capital outflows and international reserves. Therefore, this source of endogeneity would tend to generate the appearance of lower surpluses under fixed and dual regimes than under flexible arrangements. Since the empirical findings do show this profile, we reduce the likelihood of this type of endogeneity by also excluding those observations that are two years apart from “free falling” events and controlling for other regressors that are symptoms of macroeconomic and financial distress, such as episodes of debt default, bank crisis and the presence of IMF programs.<sup>22</sup>

On top of not including “free falling” events, column (1) in Table 5 also abstracts from observations within two years of “free falling” episodes, reducing the size of the sample by 20 percent. This “extra tranquil” regression supports the results previously obtained. Columns (2), (3) and (4) include the IMF Program, Bank Crisis and Default variables respectively. Only the last variable is statistically significant, indicating that countries experiencing debt defaults tend to reduce their fiscal deficit by 0.7 points of GDP. Interestingly, when this variable is included, Initial Debt loses its significance, which supports the idea that “things must be really bad before they start to get better again” as formalized in Velasco (1997). Although endogeneity of the IMF Program, Bank Crisis and Default variables might be a concern, two things are worth noting. First, such endogeneity would tend to generate positive coefficients on the three mentioned variables, which is not what we mainly find. Secondly, it is relatively unlikely that the current fiscal deficit per se generates such episodes; on the contrary, distress episodes are usually associated with chronic fiscal and macroeconomic mismanagement.<sup>23</sup> The three distress variables are included together in columns (5) and (6) in Table 5, where column (6) only considers observations for which the ERR remains constant for at least four years. In both cases the previous results are sustained in both qualitative and quantitative terms.

*Insert Table 5 here*

### 3.4.3. Endogeneity due to government type

As in Tornell and Velasco, we assume in our theoretical model that the central bank’s monetary and capital flows policies are exogenous and are not the result of any optimization problem. However, it seems reasonable to think that, to the extent that the regime choice affects fiscal

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<sup>22</sup>It is worth remembering that around 50 percent of debt default and bank crisis events were already excluded, since they occur during “free falling” episodes. The remaining episodes are roughly evenly distributed between fixed and dual regimes.

<sup>23</sup>For empirical purposes we also include the first lag of the three distress indicators obtaining similar results.

discipline, the fiscal authority will try to influence the central bank to choose the type of ERR that suits the policymaker better.

The model presented above suggests that free-spending politicians would be more likely than fiscal conservatives to persuade the central bank to choose fixed regimes or to impose capital controls. Therefore, this source of endogeneity would tend to generate the appearance of higher fiscal deficit in fixed and dual regimes than in flexible arrangements. Since the empirical findings do show this profile, we control for this source of endogeneity by using instrumental variables.

Four variables are used as instruments for the ERR: i) the percentage of total long-term debt contracted in US\$, ii) short-term external debt as a percentage of total external debt, iii) terms of trade volatility, and iv) trade openness. The first two variables are suggested by Avellán (2005) to instrument dual regimes while the last two are from the optimal currency areas literature. The percentage of total long-term debt contracted in US\$ captures the currency mismatch in a country's debt structure and proxies its degree of liability dollarization. If there is a negative shock that puts pressure on the exchange rate and the currency mismatch is perceived to be critical, policymakers would rather implement a partial devaluation through a dual regime than a unified devaluation. Short-term external debt as a percentage of total external debt controls for the maturity imbalance that might be present in external debt, pushing a country into a liquidity crisis. If a negative shock occurs, a policymaker whose interest payments are concentrated in the near future would prefer a dual regime as opposed to a unified devaluation because the debt service remains unchanged. The literature on optimal currency areas suggests that fixed regimes are preferable for more open countries while flexible arrangements are preferable for economies subject to volatile real shocks such as terms of trade.

Columns (7) and (8) in Table 5 show the results employing this standard instrumental variables approach.<sup>24</sup> Columns (7) and (8) use the “extra tranquil” sample described in section 3.4.2., and in addition column (8) only considers observations where ERRs remains constant for at least 4 years. The previous results are confirmed; capital controls induce higher fiscal deficits than fixed and flexible regimes operating under unified rates, and fixed regimes generate more deficit than flexible arrangements. To test the validity of the main assumptions used by this methodology, we use the Hansen’s J statistic, which is an over-identifying restriction test that examines whether the moment conditions assumptions are valid. Such a test does not reject the null of instrument validity at 5 percent significance for all regressions. To investigate the “exclusivity” assumption we run regressions like the one of column (8) in Table 5, but adding one-at-a-time each proposed instrument as additional regressor. In each case we instrument ERRs with the remaining three instruments. The coefficient on each instrument is indistinguishable from zero.<sup>25</sup> This hints that each instrument does not affect fiscal deficit directly, but rather through ERRs.

### **3.5. Fiscal response to changes in the importance assigned to fiscal policy**

Our theoretical model shows that fiscal differences across ERRs become more significant the higher is the importance politicians assign to fiscal policy. To test this implication we exploit natural disasters data. Severe natural disasters like droughts, earthquakes, floods and wind storms have two key features which make them appealing for our purposes:

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<sup>24</sup>Because of potential contemporaneous feedback from the ERR to these instruments, we use once-lagged values for the percentage of total long-term debt contracted in US\$, short-term external debt as a percentage of total external debt and trade openness.

<sup>25</sup>These regressions are not reported for brevity.

i) Unpredictability and exogeneity: Natural disasters are typically sudden events that are unrelated to fiscal policy and ERRs.

ii) Government involvement: Since natural disasters cause great damage, destruction and human suffering, governments generally respond with diverse policies intending to rebuild infrastructure, homes and productive systems, as well as to provide assistance and economic help to the families affected. In other words, when a severe natural disaster hits a country its government would naturally like to have more active fiscal policies.

Considering that politicians increase the importance assigned to fiscal transfers when hit by severe natural disasters, we can test proposition 7 by considering the following specification:

$$y_{it} = \gamma + \alpha y_{it-1} + \varphi ND_{it} + \sum_{j=1}^{g-1} \phi_j ND_{it} r_{it}^j + r'_{it} \beta + x'_{it} \lambda + \eta_i + \mu_{it} \quad i = 1, \dots, N \quad t = 1, \dots, T \quad (37)$$

where (37) is similar to (36), but also includes a natural disasters dummy  $ND$  and its interaction with the ERRs.

We classify a particular observation as a natural disaster when:

i) A drought, earthquake, flood or wind storm affects at least 5 percent of the country's total population.<sup>26</sup> This relatively high threshold guarantees that the natural disaster is sufficiently important to affect fiscal behavior.<sup>27</sup>

ii) The event is recorded in the year it occurs if it happens during the first 10 months of the year, while it is counted in the following year if it happens during the last 2 months of the year. Obviously, the damage happens at the moment of the catastrophe; however, it is likely that the fiscal response is reflected in the following year if the disaster occurs at the very end of the year.<sup>28</sup>

Considering this definition, 50 natural disasters are recorded, representing around 7 percent of the total sample. The average share of population affected by those events is 15 percent, which shows the severity of the recorded episodes. Excluding observations with "free falling" events, the shares of disasters occurring under each type of regime are 59 percent, 9 percent and 32 percent for fixed, flexible and dual regimes respectively. These proportions are similar to the distribution of regimes in the overall sample.

*Insert Table 6 here*

Columns (1) to (3) in Table 6 show the estimation outcomes when using specification (37).<sup>29</sup> Columns (1) and (2) in Table 6 are analogous to columns (7) and (8) in Table 5 from a sample and econometric perspective, aside from the new terms included related to natural disasters. Column (3) in Table 6 eliminates observations for which the ERR corresponding to the disaster differs from the previous year's regime. This reduces the likelihood that the natural disaster affects the

<sup>26</sup> Similar results are obtained if the percentage of country's total population used as threshold varies moderately.

<sup>27</sup> For example, Argentina had natural disasters in around 75 percent of the years in the period 1970-2001. However, 80 percent of those events affected less than 0.7 percent of the total population and on average only 0.15 percent. These events have the unpredictability characteristic; however, it is doubtful that government fiscal policy significantly responded to such "minor" events. Using a 5 percent threshold, only 2 flood events occurred in Argentina, in 1983 and 1988, affecting around 20 percent and 15 percent of the total population.

<sup>28</sup> Similar results are obtained if the month used as threshold moderately varies.

<sup>29</sup> Coefficients of other control variables are not reported for brevity. The previous results are sustained in both qualitative and quantitative terms.

choice of ERR, notwithstanding this adjustment reduce the sample only by 2 observations. The interaction terms show, at a 7% level of significance, that fixed regimes induce higher deficit than flexible regimes in the face of a natural disaster, and dual regimes generate even higher fiscal deficit than fixed regimes, giving support to the theoretical implications of our model.<sup>30</sup> In addition to the differences induced by alternative ERRs, when hit by a natural disaster capital controls produce deficits that are 1.96 percent and 1.14 percent of GDP higher than flexible and fixed arrangements respectively, and fixed regimes cause deficits that are 0.83 percent higher than flexible arrangements.

### 3.6. Fiscal response to changes in the degree of impatience

Our theoretical model shows that fiscal differences across ERRs become more significant the more shortsighted politicians are. Considering that politicians are more impatient close to an election, we analyze whether different ERRs induce different fiscal behavior in presidential pre-electoral years. In order to test this hypothesis we consider the following specification:

$$y_{it} = \gamma + \alpha y_{it-1} + \varphi PE_{it} + \sum_{j=1}^{g-1} \phi_j PE_{it} r_{it}^j + r'_{it}\beta + x'_{it}\lambda + \eta_i + \mu_{it} \quad i = 1, \dots, N \quad t = 1, \dots, T \quad (38)$$

where (38) is similar to (36), but also includes a presidential pre-electoral dummy  $PE$  and its interaction with the ERRs.

We classify a particular observation as a presidential pre-election year according to the following criteria:

- i) There is a democratic presidential election in the second half of the current year or in the first half of the following one. Arguably, this captures the most intense pre-electoral period.
- ii) We exclude presidential elections that take place in the context of civil war or violence, like the ones that took place during the Salvadoran civil war. Such exclusions allow us to focus on relatively peaceful and normal electoral processes.

Differently to what happens with natural disasters, the timing of presidential elections are subject to endogeneity. To control for such endogeneity we exclude:

- i) Electoral processes that take place after the breakdown of military regimes. There is a vast literature in political science (Gasiorowski, 1995) that shows the importance of debt crisis, increasing fiscal deficits and inflation as the main factors driving the collapse of military regimes and the reestablishment of democracy.
- ii) Unscheduled “early elections” that take place after presidential resignations. Most of these events are triggered by unmanageable economic and social tensions including growing fiscal deficits.<sup>31</sup>

Considering this definition, 38 presidential pre-electoral years are recorded, representing around 6 percent of the total sample. Excluding observations with “free falling” events, the

<sup>30</sup>The coefficient associated with natural disasters itself might not be statistically different from zero due to the reduced number of events recorded under flexible regimes (3 observations).

<sup>31</sup>For example, the Bolivian Congress rescheduled the presidential election one year earlier than expected after the resignation of President Siles Zuazo in 1985. Over the thirty-three months of his presidency there were seven ministers of finance, an equal number of Central Bank presidents, an accumulated inflation of 12,000 percent and an average fiscal deficit over GDP ratio of 12 percent.

shares of elections occurring under each type of regime are 50 percent, 11 percent and 39 percent for fixed, flexible and dual regimes respectively. These proportions are similar to the distribution of regimes in the overall sample. Columns (4) and (5) in Table 6 show the estimation outcomes when using specification (38).<sup>32</sup> Columns (4) and (5) in Table 6 are analogous to columns (7) and (8) in Table 5 from a sample and econometric perspective, aside from the new terms included related to presidential pre-electoral years. Excluding observations for which the ERR corresponding to the pre-electoral year differs from the previous year's regime does not modify the sample size with respect to the one in column (5), Table 6. The interaction terms show at a 9% level of significance that fixed regimes induce higher deficit than flexible regimes during pre-electoral years, and dual regimes generate even higher fiscal deficit than fixed regimes, giving support to the theoretical implications of our model.<sup>33</sup> In addition to the differences induced by alternative ERRs, during pre-electoral years capital controls produce deficits that are 1.93 percent and 1.04 percent of GDP higher than flexible and fixed arrangements, and fixed regimes cause deficits that are 0.89 percent higher than flexible arrangements.

### 3.7. Further evidence and sensitivity analysis

In this section we provide further evidence and sensitivity analysis. First, we consider the price and reserve insulation properties of capital controls. Last, we use the *de jure* IMF ERR classification for those arrangements operating under unified rates.

#### 3.7.1. Insulation properties under capital controls

Our model assumes, in line with most of the theoretical literature, that capital controls are completely enforceable; that is to say, the financial and commercial exchange markets can be separated at zero cost. However, as Guidotti (1988) notices, when the assumption of complete separation is relaxed, different types of “leakages” arise. Moreover, Kiguel et al. (1997) remark that the higher the exchange rate premium the more important are those “leakages” and, consequently, the less effective are dual regimes insulating prices and reserves.<sup>34</sup> In fact, this is the main reason why these regimes are usually abandoned, not because they are no longer needed or desired, but because they are no longer useful in protecting reserves and maintaining low inflation.

Our previous results are not likely to be driven by the more severe cases in which these type of “leakages” may happen, since the sample does not include “free falling” episodes.<sup>35</sup> However, there could still be “leakages” of a lower magnitude. For this reason we separate dual regimes according to the evolution of the market-determined exchange rate following the Reinhart-Rogoff classification. The median exchange premium for dual regimes with flexible

<sup>32</sup>Coefficients of other control variables are not reported for brevity. The previous results are sustained in both qualitative and quantitative terms.

<sup>33</sup>The coefficient associated with presidential pre-electoral year itself might not be statistically different from zero due to the reduced number of events recorded under flexible regimes (3 observations).

<sup>34</sup>Different “leakages” arise when exchange rate premiums increase. Following Kiguel et al. (1997) some of them are: i) Through illegal trade, as exports are diverted from official to unofficial channels (Fleming, 1971; Bhagwati, 1978). ii) Outflows of reserves may also occur through legal channels, for example Kamin (1993) reports that exporters in Argentina aggressively used special export financing facilities during the early 1980s. iii) Imports are overinvoiced (May, 1985; O’Connell, 1991). iv) For individuals with access to foreign exchange at the commercial exchange rate, a rise in the exchange rate premium increases the profit from diverting funds from the official market to the parallel one and, therefore, the supply of official reserves for private capital flows also increases.

<sup>35</sup>The median exchange premium and inflation for “free falling” events which operate under dual regimes are 28 percent and 47.5 percent respectively, while for not dual “free falling” regimes they are 12.5 percent and 11.6 percent. These differences are statistically significant with a p-value of 0.001

market-determined exchange rates, Dual(Flex.), is 20.2 percent, while for dual regimes with fixed market-determined exchange rates, Dual(Fixed), the median is 6.2 percent. This difference is statistically significant with a p-value of 0.0001.

Columns (1) and (2) in Table 7 show that capital controls mainly induce higher fiscal deficits than regimes operating under unified rates, but that effect is smaller as the market-determined exchange rate becomes more flexible and the exchange rate premium increases.<sup>36</sup> This result is consistent with the idea that increments in the exchange rate premium intensify the “leakages,” weakening the price and reserve insulation properties of capital controls, and consequently reducing the fiscal incentives to have high fiscal deficit. In other words, as the “leakages” become more important, price formation and capital flows tend to be closer to those under flexible regimes. For this reason, governments with high fiscal deficit face immediate inflation costs and do not enjoy the same degree of control over the consumption distortion.

*Insert Table 7 here*

Two issues are worth noting. First, there might be some concern about our results if Dual(Fixed) regimes are associated with low premiums because of large official exchange rate devaluations. If this is the case, such regimes might be related to poor fiscal performance because they are associated with the collapse of an unsustainable official exchange rate and not because of the relatively strong price and reserve insulation properties associated with low premiums. This concern does not seem to be warranted because official exchange devaluations higher than 25 percent represent 20 percent of Dual(Flex.) observations and only 1.5 percent of Dual(Fixed). Second, endogeneity issues might also arise since high fiscal deficit tends to increase the exchange premium. However, if this element is driving our results, Dual(Flex.) regimes should have higher fiscal deficit than Dual(Fixed) arrangements, which is the opposite of what we found. In other words, while these two concerns might affect our estimation results, correcting them would strengthen our findings and not weaken them.

### 3.7.2. De jure exchange rate regime classification

So far we have used the *de facto* Reinhart-Rogoff classification. In this section we consider instead the *de jure* IMF classification for those ERRs operating under unified rates. The results are presented in columns (3) and (4) in Table 7.<sup>37</sup> Dual regimes still induce higher fiscal deficit than either regime operating under unified rates; however, considering the *de jure* IMF classification, fixed regimes generate the same deficit as flexible arrangements. Therefore, distinguishing between what countries claim to do and what they actually do clearly matters when analyzing the influence of ERRs on diverse macroeconomic variables, including the primary fiscal balance.

## 4. Conclusions

In this paper we offer both theoretical arguments and empirical evidence showing that capital controls induce higher fiscal deficits than fixed and flexible regimes operating under perfect capital mobility. Under capital controls, the necessity of financing fiscal deficits increases future anticipated monetization and, consequently, reduce desired future money holdings. The latter change creates excess demand for bonds which, due to the presence of capital controls, reduces

<sup>36</sup>Coefficients of other control variables are not reported for brevity. The previous results are sustained in both qualitative and quantitative terms.

<sup>37</sup>Coefficients of other control variables are not reported for brevity. The previous results are sustained in both qualitative and quantitative terms.

the current domestic real interest rate. This last factor increases current consumption, which boost fiscal deficit. That is to say, capital controls boost current consumption as private agents attempt to reduce their real balances because of the expected inflation tax. This means that fiscal expansions under capital controls are not only less costly in terms of short-run inflation than under flexible regimes, but also more “convenient” than fixed regimes in terms of consumption boom. We also show that fiscal differences across ERRs become more significant the more shortsighted politicians are, and the higher is the importance politicians assign to fiscal policy.

We show robust evidence confirming that capital controls lead to larger primary deficits than fixed and flexible regimes under perfect capital mobility, even after controlling for different sources of ERRs endogeneity. Our findings also support Tornell and Velasco’s core prediction that fixed regimes induce less discipline than flexible arrangements under perfect capital mobility. Using presidential pre-electoral and natural disasters data, we also show that fiscal differences across ERRs become more significant as politicians become more impatient, and the higher is the importance politicians assign to fiscal policy.

We also illustrate the empirical relevance of insulation properties under capital controls. We confirm the relevance of effectiveness of capital controls. In particular we find that when “leakages” become more important, the price and reserve insulation properties tend to weaken and, consequently, governments with high fiscal deficit face immediate inflation costs and do not enjoy the same degree of control over the consumption distortion. Therefore, when “leakages” become more important, fiscal incentives to have high fiscal deficit are reduced.

Lastly, we illustrate the empirical relevance of using *de facto* exchange rate regimes classification as opposed to *de jure* ones; especially since more than half of the time countries do not behave as they claim they do.

The general consensus among economists is that capital controls are harmful to economic efficiency at least in the long-run because they prevent resources from being used where they are most productive. These controls have been associated with systems of financial repression, persistent overvaluation of official exchange rates, protection of inefficient import-substituting industries and low economic growth (Fry, 1988; McKinnon, 1973; Eichengreen et al., 1999; Barro and Lee, 1993; Bhagwati, 1978; Avellán, 2005). It has also been argued that capital controls can be a useful policy at least in the short-run. One of the most frequent justifications is that capital controls provide temporary insulation of reserves and domestic prices from transitory shocks to the capital account. In this line of thought, Tobin (1978) advocated throwing “some sand in the wheels of our excessively efficient international money markets.” Similarly Dornbusch (1986) claims that “running the world to the tune of assets markets may be undesirable. Hence the interest in institutional arrangements that delink asset markets and free policies to be directed to a government’s true priorities,” and in a similar vein Krugman (1998) argues that “currency controls are a risky, stopgap measure, but some gaps desperately need to be stopped.” In line with the first group of papers, we provide theoretical arguments confirming the distortions that capital controls induce in terms of consumption and fiscal policies. Our findings also tend to counter the arguments that advocate the use of capital controls as temporary relief for temporary capital account shocks in the presence of fiscal distortions, because the higher fiscal deficits they induce might exacerbate the initial condition they were intended to alleviate.

## Appendix A. Proof of proposition 6

From equation (26) and considering (14) and (17) is it straightforward that

$$\frac{d\tau_{1,fixed}^*}{d\beta} = -A, \quad (\text{A.1})$$

where  $A \equiv \left(\frac{1}{(1+r)\beta}\right)^2 (1+r) \left(\frac{\alpha}{1-\alpha}\right) \left(\frac{1-\epsilon}{\epsilon}\right) \bar{c} > 0$ .

Taking total differential of (29), (30), (15), (16), (11) and  $m_1(1 - \mu_1) \equiv m_0(1 - \pi_1)$ , and solving the system considering (14), (17) and  $\mu_1 = 0$  we find

$$\frac{d\tau_{1,flex}^*}{d\beta} = -A \left(\frac{1+x\beta(1+r)}{1+x}\right)^2 \left(\frac{w-r\epsilon\pi_1^*}{w+r\epsilon+r^2\epsilon+r\pi_1^*}\right), \quad (\text{A.2})$$

where  $x \equiv \left(\frac{1}{\beta}\right) \left(\frac{r+\pi_1^*}{r+\pi_2^*}\right) \left(\frac{1}{(1+r)+[(1-\epsilon)/\epsilon](r+\pi_1^*)}\right)$  and  $w \equiv r^2+r\epsilon+r\pi_1^*+r\pi_2^*+\epsilon\pi_2^*+(1-\epsilon)\pi_1^*\pi_2^*$ .

Taking total differential of (32), (33), (19), (20), (21), (22), (11) and  $\rho_1 = r - (1+r)\pi_2$ , and solving the system considering (17) and  $\pi_1 = 0$  we obtain

$$\frac{d\tau_{1,cc}^*}{d\beta} = -A \frac{(2+r)(1+r)}{(2+r)(1+r) + (\rho_1^* - r)} \quad (\text{A.3})$$

Since  $\rho_1^* < r$  from proposition 3, then  $\left|\frac{d\tau_{1,cc}^*}{d\beta}\right| > \left|\frac{d\tau_{1,flex}^*}{d\beta}\right|$ . The term  $\frac{w-r\epsilon\pi_1^*}{w+r\epsilon+r^2\epsilon+r\pi_1^*}$  in equation (A.2) is between zero and one and the term  $\frac{1+x\beta(1+r)}{1+x}$  is only bigger than one when  $\beta(1+r) > 1$ . Therefore,  $\left|\frac{d\tau_{1,flex}^*}{d\beta}\right| > \left|\frac{d\tau_{1,cc}^*}{d\beta}\right|$  when  $\beta(1+r) \leq 1$ .

## Appendix B. Proof of proposition 7

From equation (26) and considering (14) and (17) is it straightforward that

$$\frac{d\tau_{1,flex}^*}{d\alpha} = \frac{1}{(1+r)\beta} \left(\frac{1-\epsilon}{\epsilon}\right) \frac{1}{(-1+\alpha)^2} \bar{c}. \quad (\text{B.1})$$

Taking total differential of (29), (30), (15), (16), (11) and  $m_1(1 - \mu_1) \equiv m_0(1 - \pi_1)$ , and solving the system considering (14), (17) and  $\mu_1 = 0$  we find

$$\frac{d\tau_{1,flex}^*}{d\alpha} = \frac{1}{(1+r)\beta} \left(\frac{1-\epsilon}{\epsilon}\right) \frac{1}{(-1+\alpha)^2} \bar{c} \left(\frac{1+x\beta(1+r)}{1+x}\right)^2, \quad (\text{B.2})$$

where  $x \equiv \left(\frac{1}{\beta}\right) \left(\frac{r+\pi_1^*}{r+\pi_2^*}\right) \left(\frac{1}{(1+r)+[(1-\epsilon)/\epsilon](r+\pi_1^*)}\right)$ .

Taking total differential of (32), (33), (19), (20), (21), (22), (11) and  $\rho_1 = r - (1+r)\pi_2$ , and solving the system considering (17) and  $\pi_1 = 0$  we obtain

$$\frac{d\tau_{1,cc}^*}{d\alpha} = \frac{1}{(1+r)\beta} \left(\frac{1-\epsilon}{\epsilon}\right) \frac{1}{(-1+\alpha)^2} \bar{c} \frac{(2+r)(1+r)}{(2+r)(1+r) + (\rho_1^* - r)}. \quad (\text{B.3})$$

Since  $\rho_1^* < r$  from proposition 3, then  $\frac{d\tau_{1,cc}^*}{d\alpha} > \frac{d\tau_{1,flex}^*}{d\alpha}$ . The term  $\frac{1+x\beta(1+r)}{1+x}$  in equation (B.2) is only bigger than one when  $\beta(1+r) > 1$ . Therefore,  $\frac{d\tau_{1,flex}^*}{d\alpha} > \frac{d\tau_{1,cc}^*}{d\alpha}$  when  $\beta(1+r) \leq 1$ .

## Appendix C. Variable definitions and sources

- Fixed*: 1 if Reinhart and Rogoff coarse exchange rate regime classification equals 1 or 2 under unified market, i.e. fixed or limited flexibility not dual. 0 for any other category. Source: Reinhart and Rogoff (2004).
- Flex.*: 1 if Reinhart and Rogoff coarse exchange rate regime classification equals 3 or 4 under unified market, i.e. managed or freely floating not dual. 0 for any other category. Source: Reinhart and Rogoff (2004).
- Dual*: 1 if there exists a dual exchange rate regime, i.e. a market-determined and an official exchange rate. 0 for any other category. Source: Reinhart and Rogoff (2004).
- Dual (Fixed)*: 1 if there exists a dual exchange rate regime and Reinhart and Rogoff coarse exchange rate regime classification equals 1 or 2, i.e. there are a market-determined and an official exchange rates and the former one behaves fixed or with limited flexibility. 0 for any other category. Source: Reinhart and Rogoff (2004).
- Dual (Flex.)*: 1 if there exists a dual regime and Reinhart and Rogoff coarse exchange rate regime classification equals 3 or 4, i.e. there are a market-determined and an official exchange rates and the former one behaves as a flexible exchange rate. 0 for any other category. Source: Reinhart and Rogoff (2004).
- Free Falling*: 1 if Reinhart and Rogoff's coarse exchange rate regime classification equals 5, i.e. if inflation is above 40%. 0 for any other category. Source: Reinhart and Rogoff (2004).
- Fixed (IMF)*: 1 if the IMF exchange rate regime classification is "single currency peg", "SDR peg", "other official basket peg", "secret basket peg" under unified market, i.e. de jure fixed or limited flexibility not dual. 0 for any other category. Source: Reinhart and Rogoff (2004).
- Flex. (IMF)*: 1 if the IMF exchange rate regime classification is "more flexible" under unified market, i.e. de jure floating not dual. 0 for any other category. Source: Reinhart and Rogoff (2004).
- Cgpd*: Central government primary fiscal deficit (as percentage of GDP trend). GDP trend was calculated using the Hodrick-Prescott filter with a smoothing parameter of 100. Source: Kaminsky et al. (2004).
- GDP Cycle*: Calculated as  $((\text{RGDP} - \text{RGDP Trend})/\text{RGDP Trend}) \times 100$ . RGDP is real GDP and its trend was calculated using the Hodrick-Prescott filter with a smoothing parameter of 100. Source: Kaminsky et al. (2004).
- Initial Debt*: Total public and private guarantee debt as percentage of GDP at the end of last year. Source: Global Development Finance 2005.
- TOT Shock*: Calculated as  $((\text{TOT} - \text{TOT Trend})/\text{TOT Trend}) \times 100$ . TOT is terms of trade, calculated as the ratio of the export price index to the corresponding import price index measured relative to the base year 1995. Its trend was calculated using the Hodrick-Prescott filter with a smoothing parameter of 100. Source: Kaminsky et al. (2004).
- Real Libor*: Eurodollar deposits rate (London) minus US consumer price index inflation rate. The deposit's maturity is 6 months and it was annualized using a 360-day year or bank interest. Sources: The Federal Reserve Board for the Eurodollar deposit rates and World Development Indicators 2006 for inflation rates.
- OECD Growth*: Average annual Real GDP growth for OECD countries. Source: World Development Indicators 2006.
- Default*: 1 if foreign currency bank or bond debt defaults. 0 otherwise. Source: Standard & Poor's.
- Bank Crisis*: 1 if there is a systematic banking crisis. 0 otherwise. Source: Caprio and Klingebiel (1999 and 2003).
- IMF Program*: 1 if there is either a Stand-by Arrangement or an Extended Fund Facility IMF program for at least 7 months in the year under consideration. 0 otherwise. Source: Policy Development and Review Department, IMF.
- Natural Disaster Dummy*: 1 if there is a natural disaster that affects at least 5% of the country's total population in the first ten months of the current year or in the last two months of the previous year. The events include droughts, earthquakes, floods and wind storms. 0 otherwise. Source: Center for Research on the Epidemiology of Disasters, Université Catholique de Louvain, Belgium and World Development Indicators 2006.
- Presidential Pre-electoral Year Dummy*: 1 if there is a democratic presidential election in the last 6 months of the current year or in the first 6 months of the following year. Such election cannot be an unscheduled "early election" or occurs after the breakdown of a military regime or in the context of civil war or violence. 0 otherwise.
- Existence and date of a presidential election correspond to variables "exelec" and "dateexec" respectively. Numbers of years left in current term correspond to variable "yrcurnt". Source: from Beck et al. (2001).
- A system is considered democratic if variable "polity2" is equal or greater than 0. Source: Polity4 Project. Center for International Development and Conflict Management at University of Maryland.
- A government regime is considered military if variable "s20f7" is equal to 2 or 3. Source: The Cross-National Time-Series Data Archive (CNTS) of the Center for Comparative Political Research of the State University of New York (Binghamton).
- The presence of civil war or violence corresponds to categories "cv" or "cw". Source: "Major Episodes of Political Violence 1946-2006" from Center for Global Policy at George Mason University.
- Fordebt*: Percentage of total long-term debt contracted in US\$. Source: Global Development Finance 2005.
- Sidebt*: Short-term external debt as percentage of total external debt. Source: Global Development Finance 2005.
- Totvol*: Terms of trade volatility calculated as standard deviation of terms of trade in the last five years. Source: Kaminsky et al. (2004).
- Openness*: Imports and Exports as percentage of GDP. Source: World Development Indicators 2006.

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Table 1: Serial correlation of central gov. primary fiscal deficit as percentage of trend GDP ( $Cgpd$ ).

	$Cgpd_t$
$Cgpd_{t-1}$	0.741
$Cgpd_{t-2}$	0.516
$Cgpd_{t-3}$	0.420
$Cgpd_{t-4}$	0.389

Note: 551 observations.

Table 2: Exchange rate regime categories using Reinhart-Rogoff classification

<i>Category</i>	<i>Observations</i>	<i>Share of total sample</i>	<i>Share of total sample excluding "free falling"</i>
<i>Fixed unified rates</i>	298	40.5	51.6
<i>Flexible unified rates</i>	56	7.6	9.7
<i>Dual</i>	224	30.4	38.8
<i>"Free falling"</i>	158	21.5	
<i>Total</i>	736	100	100

Table 3: Deeds vs. words: Reinhart-Rogoff vs. IMF classification for observations under unified rates.

		<i>Reinhart-Rogoff Classification</i>		
		<i>Fixed</i>	<i>Flexible</i>	<i>Total</i>
<i>IMF Classification</i>	<i>Fixed</i>	119	11	130
	<i>Flexible</i>	179	45	224
	<i>Total</i>	298	56	354

Note: Neither "free falling" nor dual regime observations are included.

Table 4: Effects of exchange rate regimes (treated as *exogenous*).  
Reinhart-Rogoff ERR classification (Fixed-Flex.-Dual).  
Dep. var.: Central gov. primary fiscal deficit as percentage of trend GDP (*Cgpd*).

	<i>ERRs are treated as exogenous.</i>									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Cgpd (-1)</i>			0.712*** (14.419)	0.719*** (14.642)	0.709*** (14.832)	0.712*** (14.170)	0.710*** (13.884)	0.718*** (14.349)	0.713*** (13.594)	0.712*** (14.187)
<i>Fixed</i>	0.736** (2.048)	-0.428 (-0.850)	0.601** (2.115)	0.488* (1.772)	0.630** (2.467)	0.602** (2.119)	0.604** (2.109)	0.582** (2.189)	0.551** (2.377)	0.546** (2.098)
<i>Dual</i>	2.229*** (5.557)	2.072*** (4.066)	1.089*** (3.302)	1.022*** (3.286)	1.088*** (3.448)	1.091*** (3.331)	1.091*** (3.297)	1.117*** (3.525)	1.087*** (3.650)	1.078*** (3.014)
<i>GDP Cycle</i>				0.048** (2.497)					0.031 (1.508)	0.01 (0.467)
<i>Initial Debt</i>					-0.012*** (-2.696)				-0.012** (-2.517)	-0.013*** (-2.773)
<i>TOT Shock</i>						0 (-0.020)			-0.006 (-0.626)	-0.005 (-0.538)
<i>Real Labor</i>							0.024 (0.470)		0.057 (1.172)	0.074 (1.445)
<i>OECD Growth</i>								-0.237*** (-3.357)	-0.234*** (-3.341)	-0.231*** (-3.427)
<i>Observations</i>	489	489	471	471	471	471	471	471	471	433
<i>Countries</i>	23	23	23	23	23	23	23	23	23	23
<i>Sample</i>	"Tranquil"	"Tranquil"	"Tranquil"	"Tranquil"	"Tranquil"	"Tranquil"	"Tranquil"	"Tranquil"	"Tranquil"	"Tranquil" "Const. ERR"
<i>Econometric Methodology</i>	OLS	FE	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM
<i>R<sup>2</sup></i>	0.074	0.129								
<i>Tests (p-value):</i>										
<i>Fixed=Flex.</i>	0.041	0.396	0.034	0.076	0.013	0.034	0.034	0.028	0.017	0.035
<i>Dual=Flex.</i>	0	0	0	0.001	0	0	0	0	0	0.002
<i>Fixed=Dual</i>	0	0	0.047	0.028	0.049	0.048	0.049	0.024	0.025	0.041

Notes: Flexible regime is the omitted category. Intercept estimates not reported. Estimations are performed using pooled ordinary least square (OLS), panel data country fixed effects (FE) or dynamic panel data country fixed effects Blundell and Bond (1998) system GMM approach (GMM). All regressions adjust their standard errors by heteroscedasticity. All regressors, including ERRs, are treated as exogenous. All regressions exclude observations classified as "free falling" by Reinhart-Rogoff ERR classification ("Tranquil"). Column (10) only considers observations for which the ERR remains constant for at least 4 years ("Const. ERR"). The value 0 is reported when the first three decimal digits are equal to zero. T-statistics in parenthesis.

\*, \*\* and \*\*\* denote significance at 10%, 5% and 1% levels, respectively.

Table 5: Effects of exchange rate regimes (treated as *endogenous*). Reinhart-Rogoff ERR classification (Fixed-Flex.-Dual).  
Dep. var.: Central gov. primary fiscal deficit as percentage of trend GDP (*Cgpd*).

	<i>ERRs are treated as endogenous.</i>							
	<i>Considering endogeneity due to: regime choice under stress.</i>						<i>Considering endogeneity due to: regime choice under stress and government type.</i>	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>Cgpd (-1)</i>	0.725*** (14.509)	0.725*** (14.553)	0.725*** (14.548)	0.717*** (14.529)	0.715*** (14.684)	0.715*** (14.522)	0.715*** (14.681)	0.715*** (14.522)
<i>Fixed</i>	0.562** (2.264)	0.574** (2.349)	0.555** (2.237)	0.564** (2.218)	0.592** (2.327)	0.585** (2.058)	0.593** (2.330)	0.585** (2.058)
<i>Dual</i>	1.100*** (2.816)	1.113*** (2.808)	1.107*** (2.840)	1.197*** (2.859)	1.261*** (2.894)	1.246*** (2.646)	1.261*** (2.893)	1.246*** (2.646)
<i>GDP Cycle</i>	0.027 (1.189)	0.027 (1.197)	0.025 (1.133)	0.024 (1.158)	0.024 (1.130)	0.022 (1.016)	0.024 (1.131)	0.022 (1.016)
<i>Initial Debt</i>	-0.011** (-2.242)	-0.011** (-2.558)	-0.010** (-2.067)	-0.005 (-0.809)	-0.005 (-0.952)	-0.005 (-0.834)	-0.005 (-0.954)	-0.005 (-0.834)
<i>TOT Shock</i>	-0.002 (-0.175)	-0.001 (-0.159)	-0.002 (-0.179)	-0.001 (-0.108)	0 (-0.051)	0 (-0.048)	-0.001 (-0.062)	0 (-0.048)
<i>Real Labor</i>	0.019 (0.390)	0.019 (0.377)	0.023 (0.460)	0.02 (0.419)	0.022 (0.420)	0.016 (0.317)	0.022 (0.424)	0.016 (0.317)
<i>OECD Growth</i>	-0.190*** (-2.714)	-0.188*** (-2.717)	-0.190*** (-2.723)	-0.187*** (-2.670)	-0.182*** (-2.622)	-0.193*** (-2.863)	-0.181*** (-2.618)	-0.193*** (-2.863)
<i>IMF Program</i>		0.072 (0.402)			0.221 (1.285)	0.24 (1.349)	0.222 (1.289)	0.24 (1.349)
<i>Bank Crisis</i>			-0.23 (-0.900)		-0.138 (-0.605)	-0.156 (-0.653)	-0.139 (-0.606)	-0.156 (-0.653)
<i>Default</i>				-0.728** (-2.505)	-0.803*** (-2.832)	-0.838*** (-3.044)	-0.803*** (-2.831)	-0.838*** (-3.044)
<i>Observations</i>	395	395	395	395	395	381	395	381
<i>Countries</i>	22	22	22	22	22	22	22	22
<i>Sample</i>	"Extra Tranquil"	"Extra Tranquil"	"Extra Tranquil"	"Extra Tranquil"	"Extra Tranquil"	"Extra Tranquil" "Const. ERR"	"Extra Tranquil"	"Extra Tranquil" "Const. ERR"
<i>Econometric Methodology</i>	GMM	GMM	GMM	GMM	GMM	GMM	GMM	GMM
<i>Tests (p-value):</i>								
<i>Fixed=Flex.</i>	0.023	0.018	0.025	0.026	0.02	0.039	0.019	0.038
<i>Dual=Flex.</i>	0.004	0.004	0.004	0.004	0.003	0.008	0.003	0.008
<i>Fixed=Dual</i>	0.048	0.053	0.044	0.026	0.025	0.026	0.024	0.026

Notes: Flexible regime is the omitted category. Intercept estimates not reported. Estimations are performed using dynamic panel data country fixed effects Blundell and Bond (1998) system GMM approach (GMM). All regressions adjust their standard errors by heteroscedasticity. GDP Cycle is instrumented using internal instruments following the system GMM approach. On top of excluding observations classified as "free falling" by Reinhart-Rogoff ERR classification, all regressions use observations that are at least two years distant from "free falling" events ("Extra Tranquil"). Columns (6) and (8) only consider observations for which the ERR remains constant for at least 4 years ("Const. ERR"). ERRs are not instrumented in columns (1)-(6), ERRs are instrumented in columns (7) and (8) using i) Totvol and the first lag of ii) Fordebt, ii) Openness and iii) Stdebt. The value 0 is reported when the first three decimal digits are equal to zero. T-statistics in parenthesis. \*, \*\* and \*\*\* denote significance at 10%, 5% and 1% levels, respectively.

Table 6: Effects of exchange rate regimes (treated as *endogenous*), and their interaction effect with natural disasters and presidential pre-electoral years.

Reinhart-Rogoff ERR classification (Fixed-Flex.-Dual).

Dep. var.: Central gov. primary fiscal deficit as percentage of trend GDP (*Cgpd*).

	<i>ERRs are treated as endogenous. Considering endogeneity due to: regime choice under stress and government type.</i>				
	<i>Dummy Variable (DV): Natural Disaster</i>			<i>Dummy Variable (DV): Presidential Pre-Electoral Year</i>	
	(1)	(2)	(3)	(4)	(5)
<i>Cgpd (-1)</i>	0.712*** (14.598)	0.713*** (14.437)	0.711*** (14.326)	0.724*** (14.729)	0.725*** (14.577)
<i>Fixed</i>	0.527* (1.914)	0.511 (1.636)	0.567* (1.748)	0.559** (2.062)	0.538* (1.762)
<i>Dual</i>	1.115*** (2.585)	1.089** (2.320)	1.151** (2.422)	1.113** (2.377)	1.086** (2.142)
<i>Fixed*DV</i>	0.837* (1.852)	0.878* (1.844)	0.829* (1.800)	0.763 (1.515)	0.892* (1.700)
<i>Dual*DV</i>	1.961*** (3.426)	2.020*** (3.606)	1.971*** (3.457)	1.906** (2.413)	1.934** (2.370)
<i>DV</i>	-0.321 (-1.040)	-0.38 (-1.116)	-0.328 (-0.942)	-0.43 (-1.187)	-0.465 (-1.215)
<i>Observations</i>	395	381	379	395	381
<i>Countries</i>	22	22	22	22	22
<i>Sample</i>	"Extra Tranquil"	"Extra Tranquil" "Const. ERR"	"Extra Tranquil" "Const. ERR" "Const. ERR-ND"	"Extra Tranquil"	"Extra Tranquil" "Const. ERR"
<i>Econometric Methodology</i>	GMM	GMM	GMM	GMM	GMM
<i>Tests (p-value):</i>					
<i>Fixed=Flex.</i>	0.054	0.098	0.079	0.039	0.078
<i>Dual=Flex.</i>	0.009	0.02	0.015	0.017	0.032
<i>Fixed=Dual</i>	0.047	0.049	0.048	0.092	0.093
<i>Fixed*DV = Flex.*DV</i>	0.063	0.062	0.068	0.128	0.089
<i>Dual*DV = Flex.*DV</i>	0	0	0	0.015	0.017
<i>Fixed*DV = Dual*DV</i>	0.049	0.046	0.046	0.035	0.057

Notes: Flexible regime is the omitted category. Intercept, GDP Cycle, Initial Debt, TOT Shock, Real Labor, OECD Growth, IMF Program, Bank Crisis and Default estimates not reported. Estimations are performed using dynamic panel data country fixed effects Blundell and Bond (1998) system GMM approach (GMM). All regressions adjust their standard errors by heteroscedasticity. GDP Cycle is instrumented using internal instruments following the system GMM approach. On top of excluding observations classified as "free falling" by Reinhart-Rogoff ERR classification, all regressions use observations that are at least two years distant from "free falling" events ("Extra Tranquil"). Columns (2), (3) and (5) only consider observations for which the ERR remains constant for at least 4 years ("Const. ERR"). Column (3) does not include observations for which the ERR corresponding to the year in which the natural disaster is registered does not coincide with the one of the previous year ("Const. ERR-ND"). DV (dummy variable) corresponds to Natural Disaster Dummy in columns (1)-(3) and Presidential Pre-electoral Year Dummy in columns (4)-(5). All regressions instrument ERRs using i) Totvol and the first lag of ii) Fordebt, ii) Openness and iii) Stdebt. The value 0 is reported when the first three decimal digits are equal to zero. T-statistics in parenthesis.

\*, \*\* and \*\*\* denote significance at 10%, 5% and 1% levels, respectively.

Table 7: Effects of exchange rate regimes (treated as *endogenous*), insulation properties and *de jure* ERR classification. Reinhart-Rogoff ERR classification (Fixed-Flex.-Dual-Dual(Fixed)-Dual(Flex.)) and IMF ERR classification under unified rates (Fixed(IMF)-Flex.(IMF)). Dep. var.: Central gov. primary fiscal deficit as percentage of trend GDP (*Cgpd*).

	<i>ERRs are treated as endogenous. Considering endogeneity due to: regime choice under stress and government type.</i>			
	(1)	(2)	(3)	(4)
<i>Cgpd (-1)</i>	0.696 (14.711) <sup>***</sup>	0.691 (14.663) <sup>***</sup>	0.717 (14.612) <sup>***</sup>	0.712 (13.902) <sup>***</sup>
<i>Fixed</i>	0.614 (2.343) <sup>**</sup>	0.65 (2.205) <sup>**</sup>		
<i>Dual (Fixed)</i>	1.641 (3.168) <sup>***</sup>	1.685 (3.046) <sup>***</sup>		
<i>Dual (Flex.)</i>	0.759 (1.974) <sup>**</sup>	0.79 (1.852) <sup>*</sup>		
<i>Fixed (IMF)</i>			0.064 (0.282)	-0.007 (-0.025)
<i>Dual</i>			0.767 (2.651) <sup>***</sup>	0.719 (2.621) <sup>***</sup>
<i>Observations</i>	395	375	395	374
<i>Countries</i>	22	22	22	22
<i>Sample</i>	"Extra Tranquil"	"Extra Tranquil" "Const. ERR"	"Extra Tranquil"	"Extra Tranquil" "Const. ERR"
<i>Econometric Methodology</i>	GMM	GMM	GMM	GMM
<i>Tests (p-value):</i>				
<i>Fixed=Flex.</i>	0.019	0.027		
<i>Dual (Fixed)=Flex.</i>	0.001	0.002		
<i>Dual (Flex.)=Flex.</i>	0.048	0.064		
<i>Fixed= Dual (Fixed)</i>	0.013	0.014		
<i>Fixed= Dual (Flex.)</i>	0.526	0.542		
<i>Dual (Fixed)= Dual (Flex.)</i>	0.028	0.029		
<i>Fixed (IMF)=Flex. (IMF)</i>			0.778	0.980
<i>Dual=Flex. (IMF)</i>			0.008	0.009
<i>Fixed (IMF)=Dual</i>			0.070	0.079

Notes: Flexible regime is the omitted category (flexible regime from Reinhart-Rogoff ERR classification in columns (1) and (2) and flexible regime from IMF ERR classification in columns (3) and (4)). Intercept, GDP Cycle, Initial Debt, TOT Shock, Real Labor, OECD Growth, IMF Program, Bank Crisis and Default estimates not reported. Estimations are performed using dynamic panel data country fixed effects Blundell and Bond (1998) system GMM approach (GMM). All regressions adjust their standard errors by heteroscedasticity. GDP Cycle is instrumented using internal instruments following the system GMM approach. On top of excluding observations classified as "free falling" by Reinhart-Rogoff ERR classification, all regressions use observations that are at least two years distant from "free falling" events ("Extra Tranquil"). Columns (2) and (4) only consider observations for which the ERR remains constant for at least 4 years ("Const. ERR"). All regressions instrument ERRs using i) Totvol and the first lag of ii) Fordebt, ii) Openness and iii) Stdebt. T-statistics in parenthesis.  
\*, \*\* and \*\*\* denote significance at 10%, 5% and 1% levels, respectively.