Exchange Rate Regimes and Fiscal Discipline: The Role of Capital Controls *

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Abstract

How do exchange rate regimes influence fiscal discipline? This important question has typically been addressed using models assuming perfect capital mobility, even though capital controls are pervasive in emerging and developing countries. This paper analyzes the effects of capital controls on fiscal performance by focusing on dual exchange rate regimes.

In a model in which fiscal policy is endogenously determined by a non-benevolent fiscal authority, the paper shows that capital controls induce impatient politicians to have looser fiscal policies than under fixed and flexible regimes operating under perfect capital mobility. While capital controls enable politicians to enjoy the same temporarily low inflation as fixed regimes (since the commercial exchange rate is assumed to be fixed) lax fiscal policies also result in a temporary consumption boom which is regarded as desirable by impatient politicians. The consumption boom occurs because, as households attempt to get rid of unwanted real money balances, the real domestic interest rate falls.

Empirical analysis confirms that capital controls lead to larger primary deficits than fixed and flexible regimes under unified rates. The paper considers a dynamic panel data specification and controls for endogeneity by using a standard instrumental variables approach and natural disaster events to evaluate the response of fiscal policies under diverse exchange rate regimes.

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1 Introduction

The influence of exchange rate regimes 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 exchange rate regimes on fiscal discipline assuming the classic dichotomy of "fixed vs. flexible". Conventional wisdom –represented by papers like Aghevli et al. (1991), Frenkel 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, a more recent and widely cited paper by Tornell and Velasco (1998) takes 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.

Both conventional wisdom and Tornell and Velasco assume perfect capital mobility, even though capital controls are pervasive in emerging and developing countries. Capital controls, in their diverse forms, 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. Some recent examples of capital controls include Malaysia in 1998, Argentina in 2002 and Venezuela in 2003. One specific type of capital control commonly implemented in emerging and developing countries is the *dual regime*. 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 or more fixed exchange rate(s) for current account transactions (commercial exchange rate). In other words, a dual regime is equivalent to a fixed regime with capital controls. Using the Reinhart-Rogoff (2002) exchange rate regime classification for 23 emerging markets, we find that more than 60 percent of this sample had dual regimes during the 70s and 80s and about 20 percent still had them in the 90s and early 2000s.

In this paper we analyze both theoretically and empirically the influence of capital controls on fiscal discipline. We develop a standard optimization model with price flexibility, and a political economy framework and structure similar to that employed by Tornell and Velasco, but allowing for capital

controls modeled as dual regimes.[1] 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 exchange rate regimes; it only compares fiscal performance under alternative monetary and capital flows policies. The central bank can precommit to follow a particular exchange rate regime 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) and Drazen (1985). This setup captures the idea that stabilization plans are subject to "temporariness" or "imperfect credibility" as described in Calvo (1986, 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, prestige and/or greater chances of reelection. 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 looser fiscal policies than fixed and flexible regimes operating under perfect capital mobility in the periods before the stabilization plan reaches its end. The theoretical argument is quite simple:

- Under *fixed* regimes, weak fiscal policies lead to a fall in reserves or an increase in debt. Only when the situation gets unsustainable, the exchange rate collapses and the inflation cost becomes tangible. Policymakers can enjoy lax fiscal policies and low inflation today, at the cost of high inflation in the future.

- Under *flexible* regimes, lax fiscal behavior augments future expected monetization, creating an increase in current prices as in Sargent and Wallace (1981) and Drazen (1985). 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. Any fiscal misconduct is paid for with current and future inflation.

- Under *capital controls*, unsound fiscal policies also increase future anticipated monetization and, consequently, reduce the desired future money holdings. The latter change creates excess demand for bonds which, due to the presence of capital controls, increases the financial exchange rate and reduces the current domestic real interest rate. This last factor increases today's consumption, augmenting the current account deficit. That is to say, capital controls enable the same temporarily low inflation as fixed regimes, since the commercial exchange rate is assumed to be fixed, but they also boost current consumption as private agents attempt to reduce their real balances because of the expected inflation tax. Politicians can enjoy the benefits of a lax fiscal stance, low inflation and a *consumption party* today, at the cost of high inflation and a *consumption hangover* in the future.

[1] Hereafter the terms "dual regimes" and "capital controls" will be used interchangeably.

The basic point of Tornell and Velasco's paper 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 looser fiscal policies than fixed regimes while the stabilization plan lasts. This occurs because capital controls enable free-spending politicians to enjoy the same temporarily low inflation as fixed regimes, as well as a temporary consumption boom which is regarded as desirable by impatient politicians. This temporary consumption boom induce politicians to engage in looser fiscal policies before the stabilization plan collapses. Therefore, while the anticipated reaction of the exchange rate market moderates fiscal behavior under flexible rates, under capital controls it encourages loose fiscal policies.

Using a sample of 23 emerging markets for the period 1970-2001 and the *de facto* Reinhart-Rogoff classification, we confirm that capital controls lead to larger primary deficits than fixed and flexible regimes operating under unified rates. Our findings also support Tornell and Velasco's core prediction that fixed regimes induce less discipline than flexible arrangements. Consistent with our model, we test the main theoretical implications considering only relatively "tranquil" times. For this reason, we exclude observations associated with the Reinhart-Rogoff exchange rate regime category "free falling", which includes episodes with an annual inflation higher than 40 percent. We obtain such results considering a dynamic panel data specification, and we address previous studies' limitations related to the potential endogeneity of the exchange rate regime. We distinguish three main potential sources of endogeneity and propose different ways to control for them:

- *Regime classification endogeneity.* Since the Reinhart-Rogoff classification categorizes regimes based upon the evolution of the market-determined exchange rate, it is likely that countries experiencing poor fiscal performance 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 tends to generate the appearance of tighter fiscal performance in fixed and dual regimes than in flexible arrangements. Since the empirical results do not show this pattern, accounting for this source of endogeneity would strengthen our results.

- *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 tends to generate the appearance of looser fiscal performance in fixed and dual regimes than in flexible arrangements. In order to reduce the likelihood of this type of endogeneity we use only observations that are at least two years distant from "free falling" events, and we control for regressors that are symptoms of macroeconomic and financial distress, such as episodes of debt default, bank crisis and the presence of IMF programs.

- *Endogeneity due to government type.* As in Tornell and Velasco, we assume in our 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's choice affects fiscal discipline, the fiscal authority will try to influence the central bank to choose the type of exchange rate regime that suits the policymaker better. Therefore, in line with the theoretical predictions, free-spending politicians would be more likely than conservative politicians to attempt to persuade the central bank to choose fixed regimes or impose capital controls. For this reason, this source of endogeneity tends to generate the appearance of looser fiscal performance in fixed and dual regimes than in flexible arrangements. We control for this source of endogeneity by using instrumental variables for the exchange rate regime and by exploiting the randomness of natural disaster events to evaluate the response of fiscal policies under diverse exchange rate regimes.

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 exchange rate regimes on fiscal discipline. Existing models of capital controls focus on the implications of capital controls for a myriad of variables, but treat fiscal activity as exogenously given (see for example, Calvo (1981, 1989), Obstfeld (1984), 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 exchange rate regimes on fiscal behavior use models with endogenous fiscal determination, but assume perfect capital mobility (see for example Tornell and Velasco (1998) and Sun (2003)). Instead, we analyze the fiscal incentives under capital controls.

This paper is also related to the literature that documents and analyzes the consumption party and subsequent hangover observed under temporary stabilization programs (see Calvo (1986), Kiguel and Liviatan (1992), Végh (1991), Calvo and Végh (1993) and 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, but allowing for capital controls modeled as dual exchange rate regimes. 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, including the agents involved and their sequence of actions and budget constraints. We also explain the behavior of the real interest rate under capital controls by examining the uncovered interest parity condition. Secondly, we solve the model and show

the intuition and some numerical examples confirming that capital controls induce looser discipline than fixed and flexible regimes during the periods *before the stabilization plan reaches its end.*

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 three periods -periods 0, 1 and 2- with either perfect capital mobility, as in Tornell and Velasco, or capital controls modeled as a dual exchange rate. 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* rate under dual regimes) is equal to the domestic price level, i.e. $E_t = P_t$.[2] Hence inflation and nominal devaluation rates are[3]

$$\pi_t \equiv \frac{P_t - P_{t-1}}{P_t} = \frac{E_t - E_{t-1}}{E_t}. \tag{1}$$

The *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 monetary and capital flows policies and, subsequently, the FA announces the net fiscal transfers that will occur in the future, τ_1 and τ_2.[4] Right after this news, the PA attempts to rearrange her portfolio from (m_{0-}, f_{0-}) to (m_0, f_0).[5] As shown in Tornell and Velasco, and as we detail later, she can achieve such a rearrangement under perfect capital mobility. However, under capital controls the PA cannot rearrange her portfolio, i.e. $m_0 = m_{0-}$ and $f_0 = f_{0-}$. This is because under capital controls the commercial exchange rate cannot jump (i.e. $E_0 = E_{0-}$), the private capital account is closed and the CB does not intervene in the financial market. Lastly, the

[2] Throughout this paper, the exchange rate is defined as units of domestic currency per unit of foreign currency.
[3] We specify the inflation and devaluation rates so that they are constraint between 0 and 1.
[4] These net transfers equal expenditures minus revenues. Hence, they could be either negative or positive.
[5] m_{0-} and f_{0-} refer to the initial asset conditions.

government transfers to the PA the gain (loss) it made as a result of movement in the exchange rate during period 0.

During period 1 the PA selects c_1 and m_1, her desired real balances for period 2. The FA does not make any decision in periods 1 or 2.[6]

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.[7]

We assume that the CB can precommit to an independent monetary policy that ignores the behavior of the FA only for a finite period of time, periods 0 and 1 in our model:[8]

- Under *fixed* regimes, the CB sets the nominal devaluation rates of period 0 and period 1 equal to zero (i.e. $\pi_0 = \pi_1 = 0$), and the nominal money supplies M_0 and M_1 become endogenous.[9]

- In a *flexible* regime the CB sets the growth rate of nominal money in period 0 and period 1 equal to zero (i.e. $\mu_0 \equiv (M_0 - M_{0-})/M_0 = 0$ and $\mu_1 \equiv (M_1 - M_0)/M_1 = 0$), and the exchange rates E_0 and E_1 become endogenous.[10]

- Under *capital controls* the CB sets the nominal devaluation rate of the commercial exchange rate for period 0 and period 1 equal to zero (i.e. $\pi_0 = \pi_1 = 0$), and the PA is prohibited from freely transacting in the world capital markets. The CB does not intervene in the financial market; however, it sells (buys) foreign bonds for (with) money for current account purposes. As previously analyzed, this implies that the PA cannot change her portfolio in period 0 (i.e. $M_{0-} = M_0$, $m_{0-} = m_0$ and $f_0 = f_{0-}$). The financial exchange rate, real domestic interest rates and M_1 become endogenous.

In period 2, as in Sargent and Wallace (1981) and Drazen (1985), 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 exchange rate regime is in period 2.

[6] 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 argument of the paper. See Sun (2003) for a treatment of this subject.

[7] One interesting extension of the paper would be to include such an optimization process and to see how it affects the choice of the exchange rate regime.

[8] The assumption of finite precommitment to an independent monetary policy 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 (1986, 1991) and Drazen and Helpman (1987).

[9] Similar qualitative results hold if devaluation rates differ from zero. See Tornell and Velasco for details.

[10] Similar qualitative results hold if the growth rate of nominal money differs from zero. See Tornell and Velasco for details.

In other words, period 0 and 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 only under relatively "tranquil" conditions, in periods 0 and 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 Uncovered Interest Parity Condition

One crucial implication of abandoning the perfect capital mobility assumption is that the real domestic interest rate ρ_t does not necessarily coincide with the world real interest rate r. Specifically, under perfect foresight and capital controls, the uncovered interest parity condition and the Fisher equation lead to the following well-known condition for the real domestic interest rate:

$$1 + \rho_t = \frac{q_{t+1}}{q_t}(1 + r), \tag{2}$$

where $q_t \equiv Q_t/E_t$.[11] Thus, the return on bonds in the domestic economy also includes capital gains associated with the depreciation of the financial exchange rate relative to the commercial one.

Since we assume $Q_2 = E_2$ we can use equation (2) to write ρ_1 as

$$\rho_1 = \frac{E_1}{Q_1}(1 + r) - 1. \tag{3}$$

Therefore, $\rho_1 = r$ when $Q_1 = E_1$ and $\rho_1 < r$ ($\rho_1 > r$) when $Q_1 > E_1$ ($Q_1 < E_1$). In other words, a positive (negative) exchange rate premium is associated with a real domestic interest rate lower (higher) than r. As will become clear later, this is the key element driving our results under imperfect capital mobility.

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, and that she has an initial stock of internationally traded bonds f_{0-} and a stock of money M_{0-}. Then the PA's budget constraint for period 0 under perfect capital mobility is[12]

$$f_0 - f_{0-} = m_{0-} - m_0, \tag{4}$$

[11] We assume that interest income is repatriated at the financial exchange rate. The expression for the real domestic interest rate would be slightly different if the commercial rate is used.

[12] As detailed in Tornell and Velasco in the context of perfect capital mobility, and more generally as considered in Auernheimer (1974), in order to make a consistent comparison across exchange rate regimes, 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. This circumstance only arises under flexible regimes.

while under capital controls it is[13]

$$\frac{Q_0}{E_0}\left(f_0 - f_{0-}\right) = m_{0-} - m_0. \tag{5}$$

The PA's budget constraint for period 1 under perfect capital mobility is

$$(1+r)f_0 + m_0 + y + \tau_1 = c_1 + \pi_1 m_0 + m_1 + f_1, \tag{6}$$

while under capital controls it is

$$\frac{Q_1}{E_1}(1+r)f_0 + m_0 + y + \tau_1 = c_1 + \pi_1 m_0 + m_1 + \frac{Q_1}{E_1}f_1. \tag{7}$$

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

$$(1+r)(f_1 + m_1) + y + \tau_2 = c_2 + (r + \pi_2)m_1. \tag{8}$$

Combining equations (4), (6) and (8) we obtain the PA's intertemporal budget constraint under perfect capital mobility:

$$(1+r)(f_{0-} + m_{0-}) + y\left(\frac{2+r}{1+r}\right) + \tau_1 + \frac{\tau_2}{1+r} = c_1 + (r+\pi_1)m_0 + \frac{c_2 + (r+\pi_2)m_1}{1+r}, \tag{9}$$

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

Combining equations (5), (7) and (8) we obtain the intertemporal budget constraint under capital

Under *fixed* regimes, the PA buys (sells) domestic currency from (to) the CB changing her nominal stock of domestic currency from M_{0-} to M_0. Since the nominal exchange rate E_0 cannot move under fixed regimes (i.e. $E_0 = E_{0-}$), the portfolio rearrangement is obtained through the following operation at the CB: $(M_0 - M_{0-})/E_0 = m_0 - m_{0-} = b_0 - b_{0-}$. After the PA rearranges her portfolio, the government net assets are $b_0 - m_0 = b_{0-} - m_{0-}$. Consequently, there is no transfer of wealth between the PA and the government in period 0 as a result of the announcements.

Under *flexible* regimes the CB does not intervene in the foreign exchange market (i.e. $M_{0-} = M_0$). Therefore, the market only clears as a result of an exchange rate movement in period 0. Since $m_0 = (1-\pi_0)m_{0-}$, with $\pi_0 \equiv (E_0 - E_{0-})/E_0$, the PA experiences a capital loss (gain) of $\pi_0 m_{0-}$ that implies an equivalent gain (loss) for the government. Following Tornell and Velasco we assume that at the end of period 0 the government gives a rebate to the PA equal to $s_0 = \pi_0 m_{0-}$. Since m_0 is all the real domestic balances the PA wishes to hold, she uses the government transfer to buy bonds, hence $f_0 = f_{0-} + s_0$. After these operations occur in period 0, the government net assets are $b_0 - m_0 = b_{0-} - m_{0-} + \pi_0 m_{0-} - s_0 = b_{0-} - m_{0-}$, the same as under fixed regimes.

[13] Under *capital controls* the CB does not intervene in the financial exchange market and the commercial exchange rate cannot jump (i.e. $M_{0-} = M_0$ and $E_{0-} = E_0$). For this reason the exchange rate market only clears as a result of a movement in the financial exchange rate in period 0. Since $(Q_0/E_0)(f_0 - f_{0-}) = m_{0-} - m_0$, the PA experiences a capital loss (gain) of $(1 - E_0/Q_0)(m_{0-} - m_0)$ that implies an equivalent gain (loss) for the government. However, for the reasons explained above, $m_{0-} = m_0$ and $f_0 = f_{0-}$ and, consequently, there are no effective transfers between the government and the PA. For this reason, the government net assets at the very end of period 0 are $b_0 - m_0 = b_{0-} - m_{0-}$, the same as under fixed and flexible regimes.

controls:

$$\frac{(1+r)^2}{1+\rho_1}f_{0-} + (1+\rho_0)m_{0-} + y\left(\frac{2+\rho_1}{1+\rho_1}\right) + \tau_1 + \frac{\tau_2}{1+\rho_1} = c_1 + (\rho_0+\pi_1)m_0 + \frac{c_2 + (\rho_1+\pi_2)m_1}{1+\rho_1}. \quad (10)$$

The PA's objective is to maximize

$$ln(c_1) + \left(\frac{\epsilon}{\epsilon-1}\right)m_0^{\frac{\epsilon-1}{\epsilon}} + \left(\frac{1}{1+r}\right)\left[ln(c_2) + \left(\frac{\epsilon}{\epsilon-1}\right)m_1^{\frac{\epsilon-1}{\epsilon}}\right], \quad (11)$$

where $\epsilon \in (0,1)$ to guarantee that the economy is always on the upward-sloping side of the Laffer curve.[14] 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.

2.1.5 The Government's Budget Constraints and Objective Function

We present the consolidated accounts of both the FA and CB. The government has an initial total stock of net foreign assets b_{0-} and monetary liabilities M_{0-}. In period 1, the FA transfers a net amount τ_1 to the PA, financed with interest income rb_0, monetary revenue $(M_1 - M_0)/E_1 = (m_1 - m_0) + \pi_1 m_0$ (which includes both seigniorage and the inflation tax) and by changing its total net asset position. Under capital controls the FA also receives revenues if there is a positive (negative) exchange rate premium and private capital inflows (outflows).[15] In period 2, the government makes a transfer τ_2 and pays back its real debt and money balances, using only the inflation tax. The government's budget constraint for period 0 under perfect capital mobility is

$$b_{0-} - b_0 = m_{0-} - m_0, \quad (12)$$

while under capital controls it is

$$\frac{Q_0}{E_0}\left(b_{0-} - b_0\right) = m_{0-} - m_0. \quad (13)$$

The government's budget constraint for period 1 under perfect capital mobility is

$$b_1 + \tau_1 = (1+r)b_0 + m_1 - m_0 + \pi_1 m_0, \quad (14)$$

while under capital controls it is

[14] This assumption guarantees that inflation tax revenue is increasing in inflation.

[15] Similar qualitative results would be obtained if a separate institution that deals with the purchase and sale of internationally traded bonds rebated all revenues to the PA at the end of the respective period, as long as this behavior is not internalized by the PA.

$$b_1 + \tau_1 = (1+r)b_0 + m_1 - m_0 + \pi_1 m_0 + \left(\frac{Q_1}{E_1} - 1\right)\big(f_1 - f_0(1+r)\big). \tag{15}$$

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

$$m_1 + \tau_2 = (1+r)b_1 + \pi_2 m_1. \tag{16}$$

Combining equations (12), (14) and (16) the government's intertemporal budget constraint under perfect capital mobility is

$$\tau_1 + \frac{\tau_2}{1+r} = (1+r)(b_{0-} - m_{0-}) + m_0(r+\pi_1) + \frac{m_1(r+\pi_2)}{1+r}, \tag{17}$$

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

Combining equations (13), (15) and (16) the government's intertemporal budget constraint under capital controls is

$$\tau_1 + \frac{\tau_2}{1+r} = (1+r)(b_{0-} - m_{0-}) + m_0(r+\pi_1) + m_1\frac{(r+\pi_2)}{1+r} + (1+r)\left(\frac{Q_0}{E_0} - 1\right)(f_0 - f_{0-}) + \left(\frac{Q_1}{E_1} - 1\right)\big(f_1 - f_0(1+r)\big). \tag{18}$$

The FA's objective is to maximize

$$\alpha\Big[\upsilon(\tau_1) + \beta\upsilon(\tau_2)\Big] + (1-\alpha)\left[ln(c_1) + \left(\frac{\epsilon}{\epsilon-1}\right)m_0^{\frac{\epsilon-1}{\epsilon}} + \beta\left[ln(c_2) + \left(\frac{\epsilon}{\epsilon-1}\right)m_1^{\frac{\epsilon-1}{\epsilon}}\right]\right], \tag{19}$$

where $\upsilon'(\tau) > 0$, $\upsilon''(\tau) < 0$, β is the FA's subjective discount factor, $\beta \in (0,1)$, and $\alpha \in (0,1)$. It is worth making two points about this function. First, government transfers give utility, possibly because they provide political power, prestige and/or greater chances of reelection. This factor carries a weight of α 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 β does not necessarily match that of the PA, which equals $1/(1+r)$. 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*.[16]

[16] 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 (9) and (17) or (10) and (18) we obtain the economy's resource constraint under perfect capital mobility and capital controls:

$$(1+r)(b_{0-}+f_{0-})+y\left(\frac{2+r}{1+r}\right)=c_1+\frac{c_2}{1+r}. \tag{20}$$

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.

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 (11) subject to (9), taking as given τ_1, τ_2, π_1 and π_2. The optimal conditions under perfect capital mobility (pcm) are

$$c^*_{1,pcm}=c^*_{2,pcm}, \tag{21}$$

$$m^*_{0,pcm}={c^*_{1,pcm}}^{\epsilon}\,(r+\pi_1)^{-\epsilon}, \tag{22}$$

$$m^*_{1,pcm}={c^*_{2,pcm}}^{\epsilon}\,(r+\pi_2)^{-\epsilon}. \tag{23}$$

Condition (21) implies that consumption is constant across both periods. Combining this last equality with (20), consumption equals permanent income $\bar{c}$ for both periods, where

$$\bar{c}=\left[\frac{(1+r)^2}{2+r}\right](b_{0-}+f_{0-})+y. \tag{24}$$

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 (11) subject to (10), taking as given τ_1, τ_2, π_1, π_2, ρ_0 and ρ_1. The optimal conditions under capital controls (cc) are

$$\frac{c^*_{1,cc}}{c^*_{2,cc}}=\frac{1+r}{1+\rho_1}, \tag{25}$$

$$m^*_{0,cc}={c^*_{1,cc}}^{\epsilon}\,(\rho_0+\pi_1)^{-\epsilon}, \tag{26}$$

$$m^*_{1,cc}={c^*_{2,cc}}^{\epsilon}\,(\rho_1+\pi_2)^{-\epsilon}. \tag{27}$$

Condition (25) 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 ρ_1; consumption is higher when it is cheaper.

Substituting equation (25) into (20) and considering (24), we have that

$$c^*_{1,cc} = \bar{c}\left[\frac{(2+r)(1+r)}{(2+r)(1+r)+(\rho_1 - r)}\right], \tag{28}$$

$$c^*_{2,cc} = \bar{c}\left[\frac{(2+r)(1+\rho_1)}{(2+r)(1+r)+(\rho_1 - r)}\right]. \tag{29}$$

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

$$Distortion(c_1) = \left| \; c^*_{1,cc} - \bar{c} \; \right|, \tag{30}$$

$$Distortion(c_2) = \left| \; c^*_{2,cc} - \bar{c} \; \right|. \tag{31}$$

Combining (28), (29), (30) and (31) 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 ρ_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 party* in period 1 and a severe *hangover* in period 2.

2.3 Endogenous Determination of Fiscal Policy

Now we focus on the FA's optimization problem under alternative exchange rate regimes by solving the Ramsey planner's problem. The FA chooses quantities, as a planner would, but subject to the constraint that the chosen allocation be implementable as a competitive equilibrium. As remarked earlier, the solutions for fixed and flexible regimes correspond to Tornell and Velasco and are only developed for comparison purposes.

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 τ_1, τ_2, and m_1 to maximize (19) subject to (17), (9), (21), (24), $\pi_1 = 0$ and $\pi_2 = \bar{c}m_1^{-1/\epsilon} - r$ from (23). Combining the optimal conditions we obtain

$$\upsilon'(\tau^*_{1,fixed}) = (1+r)\beta\upsilon'(\tau^*_{2,fixed}), \tag{32}$$

$$\upsilon'(\tau^*_{1,fixed}) = (1+r)\beta\left(\frac{1-\alpha}{\alpha}\right)\left(\frac{\epsilon}{1-\epsilon}\right)\frac{1}{c^*_{1,pcm}}, \tag{33}$$

$$\upsilon'(\tau^*_{2,fixed}) = \left(\frac{1-\alpha}{\alpha}\right)\left(\frac{\epsilon}{1-\epsilon}\right)\frac{1}{c^*_{2,pcm}}. \tag{34}$$

Equation (32) states that the intertemporal pattern of transfers depends only on the discount and interest rates. Equations (33) and (34) 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, aside from the terms involving r, β, α and ϵ, 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. Since $\upsilon''(\tau) < 0$, 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. Hence, unlike the fixed regime case, inflation is endogenously determined in period 1 and responds to events that are anticipated to take place in period 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 selects τ_1, τ_2, m_0 and m_1 to maximize (19) subject to (17), (9), (21), (24), $\pi_1 = \bar{c}m_0^{-1/\epsilon} - r$ from (22), $\pi_2 = \bar{c}m_1^{-1/\epsilon} - r$ from (23) and $m_1 \equiv m_0(1-\pi_1)$. Combining the optimal conditions we have

$$\upsilon'(\tau^*_{1,flex}) = (1+r)\beta\upsilon'(\tau^*_{2,flex}), \tag{35}$$

$$\upsilon'(\tau^*_{1,flex}) = (1+r)\beta\left(\frac{1-\alpha}{\alpha}\right)\left(\frac{\epsilon}{1-\epsilon}\right)\frac{1}{c^*_{1,pcm}}\left[\frac{1+x}{1+x\beta(1+r)}\right], \tag{36}$$

$$\upsilon'(\tau^*_{2,flex}) = \left(\frac{1-\alpha}{\alpha}\right)\left(\frac{\epsilon}{1-\epsilon}\right)\frac{1}{c^*_{2,pcm}}\left[\frac{1+x}{1+x\beta(1+r)}\right], \tag{37}$$

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 (35) indicates, identically to fixed regimes, that the intertemporal profile of transfers depends only on the rates of discount and interest. Once again, (36) and (37) also imply a positive relation between consumption and fiscal transfers. Nevertheless, since $c_{1,pcm}^* = c_{2,pcm}^* = \bar{c}$ under perfect capital mobility, this effect plays no role in the intertemporal pattern of transfers for flexible regimes. Since $\upsilon''(\tau) < 0$, 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 not more patient 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 ρ_1. The real domestic interest rate, ρ_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 composition 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 τ_1, τ_2, c_1, c_2 and m_1 to maximize (19) subject to $\rho_0 = c_1 m_0^{-1/\epsilon} - \pi_1$ from (26), $\rho_1 = (1+r)(c_2/c_1) - 1$ from (25), $\pi_1 = 0$, $\pi_2 = c_2 m_1^{-1/\epsilon} - \rho_1$ from (27) and $m_0 = m_{0-}$.[17] Combining the optimal conditions with (28) and (29) we obtain

$$\upsilon'(\tau_{1,cc}^*) = (1+r)\ \beta\ \frac{1+\rho_1^*}{1+r}\ \upsilon'(\tau_{2,cc}^*), \tag{38}$$

$$\begin{aligned}\upsilon'(\tau_{1,cc}^*) &= (1+r)\beta\left(\frac{1-\alpha}{\alpha}\right)\left(\frac{\epsilon}{1-\epsilon}\right)\frac{1}{c_{1,cc}^*}, \\ &= (1+r)\beta\left(\frac{1-\alpha}{\alpha}\right)\left(\frac{\epsilon}{1-\epsilon}\right)\frac{1}{\bar{c}}\left[\frac{(2+r)(1+r)+(\rho_1^*-r)}{(2+r)(1+r)}\right],\end{aligned} \tag{39}$$

$$\begin{aligned}\upsilon'(\tau_{2,cc}^*) &= \left(\frac{1-\alpha}{\alpha}\right)\left(\frac{\epsilon}{1-\epsilon}\right)\frac{1}{c_{2,cc}^*}, \\ &= \left(\frac{1-\alpha}{\alpha}\right)\left(\frac{\epsilon}{1-\epsilon}\right)\frac{1}{\bar{c}}\left[\frac{(2+r)(1+r)+(\rho_1^*-r)}{(2+r)(1+\rho_1^*)}\right].\end{aligned} \tag{40}$$

[17] This is the result of the condition $f_0 = f_{0-}$ under capital controls.

Equation (38) shows that the intertemporal pattern of fiscal transfers depends on the discount rate and the domestic real interest rate ρ_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. As a 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. On the other hand, if $\rho_1^* > r$ then $c_{1,cc}^* < c_{2,cc}^*$ inducing the FA to make smaller transfers in period 1 relative to period 2. These particular intertemporal pattern of fiscal transfers occurs because the FA increases (decreases) fiscal transfers as consumption increases (decreases). Hence, this new effect exacerbates the intertemporal pattern of transfers induced by an impatient FA if $\rho_1^* < r$, while it moderates this profile if $\rho_1^* > r$. Since $\upsilon''(\tau) < 0$, the Ramsey planner's problem uniquely determines ($\tau_{1,cc}^*$, $\tau_{2,cc}^*$, $c_{1,cc}^*$, $c_{2,cc}^*$, $m_{1,cc}^*$, $\pi_{2,cc}^*$, Q_0^*, ρ_0^*, Q_1^*, ρ_1^*).

2.4 Comparing Fiscal Performance Under Alternative Monetary and Capital Flows Policies

In this section we compare fiscal performance under alternative monetary and capital flows policies. We define fiscal discipline in terms of the present value of net fiscal transfers ($pdv\tau$), where $pdv\tau \equiv \tau_1 + \tau_2\,(1+r)^{-1}$. An exchange rate regime induces more fiscal discipline if it has a lower value for $pdv\tau$. However, it is important to recall that since all regimes *explode* in period 2, we effectively observe the performance of each regime only under the relatively "tranquil" conditions of period 1. Because of this, we also examine the intertemporal profile of fiscal transfers, in particular the fiscal performance in period 1.

Combining (33), (34), (36), (37), (39) and (40) we obtain

$$\upsilon'(\tau_{1,fixed}^*) = \upsilon'(\tau_{1,flex}^*)\left[\frac{1+x\beta(1+r)}{1+x}\right] = \upsilon'(\tau_{1,cc}^*)\left[\frac{(2+r)(1+r)}{(2+r)(1+r)+(\rho_1^*-r)}\right], \quad (41)$$

$$\upsilon'(\tau_{2,fixed}^*) = \upsilon'(\tau_{2,flex}^*)\left[\frac{1+x\beta(1+r)}{1+x}\right] = \upsilon'(\tau_{2,cc}^*)\left[\frac{(2+r)(1+\rho_1^*)}{(2+r)(1+r)+(\rho_1^*-r)}\right]. \quad (42)$$

Considering (41), (42), (33) and (34), it is clear that the ranking of transfers across regimes depends on the degree of patience of the FA and on the relation between ρ_1^* and r. We can summarize the main results as follows:

1. Fixed vs. Flexible: As in Tornell and Velasco, fixed regimes induce larger transfers in each period than flexible arrangements if the FA is impatient in the sense that $\beta < 1/(1+r)$. If $\beta > 1/(1+r)$, fixed regimes induce smaller transfers in each period than flexible arrangements. If $\beta = 1/(1+r)$ both regimes induce the same fiscal behavior.

2. Fixed vs. Capital Controls: The comparison of the levels and the intertemporal distortion of transfers across these regimes depends on the relation between ρ_1^* and r. As we show later, $\rho_1^* < r$ in equilibrium.

- If $\rho_1^* = r$ capital controls and fixed regimes behave identically, since the capital control does not bind, and the commercial exchange rate coincides with the financial rate.

- If $\rho_1^* < r$ then $\tau_{1,cc}^* > \tau_{1,fixed}^*$ and $\tau_{2,cc}^* < \tau_{2,fixed}^*$. The capital control binds and the financial rate Q_1^* is bigger than E_1, so that, there is a positive exchange premium.

- If $\rho_1^* > r$ then $\tau_{1,cc}^* < \tau_{1,fixed}^*$ and $\tau_{2,cc}^* > \tau_{2,fixed}^*$. The capital control binds and the financial rate Q_1^* is smaller than E_1, so that, there is a negative exchange premium.

Thus, capital controls *exacerbate* the distortion of fiscal transfers present under fixed arrangements when (i) $\rho_1^* < r$ and the FA is impatient or (ii) when $\rho_1^* > r$ and the FA is patient. However, capital controls counterbalance the intertemporal distortion of transfers when (i) $\rho_1^* < r$ if the FA is patient or (ii) when $\rho_1^* > r$ and the FA is impatient.

3. Flexible vs. Capital Controls: The comparison of the intertemporal distortion of transfers across these regimes depends on the relation between ρ_1^* and r; however, the ranking between the levels of transfers also depends upon the degree of impatience of the FA. As we show later $\rho_1^* < r$ in equilibrium.

Capital controls *exacerbate* the intertemporal profile of fiscal transfers present under flexible arrangements when (i) $\rho_1^* < r$ and the FA is impatient or (ii) when $\rho_1^* > r$ and the FA is patient. However, capital controls counterbalance the intertemporal distortion of transfers when (i) $\rho_1^* < r$ if the FA is patient or (ii) when $\rho_1^* > r$ and the FA is impatient.

Regarding the level of transfers, we can state that $\tau_{1,cc}^* > \tau_{1,flex}^*$ if: i) the FA is impatient and $\rho_1^* \leqslant r$, or ii) $\beta = 1/(1+r)$ and $\rho_1^* < r$. However $\tau_{2,cc}^* \lesseqgtr \tau_{2,flex}^*$.

4. Notice that even when $\beta = 1/(1+r)$, so that $\tau_{1,fixed}^* = \tau_{2,fix}^* = \tau_{1,flex}^* = \tau_{2,flex}^*$, the optimal pattern of fiscal transfers differs under capital controls if $\rho_1^* \neq r$ because of the effect of the intertemporal consumption distortion on fiscal transfers.

5. Aside from the particular case when $\rho_1^* = r$, we cannot make an unambiguous analytical statement regarding the $pdv\tau$ of capital controls relative to fixed or flexible regimes. This is not surprising, since the main new feature generated by capital controls is the intertemporal distortion of consumption and fiscal transfers created by deviations of the domestic interest rate from the world one.

6. Nevertheless, we can state that capital controls induce looser fiscal policy initially than fixed and flexible regimes whenever $\rho_1^* < r$ as long as the FA is not patient. That is to say, if $\beta \leqslant 1/(1+r)$ and $\rho_1^* < r$, then $\tau_{1,cc}^* > \tau_{1,fixed}^* \geqslant \tau_{1,flex}^*$.

Although we cannot solve analytically the Ramsey planner's problem for the capital controls case, below we present some intuition and some numerical examples suggesting that $\rho_1^* < r$ *in equilibrium* under capital controls. In other words, under reasonable conditions regarding the impatience of the FA, capital controls induce looser discipline than fixed and flexible regimes initially, during the periods *before the bomb explodes*.

2.4.1 Interest Rates, Inflation and Transfers in Equilibrium: Intuition

The previous sections described optimal behavior for a given path of domestic inflation and interest rates. In this section we provide intuition for how these prices are determined in equilibrium. We begin by describing how the PA adjusts real balances under each regime, since this adjustment is the critical driving force behind equilibrium prices. We then describe the FA's choice of transfers in equilibrium.

How the PA adjusts real balances

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 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 market 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 tends to increase the value of the financial exchange rate Q_1. The latter change reduces ρ_1, inducing an increase in consumption in period 1 and worsening the current account deficit. In summary, the desire to reduce real balances because of the expected inflation tax in period 2 creates an increase in c_1^* and a decrease in c_2^*. This effect is always present under capital controls as long as there is an excess demand for bonds in period 1.

FA's Incentives

If the FA's *discount factor is* $\beta = 1/(1+r)$, the FA prefers not to induce any fiscal or consumption intertemporal distortion. However, since the FA has the proclivity to spend more than socially desirable, the expected inflation tax in period 2 is always positive in equilibrium. Therefore, flexible regimes induce the same fiscal behavior than fixed regimes. However, capital controls induce higher transfers in period 1 than in period 2 because of the consumption distortion that occurs as the PA attempts to get rid of real money balances because of the expected inflation tax in period 2.

Assuming an *impatient* FA, 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 (19)), while the intertemporal relative cost is given by the interest rate, an impatient FA would be delighted to have a *fiscal party*. This incentive is present under fixed and flexible regimes, as well as under capital controls.

- *Consumption party incentive*: As described when we analyzed equation (19), an impatient FA would also like the PA to have a *consumption party*. Under perfect capital mobility we showed that consumption is smooth over time. However, under capital controls, an impatient FA could add fuel to the consumption party that is already likely to happen. This encourages the FA to increase the overall $pdv\tau$ in order to increase period 2 inflation and increase the exchange rate premium in period 1, so that there can be a lower ρ_1 and a bigger intertemporal consumption distortion.

Flexible regimes induce more fiscal discipline than fixed regimes because of the different timing of exchange rates adjustment. Under fixed regimes any loose fiscal behavior is reflected only in lower real money demand in period 2, while under flexible regimes money demand also falls in period 1. Thus if the FA is *impatient*, the higher up-front costs of inflation under flexible regimes induce the FA to exercise more fiscal self-control. This is the main result of Tornell and Velasco.

What happens to the FA's incentives under capital controls? Capital controls enable the FA to enjoy the same temporarily low inflation as fixed regimes, since the commercial exchange rate is assumed to be fixed. However, given the way the PA adjusts real balances, an *impatient* FA has a new incentive for looser fiscal behavior, because the bigger the expected inflation tax in period 2, the bigger the consumption party experienced by the PA in period 1. This last effect tilts transfers towards period 1; therefore, capital controls induce looser discipline than fixed and flexible regimes before the bomb explodes in period 2.

We can anticipate from the previous discussions that:

- Case 1: When the *FA's discount factor is* $\beta = 1/(1+r)$, there will be no fiscal distortions from the FA's impatience per se. Therefore, fixed and flexible regimes will induce the same fiscal behavior. However, under capital controls $\rho_1^* < r$, the PA will have a consumption party in period 1 and a severe hangover in period 2. Therefore, fiscal transfers will tend to be bigger in period 1 and smaller by a greater margin for period 2 than under fixed and flexible regimes. As a consequence, the $pdv\tau$ under capital controls might be smaller or bigger than under fixed or flexible regimes, depending on the value of r. That is to say, $\tau^*_{1,cc} > \tau^*_{1,fixed} = \tau^*_{1,flex}$, $\tau^*_{2,cc} < \tau^*_{2,fixed} = \tau^*_{2,flex}$, $pdv\tau^*_{cc} \gtreqless pdv\tau^*_{fixed} = pdv\tau^*_{flex}$, $c^*_{1,cc} > c^*_{1,fixed} = c^*_{1,flex} = \bar{c}$, $c^*_{2,cc} < c^*_{2,fixed} = c^*_{2,flex} = \bar{c}$.

- Case 2: When the *FA is impatient* there will be intertemporal fiscal distortions due to the *fiscal party incentive* under all regimes, and because of the *consumption party incentive* only under capital controls. Fixed regimes will induce fiscal transfers in each period bigger than under flexible regimes because given the same incentive towards loose fiscal policies, the inflation cost under fixed regimes is paid in period 2, while under flexible regimes it is also paid in period 1. Under capital controls the inflation cost is, like fixed regimes, postponed into the future. However, there is a new reason why transfers in period 1 under capital controls are bigger than under fixed regimes by an even greater margin that in Case 1. This occurs because the FA adds fuel to the consumption party by increasing the $pdv\tau$ in relation to the one in Case 1. This increase the consumption distortion, which induce the FA to have an even bigger party in period 1 than in Case 1 and, consequently, a more striking fiscal bust in period 2. That is to say, $\tau^*_{1,cc} > \tau^*_{1,fixed} > \tau^*_{1,flex}$, $\tau^*_{2,cc} < \tau^*_{2,fixed}$, $\tau^*_{2,cc} \gtreqless \tau^*_{2,flex}$, $\tau^*_{2,fixed} > \tau^*_{2,flex}$, $pdv\tau^*_{cc} \gtreqless pdv\tau^*_{fixed}$, $pdv\tau^*_{cc} \gtreqless pdv\tau^*_{flex}$, $pdv\tau^*_{fixed} > pdv\tau^*_{flex}$, $c^*_{1,cc} > c^*_{1,fixed} = c^*_{1,flex} = \bar{c}$, $c^*_{2,cc} < c^*_{2,fixed} = c^*_{2,flex} = \bar{c}$.

2.4.2 Numerical Examples

Although we cannot solve the Ramsey planner's problem for the capital controls case analytically, we provide in this subsection some numerical examples confirming the intuition that capital controls induce less discipline than fixed and flexible regimes during the periods before the bomb explodes.[18] We assume $\upsilon(\tau) = 1 - e^{-k\tau}$ is the FA utility function associated with the net transfers.[19] We set the following initial conditions, parameters and endowments: $y = 50$, $b_{0-} = m_{0-} = \bar{c}^{\,\epsilon}\, r^{-\epsilon}$, $f_{0-} = 0$, $r = 0.05$, $\epsilon = 0.3$, $\alpha = 0.5$, $k = 5$. Tables 1 and 2 present results from two examples with different assumptions about the patience of the FA.

Table 1 presents results for the case in which $\beta = 1/(1+r)$. As in Tornell and Velasco, $\tau^*_{1,fixed} = \tau^*_{1,flex} = \tau^*_{2,fixed} = \tau^*_{2,flex}$, so that fixed and flexible regimes induce the same fiscal behavior. Under capital controls, consumption and transfers are distorted towards period 1 because of the low domestic interest rate ρ_1. However the transfers in each period, and their present discounted value, are virtually identical to those under fixed and flexible regimes. For the same reason, the three regimes attain almost identical PA's welfare. However, for this particular example, capital controls generate marginally higher PA's welfare than fixed and flexible regimes because they imply a lower $pdv\tau$, despite the intertemporal distortion.

Table 2 presents results for an *impatient* FA which is, arguably, the most realistic scenario. As in Tornell and Velasco the presence of an impatient FA induces a looser fiscal policy in both periods for fixed regimes than flexible arrangements (i.e. $\tau^*_{1,fixed} > \tau^*_{1,flex}$ and $\tau^*_{2,fixed} > \tau^*_{2,flex}$). For this particular example, the $pdv\tau$ under capital controls is lower than for fixed arrangements and higher than for flexible regimes. However, the fiscal and consumption party observed in period 1 is bigger under capital controls than under fixed and flexible arrangements. Moreover, the consumption and fiscal distortions under capital controls are larger in this case than when the FA has the same discount factor as the PA. This occurs because an impatient FA benefits directly from front-loaded transfers (i.e. *fiscal party incentive*), and because an impatient FA wants to encourage a larger consumption party in period 1 (i.e. *consumption party incentive*). FA's impatience thus boosts the fiscal and consumption party while the stabilization plan lasts, and increases the severity of the hangover when the bomb explodes. Capital controls have negative welfare effects in relation to fixed and flexible regimes because the detrimental intertemporal distortion effect more than compensates for the reduction in the $pdv\tau$.

[18] We rule out any scenario in which the initial asset position creates an initial excess of demand for money. This would create pressure towards a negative exchange rate premium (i.e. $Q^*_1 < E_1$) which is not observed in reality when capital controls are imposed. This peculiar scenario tends to occur if there is an initial positive net asset position in the private sector (i.e. $f_{0-} > 0$) and/or an initial positive net asset position in the government (i.e. $b_{0-} > 0$). These conditions do not generally apply for EM and developing countries, since most of them have indebted private and public sectors.

[19] We use this utility function because it implies $\upsilon'(\tau) > 0$, $\upsilon''(\tau) < 0$ and $\tau \gtreqless 0$. When transfers are positive in equilibrium, we obtain similar results using other preferences.

In summary, we argue that capital controls induce even looser fiscal policies than fixed and flexible regimes while the stabilization plan lasts. This occurs because capital controls enable free-spending politicians to enjoy the same temporarily low inflation as fixed regimes, as well as a temporary consumption boom which is regarded as desirable by impatient politicians. This temporary consumption party induce politicians to engage in a fiscal party before the stabilization plan collapses.

3 Empirical Analysis

In this section we empirically test the implication of our theoretical model that capital controls induce looser fiscal behavior than fixed and flexible regimes during the initial periods *before the bomb explodes* or, in other words, in relatively *tranquil* times. We also test Tornell and Velasco's core prediction that fixed regimes induce less discipline than flexible regimes. The rest of this section is organized as follows. First, we discuss earlier empirical studies of the link between fiscal discipline and exchange rate regime. Second, we present the data used in our study. Third, we show some preliminary evidence. Fourth, we present the econometric methodology. Fifth, we show our benchmark empirical results, accounting for diverse sources of potential exchange rate regime endogeneity. Finally, we do some sensitivity analysis by considering alternative exchange rate regime classifications.

3.1 Previous Empirical Studies

To begin, we discuss existing empirical studies that test whether fixed regimes induce more fiscal discipline than flexible regimes. Although this comparison is not the main focus of our paper, it is useful to identify the main limitations and difficulties of previous work. Tables 3 and 4 summarize the principal existing studies. As mentioned in the introduction, the literature is not conclusive as to whether fixed regimes induce more discipline than flexible arrangements. Tornell and Velasco (2000) find that fixed regimes tend to induce less discipline than flexible arrangements; Alberola and Molina (2004) find similar performance; and Alberola et al. (2005) and Fatás and Rose (2001) find that fixed regimes generate more sound fiscal policies than flexible arrangements. Vuletin (2004) finds that fixed regimes induce looser (tighter) fiscal policies than flexible arrangements in relatively "stable" ("volatile") international finance contexts. These studies share some common problems:

- *Exchange rate regime classification.* Most previous studies use the *de jure* IMF exchange rate regime classification, which until recently asked member states to self-declare their arrangements. Since such an official classification often fails to describe actual countries' practices, *de facto* classifications should be used instead. Only Vuletin (2004) and Alberola et al. (2005) consider this element.

- *Lag of dependent variable as regressor.* It is difficult to model the underlying "primitive" determinants of the level of fiscal variables like expenditures 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 exchange rate regime. Only Vuletin (2004) and Alberola et al. (2003, 2005) consider this factor.

- *Country-specific effects.* Heterogeneity in fiscal institutions is considered to be important in understanding diverse fiscal outcomes.[20] 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. Only Vuletin (2004) and Alberola et al. (2005) consider this element in a panel data context.

-*Exchange rate regime endogeneity.* All studies recognize the crucial importance of this factor. Tornell and Velasco (2000) argue that the Sub-Saharan Africa sample they use provides a sort of "natural experiment", since the choice of exchange rate regime in these countries was based on colonial history and not on political or economic considerations. This statement might be correct for the CFA countries[21], which maintained a fixed exchange rate with the French franc from 1948 until 1994, as long as 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. Fatás and Rose (2001) remark that endogeneity could be relevant for currency boards, but not so much for currency unions. However, they 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. Alberola et al. (2005) remark that the expected influence of the endogeneity bias is not clear-cut. While chronic deficits might induce the choice of a fixed regime, fiscal discipline makes fixed regimes more sustainable.

In summary, while the three first elements are seldom considered in previous empirical studies, a more appropriate treatment of the exchange rate regime endogeneity is an open subject in the literature. In this paper we tackle each of the factors described before, including the regime endogeneity.

[20] See for example Alesina and Perotti (1996) and Poterba and von Hagen (1999).
[21] CFA refers to Communauté Financière d'Afrique.

3.2 Data

Our empirical study uses a panel data set which consists of 23 emerging market countries in the period 1970-2001.[22] We focus on this set of countries because they have at least 15 years of continuous fiscal data and, more importantly, because they experienced diverse macroeconomic problems related to fiscal, inflation and debt difficulties. For example, the average 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.

The main sources of data for the macroeconomic and fiscal variables are Kaminsky et al. (2004), and the publications Global Development Finance and World Development Indicators. The *de jure* IMF and the *de facto* Reinhart-Rogoff exchange rate classifications are from Reinhart and Rogoff (2002). We also use data on natural disasters from the Center of Research on the Epidemiology of Disasters, Université Catholique de Louvain.[23]

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 surplus as a percentage of trend GDP. 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. One of the most notable characteristics of fiscal variables is their strong time inertia. Table 5 shows this strong positive serial correlation with a value close to 0.75 at a one year horizon.

Our control variables include: i) the country's position in the business cycle, ii) terms of trade shocks, iii) initial government debt, iv) whether the country has a debt default or bank crisis, v) whether the country has an IMF program, vi) the real LIBOR interest rate and vii) average real GDP growth in OECD countries. As instruments for the exchange rate regime we use the 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. Later, we also use natural disasters to evaluate the response of fiscal policies to exogenous shocks under diverse exchange rate regimes. We justify these controls and instruments afterwards.

[22] 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.

[23] See Appendix A.1 for a complete description of all variables used in the study and their source.

3.2.2 Exchange Rate Regime Classification

The selection of an exchange rate regime classification is crucial for any study that aims to measure the influence of exchange regimes on other variables. As remarked by Reinhart and Rogoff (2002), the *de jure* IMF classification can be misleading, since "the gap between *de facto* and *de jure* can be vast". Reinhart and Rogoff (2002) 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. Second, it identifies dual exchange rate regimes, which are crucial to test our hypothesis. While unified rates regimes are classified by the evolution of the single exchange rate, dual or multiple regimes are classified according to the evolution of the market-determined rate. Lastly, 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. As suggested by Reinhart and Rogoff, this category allows the researcher to avoid mixing the effects of modest inflation under floating regimes with those related to severe stressful circumstances.

In line with our theoretical model, we do not include observations classified as "free falling", since we want to measure the influence of regimes in relatively tranquil times and not when the bomb actually explodes. As described in Table 6, around 20 percent of potential sample observations correspond to this category. Once "free falling" observations are excluded, we distinguish 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 7 shows, this occurs because most countries that claimed to follow flexible arrangements during our sample period actually fixed their exchange rates. This phenomenon is known as "fear of floating" (see Calvo and Reinhart (2000)).

3.3 Preliminary Evidence

Before proceeding with more elaborate tests, we provide a descriptive analysis by examining the mean differences in the government primary balance across exchange regimes. In Table 8 we examine both the raw data and the deviation of each observation from its country-specific mean. We find that dual regimes are associated with worse primary balances 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.

Columns (1) and (2) of Table 9 confirm the mean test results using a simple regression specification without any controls beyond country fixed effects. Since fixed effects might exacerbate the downward bias in standard errors due to the presence of positive error autocorrelation, column (3) allows for country clustered heteroscedasticity and autocorrelation in the errors. Given the strong time persistence of the primary balance described above, it is no surprise that this inclusion increases the standard errors and severely reduces the statistical significance of capital controls.

3.4 Econometric Methodology and Specification

In this section we outline the elements that an ideal econometric methodology should take into account, and conclude that the dynamic panel system GMM approach developed by Blundell and Bond (1998) constitutes the most appropriate technique. The desired econometric methodology should consider the following aspects:

- *Lag of dependent variable as regressor.* As discussed in Section 3.1 the specification should be dynamic, not only because of a direct interest in the coefficient of the lagged fiscal balance itself, but also because a correct dynamic specification is necessary to recover consistent estimates of other coefficients of interest.

- *Country-specific effects.* As argued in Section 3.1 the specification should consider country-specific effects.

- *Other fiscal determinants.* Our primary goal is to test the influence of exchange regimes on the primary budget balance; however, other potential determinants should be included, especially if their behavior is suspected to be correlated with the exchange rate regime. We consider several regressors:

i) The country's position in the business cycle captures the procyclicality or countercyclicality of fiscal policies. Existing literature tends to find that deficits in emerging markets and developing countries behave procyclically, while developed countries adopt countercyclical fiscal policies.[24] Approximately 47 percent, 59 percent and 62 percent of fixed, flexible and dual regime observations are classified as recessions respectively.[25]

ii) Initial government debt measures the debt burden and the ability to borrow. It is expected that the higher the degree of initial indebtness, the more difficult will be to obtain a new loan to finance the deficit. The mean level of indebtness is similar across observations under different exchange rate regimes.

iii) Debt defaults, bank crises and IMF programs represent symptoms of diverse macroeconomic and financial difficulties. If such circumstances are mainly the result of continuous fiscal misbehavior, their

[24] See for example Kaminsky et al. (2004).
[25] We identify recessions as episodes where trend real GDP is above its actual value.

occurrence might trigger a fiscal reform towards more discipline, following the arguments developed by Alesina and Drazen (1991) and Velasco (1997). Approximately 50 percent of debt default and bank crisis episodes are concentrated in the excluded category "free falling". The remaining episodes are roughly evenly distributed between fixed and dual regimes.

iv) 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.

v) Terms of trade shocks represent another external shock that could affect fiscal performance.[26]

-Endogeneity of the exchange rate regime and other regressors. Aside from the initial level of debt, all fiscal determinants -including the exchange rate regime- are subject to endogeneity. For example, a positive relationship between fiscal primary surplus and the business cycle could reflect countercyclical fiscal policies; however, such a positive relationship could also occur if promoting fiscal discipline drives the economy towards a boom. Therefore, the econometric technique should instrument for all potentially endogenous regressors.

Taking into account all the previous 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:

$$y_{it} = \gamma + \alpha\ y_{it-1} + r_{it}^{'}\lambda + x_{it}^{'}\ \beta + \eta_i + \mu_{it} \qquad i = 1, ..., N \qquad t = 1, ..., T \tag{43}$$

where y_{it} is the central government primary balance, α is a scalar, $r_{it}^{'}$ of dimension $1 \times g$ refers to exchange rate regimes, $x_{it}^{'}$ of dimension $1 \times k$ consists of control variables that also affect the central government primary balance, β and λ are $k \times 1$ and $g \times 1$ vectors, and $\eta_i \sim IID\big(0, \sigma_\eta^2\big)$ and $\mu_{it} \sim IID\big(0, \sigma_\mu^2\big)$ 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.

The intuition for the Blundell and Bond (1998) approach is as follows. According to equation (43), y_{it} is a function of η_i and, because of this, so is y_{it-1}. Since y_{it-1} is also a regressor in equation (43) both within and random effect transformations are correlated with the transformed errors even if μ_{it} is not serially correlated, yielding a biased and inconsistent estimator of α. An alternative that eliminates the individual effect without creating the mentioned problems is the first-difference transformation. Anderson and Hsiao (1981) suggest using $\triangle y_{it-2}$ or y_{it-2} as an instrument for $\triangle y_{it-1}$. As long as μ_{it} is not serially correlated the proposed instruments would not be correlated with $\triangle \mu_{it}$. However, Ahn and Schmidt (1995) show that while consistent, the resulting estimates are not necessarily efficient

[26] See for example Lane and Tornell (1999).

because they do not use all available moments. The dynamic panel *first-difference* GMM approach developed by Arellano and Bond (1991) uses lagged levels dated $t-2$ and earlier as instruments for the equations in first-differences by assuming that μ_{it} are serially uncorrelated and that the initial conditions y_{i1} are predetermined. While producing a consistent estimator of α, Blundell and Bond (1998) show that as α approaches unity or as σ_η^2 increases relative to σ_μ^2, this estimator has poor finite sample properties in terms of bias and imprecision because the lagged series of the levels are weak instruments for the first-difference equations.[27] Blundell and Bond (1998) developed an estimator with superior finite sample properties for dynamic panel models with persistent data, called dynamic panel *system* GMM. Assuming additionally that $E\big(\eta_i \triangle y_{i2}\big) = 0$ for each i –which holds if the means of the y_{it} series, while differing across individuals, are constant through time for periods 1, 2, ..., T for each individual– they construct an estimator that makes use of an extra set of moment conditions. The proposed estimator not only uses the lagged levels as instruments for first-difference equations but also lagged first-differences as instruments for equations in levels.

In our empirical model r_{it} and x_{it} could also 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 $E\big(\eta_i \triangle x_{it}\big) = 0$ as additional moment conditions. Following Blundell and Bond (2000), constant means of x_{it} series through time for each country would be sufficient for the validity of the preceding moment conditions. Although stationary means of business cycle might be reasonable, constant means of the exchange rate regime series are not. For this reason we follow the first approach using external instruments in a standard instrumental variables approach.

To test the validity of the main assumptions used by this methodology, we report three tests in each regression outcome. First, we report the Hansen's J statistic, which is an over-identifying restriction test which examines whether the moment conditions assumptions are valid. Second, since the method assumes that μ_{it} is serially uncorrelated, we also report the first and second order serial correlation test for the residuals of the first-difference equations. While the first order serial correlation test is expected to reject the null of no correlation, the second serial order correlation test should not reject the null hypothesis of no correlation. It is worth mentioning that the Hansen's J test does not reject and the second order serial correlation test rejects the null hypothesis for all regressions at 5 percent significance.

[27] Using Monte Carlo simulations Blundell and Bond (1998) show that this bias is particularly important when the number of available periods is small. For example, with a T=4 and N=100 and a true value of α=0.9, the distribution of the first-difference GMM estimator has a mean of 0.23 with a standard deviation of 0.83.

3.5 Benchmark Results

In this section we examine the estimation results for the conditional effects of exchange rate regimes on the primary government balance. In the first subsection we treat all regressors, including exchange rate regimes, as exogenous. Afterwards, we control for endogeneity by modifying the sample used, including additional regressors, using a standard instrumental variables approach, and using natural disaster events to evaluate the response of fiscal policies under diverse exchange rate regimes.

3.5.1 Conditional Effects of Exchange Rate Regimes

Columns (1) and (2) in Table (10) show the most basic dynamic panel data models, which only include the autoregressive component. They only differ in the econometric methodology used for their estimation. While column (1) uses a fixed effects regression allowing for country clustered heteroscedasticity and autocorrelation in the errors, column (2) makes use of the system GMM approach developed by Blundell and Bond (2004), which also estimates the standard errors considering any pattern of heteroscedasticity and autocorrelation within panels. We confirm that the primary fiscal balance is persistent over time, independently of the methodology used. However, the estimated coefficients and, more notably, the statistical significance of the exchange rate regimes vary across methodologies. The coefficients associated with exchange rate regimes are significant only when using the system GMM approach, illustrating the relevance of the estimation choice.

Columns (3) to (7) in Table 10 show the results of the dynamic panel strategy controlling one-at-a-time for domestic and external variables that could affect the fiscal performance. The business cycle is negatively related to the fiscal balance, which suggests procyclicality of fiscal policies. The initial debt has a positive 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 significatively affect the primary fiscal balance. The positive and significant coefficient associated with the average real GDP growth in OECD countries indicates that good times in the developed world economies are related to better fiscal performance in emerging markets. When all these regressors are considered altogether, in Table 10 column (8), the results are maintained but the business cycle loses its significance.

Abstracting from endogeneity issues, the results support the main implication of the model, that capital controls induce looser fiscal performance than fixed and flexible regimes operating under unified rates. Our findings also favor Tornell and Velasco's prediction that fixed regimes generate less fiscal discipline than flexible arrangements. In quantitative terms, dual regimes produce deficits 1.1 percent and 0.5 percent of GDP higher than flexible and fixed arrangements, respectively, and fixed regimes cause deficits 0.6 percent higher than flexible arrangements. These are economically significant magnitudes considering that the average primary fiscal deficit in the sample is 1.25 percent of GDP.

Exchange rate regime changes is a source of identifying variation. However, since the fiscal process is continuous and inertial by nature, some concern might exist to the extent that "excessive" exchange rate regime variability allow us to identify the precise influence of regimes on fiscal performance. For this reason, column (9) in Table 10 considers observations for which the exchange rate regime remains constant for at least four years. The results stand against this consideration, even when the size of the sample is reduced by almost 9 percent.

3.5.2 Exchange Rate Regime Endogeneity

In this section we address endogeneity of the exchange rate regime and the business cycle. The latter is addressed by using internal instruments following the system GMM approach, that is to say, considering lagged levels as instruments for first-difference equations and lagged first-differences as instruments for equations in levels.[28] To properly analyze exchange rate regime endogeneity, we distinguish three main potential sources:

- *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 poor fiscal performance 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.

- *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 using only observations that are at least two years distant 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.[29]

[28] Similar results are obtained if the first lag of GDP Cycle is used instead.

[29] It is worth remembering that around 50 percent of debt defaults and bank crisis events were already excluded, since they occur during "free falling" episodes.

Column (1) in Table 11 abstracts from observations within two years of "free falling" episodes, reducing the size of the sample by 20 percent. This "tranquil" regression supports the results obtained before. 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 improve their fiscal performance. Specifically, default increases the primary balance by 0.7 points of GDP.[30] Interestingly, when this variable is included, the 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 Alesina and Drazen (1991) and Velasco (1997).

The three distress variables are included together in columns (5) and (6) in Table 11, where column (6) only considers observations for which the exchange rate regime remains constant for at least four years. In both cases the previous results are sustained in both qualitative and quantitative terms.

- *Endogeneity due to government type.* As in Tornell and Velasco, we assume in our 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 discipline, the fiscal authority will try to influence the central bank to choose the type of exchange rate regime 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 impose capital controls. For this reason, this source of endogeneity tends to generate the appearance of looser fiscal performance in fixed and dual regimes than in flexible arrangements. We control for this source of endogeneity by using instrumental variables and by exploiting the randomness of natural disaster events to evaluate the response of fiscal policies under diverse exchange rate regimes.

Four variables are used as instruments for the exchange rate regime: i) the percentage of total long-term debt contracted in US$, ii) short-term external debt as a percentage of total external debt, iii) terms of trade volatility and, iv) trade openness. The first two variables are suggested by Avellán (2005) to identify the impact of dual regimes, while the last two are typically used by empirical papers that analyze the determinants of exchange rate regimes using factors affecting optimal currency areas.[31] Following Avellán (2005): i) The percentage of total long-term debt contracted in US$ 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

[30] 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 negative coefficients on the three mentioned variables, which is not what we observe. Secondly, it is relatively unlikely that the current fiscal performance per se generates such episodes; on the contrary, distress episodes are usually associated with chronic fiscal and macroeconomic mismanagement. For empirical purposes we also include the first lag of the three distress indicators, obtaining similar results.

[31] See for example Rizzo (1998), Poirson (2001) and Juhn and Mauro (2002).

to be critical, policymakers would rather implement a partial devaluation through a dual regime than a unified devaluation. ii) 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, because of the trade gains derived from stable bilateral exchange rates, while flexible arrangements are preferable for economies subject to volatile real shocks such as terms of trade. Because of potential contemporaneous feedback from the exchange rate regime to these instruments, we use one lagged values. Columns (1) and (2) in Table 12 show the results employing this standard instrumental variables approach. Columns (1) and (2) use the tranquil sample described above and column (2) only considers observations where regime remains constant for at least 4 years. The previous results are confirmed; capital controls induce looser fiscal policies than fixed and flexible regimes operating under unified rates, and fixed regimes generate less discipline than flexible arrangements.

We also show additional evidence exploiting the randomness of natural disasters, in line with Ramcharan (2005).[32] Severe natural disasters like droughts, earthquakes, floods and wind storms have two key features which make them appealing for our purposes:

- *Unpredictability and exogeneity.* Natural disasters are typically sudden events, and they are usually unrelated to human activity.

- *Government involvement.* Since they cause great damage, destruction, and human suffering, governments generally respond to natural disasters with diverse policies intending to alleviate the damage inflicted. In particular, active fiscal policies are used to rebuild infrastructure, homes and productive systems, as well as to provide assistance and economic help to the families affected.

For these reasons we can assess the impact of exchange rate regimes on fiscal discipline by evaluating whether the fiscal response differs across exchange arrangements in the presence of such natural

[32] Ramcharan analyzes the relationship between exchange rate regimes and economic adjustment to adverse real shocks. He argues that, since the choice of the exchange rate regime may influence the type of shock that the country experiences, variables commonly used to capture real shocks -such as terms of trade volatility- can cause selection bias and hamper identification. For this reason, he takes advantage of the randomness of natural disasters to measure whether the influence of natural shocks on investment and economic growth depends on the exchange rate regime.

Using the database from the Center for the Research on the Epidemiology of Disasters, a disaster is recorded in his analysis when some of the following conditions hold: i) 10 or more reported killed, ii) 100 people reported affected, iii) a call for international assistance and/or iv) a declaration of a state of emergency. He argue that these "low thresholds ensure that most disasters are recorded in the database". A natural disaster is registered in the same year it occurs.

catastrophes. In order to evaluate this hypothesis we consider the following specification:

$$y_{it} = \gamma + \alpha\ y_{it-1} + \varphi\ ND_{it} + \sum_{j=1}^{g-1} \phi_j\ ND_{it}\ r_{it}^{j} + r_{it}^{'}\lambda + x_{it}^{'}\ \beta + \eta_i + \mu_{it} \quad i = 1, ..., N \quad t = 1, ..., T \qquad (44)$$

where (44) is similar to (43), but also includes a natural disasters dummy ND and its interaction with the exchange rate regimes.

We identify natural disasters using data from the Center for the Research on the Epidemiology of Disasters. 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.[33] This relatively high threshold guarantees that the natural disaster is sufficiently important to affect fiscal behavior. 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 of the country was affected. Although these events have the unpredictability characteristic, 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.[34]

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 destruction effects happen at the moment of the catastrophe; however, it is likely that the fiscal response to such severe events is reflected in the following year if the disaster occurs at the very end of the year.[35]

Considering this definition, 53 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 46 percent, 16 percent and 38 percent for fixed, flexible and dual regimes respectively. These proportions are similar to the overall sample.

Columns (3) to (5) in Table 12 show the estimation outcomes when using specification (44). Columns (3) and (4) are analogous to (1) and (2) from a sample and econometric perspective, aside from the new terms included related to natural disasters. Column (5) eliminates observations for which the exchange rate regime corresponding to the disaster differs from the previous year's regime. This reduces the likelihood that the natural disaster affects the choice of exchange rate regime. The interaction terms

[33] Similar results are obtained if the percentage of country's total population used as threshold varies moderately.
[34] Although the data base also contains some information regarding total damages in monetary terms, it is quite scarce.
[35] Similar results are obtained if the month used as threshold moderately varies.

show that fixed regimes induce lower discipline than flexible regimes in the face of a natural disaster, and dual regimes generate an even looser fiscal performance than fixed regimes, giving support to our previous results. In quantitative terms, dual regimes produce deficits that are 2.6 percent and 1.2 percent of GDP higher than flexible and fixed arrangements, and fixed regimes cause deficits that are 1.4 percent higher than flexible arrangements.

3.6 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. Second, we use the *de jure* IMF exchange rate regime classification.

3.6.1 Insulation Properties Under Dual Exchange Rate Regimes

Our theoretical model and empirical analysis assumes, in line with most of the literature, that the financial and commercial exchange markets can be separated at zero cost.[36] However, as Guidoti (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 in insulating prices and reserves.[37] In fact, this is the main reason why these regimes are usually abandoned, not because they are no longer needed, 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.[38] 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 market-determined exchange rates,

[36] Some exceptions are Guidoti (1988), Braga de Macedo (1982), Bhandari and Decaluwé (1990) and Bhandari and Végh (1990).

[37] Different "leakages" arise when exchange rate premiums increase. Following Kiguel et al. (1995) some of them are: i) Through illegal trade, as exports are diverted from official to unofficial channels (Fleming 1971, Lanyi 1975 and 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 1995, O'Connel 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.

[38] 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 "free falling" dual regimes they are 12.5 percent and 11.6 percent. This difference is statistically significant with a p-value of 0.001

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.

Table 13 shows that capital controls induce looser fiscal policy 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. 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 unsound fiscal policies. 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 low fiscal discipline face immediate inflation costs and do not enjoy the same degree of control over the consumption distortion.

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 associated with 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 insulations that low premiums may assure. This concern does not seem to be warranted, since only 1.5 percent of Dual(Fixed) regimes have official exchange devaluations higher than 25 percent, while 20 percent of Dual(Flex.) observations are associated with large devaluations. Second, endogeneity issues might also arise, since poor fiscal performance tends to increase the exchange premium. However if this element drives our results, Dual(Flex.) regimes should have worse fiscal discipline than Dual(Fixed) arrangements, which is the opposite of what we found. In other words, these two concerns affect our estimation results, correcting for them would strength our findings and not weaken them.

3.6.2 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 arrangements operating under unified rates. The results are presented in Table 14. Considering this classification, fixed regimes generate the same discipline as flexible arrangements; however, dual regimes still induce less discipline than either regime operating under unified rates. Therefore, the difference between what countries claim to do and what they actually do clearly matters when analyzing the influence of exchange arrangements 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 looser fiscal policies than fixed and flexible regimes operating under perfect capital mobility.

On the theoretical front we argue that while capital controls allow politicians to enjoy the same temporarily low inflation as fixed regimes, lax fiscal policies also generate a temporary consumption boom which is regarded as desirable by impatient politicians. The consumption boom occurs because as the households attempt to get rid of unwanted real money balances, the real domestic interest rate falls. Therefore, the more shortsighted the politicians are, the looser the policies will be.

We performed an econometric analysis confirming that capital controls lead to larger primary deficits than fixed and flexible regimes under unified rates. Our findings also support Tornell and Velasco's core prediction that fixed regimes induce less discipline than flexible regimes. We confirm the relevance of "leakages" under capital controls. In particular we find that when the market-determined exchange rate is more flexible and the exchange rate premium increases, fiscal performance tends to improve.

The general consensus among economists is that capital controls are clearly harmful to economic efficiency 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.[39] However, several arguments claim that capital controls might be a useful policy. One of the most frequent justifications is that dual regimes provide at least 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 current account deficits. Our findings also counter the arguments that advocate the use of capital controls as temporary relief for temporary capital account shocks, because the loose fiscal policy they induce might exacerbate the initial condition they were intended to alleviate.

[39] See for example Fry (1988), McKinnon (1973), Shaw (1973), Eichengreen et al. (1999), Barro and Lee (1993), Bhagwati (1978) and Avellán (2005).

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A Appendix

A.1 Appendix I: Sources and Definitions of Variables

Variable Name	*Definition and Source*
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 (2002).
Flexible	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 (2002).
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 (2002).
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 (2002).
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 (2002).
Freely 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 (2002).
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 (2002).
Flexible (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 (2002).
Cgpb	Central government primary fiscal balance (as percentage of GDP trend). GDP trend was calculated using the Hodrick-Prescott filter with a smoothing parameter of 100. Source: Kaminsky, Reinhart and Végh (2004).

Variable Name	*Definition and Source*
GDP Cycle	Calculated as ((RGDP - RGDP Trend)/RGDP Trend)*100. RGDP is real GDP and its trend was calculated using the Hodrick-Prescott filter with a smoothing parameter of 100. Source: Kaminsky, Reinhart and Végh (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 ((TOT - TOT Trend)/TOT Trend)*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, Reinhart and Végh (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 default. 0 otherwise. Source: Standard & Poor's.
Bank Crisis	1 if there is a systematic banking crises. 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.
ND	1 if there is a natural disaster that affects at least 5% of the country's total population in the first ten month of the current year or in the last two month 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.
Fordebt	Percentage of total long-term debt contracted in US$. Source: Global Development Finance 2005.
Stdebt	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, Reinhart and Végh (2004).
Openness	Imports and Exports as percentage of GDP. Source: World Development Indicators 2006.

A.2 Appendix II: Tables

Table 1: Example 1. $\beta = 1/1.05 = 1/(1+r)$.

Variable	*CC*	*Fixed*	*Flexible*	*(CC-Fixed)* $\triangle$ %	*(CC-Flex.)* $\triangle$ %	*(Fixed-Flex.)* $\triangle$ %
τ_1	1.294	1.291	1.291	0.257	0.257	0
τ_2	1.287	1.291	1.291	-0.275	-0.275	0
$pdv\tau$	2.520	2.520	2.520	-0.002	-0.002	0
c_1	55.291	54.381	54.381	1.674	1.674	0
c_2	53.425	54.381	54.381	-1.758	-1.758	0
m_0	8.146	8.146	5.406	0	50.677	50.677
m_1	4.027	3.940	4.616	2.205	-12.771	-14.653
π_1	0	0	0.146			
π_2	0.500	0.513	0.282	-2.579	77.222	81.914
ρ_1	0.015					
Q_1	1.035					
PA's Welfare	7.782	7.782	7.782	0.007	0.007	0.000

Note: *CC* denote capital controls.

Table 2: Example 1. $\beta = 1/1.5 < 1/(1+r)$.

Variable	*CC*	*Fixed*	*Flexible*	*(CC-Fixed)* $\triangle$ %	*(CC-Flex.)* $\triangle$ %	*(Fixed-Flex.)* $\triangle$ %
τ_1	1.384	1.362	1.339	1.595	3.369	1.746
τ_2	1.265	1.291	1.267	-1.989	-0.181	1.845
$pdv\tau$	2.588	2.591	2.545	-0.105	1.686	1.793
c_1	60.618	54.381	54.381	11.470	11.470	0
c_2	47.832	54.381	54.381	-12.043	-12.043	0
m_0	8.146	8.146	5.390	0	51.131	51.131
m_1	3.524	3.884	4.592	-9.278	-23.258	-15.410
π_1	0	0	0.148			
π_2	0.890	0.540	0.288	64.681	209.040	87.660
ρ_1	-0.171					
Q_1	1.267					
PA's Welfare	7.763	7.781	7.782	-0.232	-0.236	-0.005

Note: *CC* denote capital controls.

Table 3: Brief Description of Previous Empirical Studies.

Study	*Countries and Period Coverage*	*ERR Classif.*	*Main Econometric Specification*	*ERR Endogeneity Considerations*	*Main Findings*
Tornell and Velasco (2000)	28 african countries. Early 80s.	Fixed: CFA countries. Flexibles: Non-CFA countries.	Cross-section: $y_{i,t_1} - y_{i,t_0} = \gamma_0 + \lambda_1\ ERR_i + + \sum_h \gamma_h\ x_i^h + \mu_i$ t_0=1980, 1981 and t_1=1983-1987. y=several fiscal measures including fiscal deficit and expenditures as share of GDP. x=initial debt, RGDPpc, TOT.	Argue that the sample provides a "natural experiment" since ERR selection is due to colonial history and not to econ. or pol. causes.	Fixed ERRs induce looser fiscal policies than flexible ERRs.
Fatás and Rose (2001)	206 countries. 1960-1998.	Ghosh et al. (2003) and IMF.	Panel Data-Time FE: $y_{it} = \gamma_0 + \sum_j \lambda_j ERR_{it}^j + + \sum_h \gamma_h\ x_{it}^h + \nu_t + \mu_{it}$ y=several fiscal measures including fiscal deficit and expenditures as share of GDP. x=RGDPpc, Openness, Population, Land Area, Urbanization.	Could be important for currency boards, not so much for currency unions.	Currency unions do not induce more fiscal discipline, but currency boards seem to.
Vuletin (2004)	83 countries. 1974-1998.	LYS and IMF.	Panel Data-Country FE-Dynamic: $y_{it} = \gamma_0 + \alpha_1\ y_{it-1} + \sum_j \lambda_j ERR_{it}^j + + \sum_h \gamma_h\ x_{it}^h + \eta_i + \mu_{it}$ y=several fiscal measures including fiscal deficit and expenditures as share of GDP. x=RGDPpc, Openness, TOT, inflation, hyper-inflation.	Addressed using internal instruments of GMM approach.	Fixed ERRs induce looser (tighter) fiscal policies than flexible ERRs in "stable" ("volatile") international finance contexts.

Notes: ERR denote exchange rate regime, FE indicate fixed effects, CFA refers to Communauté Financière d'Afrique, LYS adduce to Levy-Yeyati and Sturzenegger (2000) ERR classification and TOT means terms of trade.

Table 4: Brief Description of Previous Empirical Studies.

Study	*Countries and Period Coverage*	*ERR Classif.*	*Main Econometric Specification*	*ERR Endogeneity Considerations*	*Main Findings*
Alberola and Molina (2004)	32 emerging markets. 1972-2001.	Modified IMF.	Panel Data-No FE-Dynamic: $y_{it} = \gamma_0 + \alpha_1\ y_{it-1} + \sum_j \lambda_j ERR_{it}^j + + \mu_{it}$ y=several fiscal measures including fiscal deficit and expenditures as share of GDP.	Argue that it is not an issue since the choice of the sample considers explicit attempts to use the fixed ERR as a stabilization device.	Fixed ERRs induce similar fiscal discipline than flexible ERRs.
Alberola, Molina and Nadia (2005)	110 countries. 1991-2001.	RR and IMF.	Panel Data-Country FE: $y_{it} = \gamma_0 + \sum_j \lambda_j ERR_{it}^j + + \eta_i + \mu_{it}$ y=primary fiscal balance as share of GDP.	Endogeneity bias sign is not clear: i) chronic deficits might induce the election of fixed ERR. ii) a better fiscal performance makes more likely the sustainability of the fixed ERR.	Using the RR (IMF) classif., fixed ERRs do (do not) provide more fiscal discipline than flexible ERRs.

Notes: ERR denote exchange rate regime, FE indicate fixed effects and RR adduce to Reinhart and Rogoff (2002) ERR classification.

Table 5: Serial Correlation of Central Government Primary Fiscal Balance (as percentage of Trend GDP)

	$Cgpb_t$
$Cgpb_{t-1}$	0.741
$Cgpb_{t-2}$	0.516
$Cgpb_{t-3}$	0.420
$Cgpb_{t-4}$	0.389

Note: 551 Obs.

Table 6: Exchange Rate Regime Categories using Reinhart and Rogoff Classification

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

Table 7: Deeds vs. Words: Reinhart and Rogoff vs. IMF Classification. Number of Observations.

		Reinhart and Rogoff Classification		
		Fixed	*Flexible*	*Total*
IMF	*Fixed*	119	11	130
Classification	*Flexible*	179	45	224
	Total	298	56	354

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

Table 8: Mean Test for Central Government Primary Fiscal Balance (as percentage of Trend GDP) across Exchange Rate Regimes.

	Cgpb mean value			H_0 : *Means are equal* ; H_1*: Means are different (p-value)*		
	Fixed	*Flexible*	*Dual*	*Fixed vs. Flexible*	*Fixed vs. Dual*	*Dual vs. Flexible*
Overall	-0.760	-0.027	-2.294	0.047	0	0
Within	0.592	0.507	-1.004	0.833	0	0.001

Note: Within measures are obtained by subtracting from each observation the country's mean value. We allow unequal variances in the the two-sample t-test. There are 489 Obs.
The value 0 is reported when the first four decimal digits equal zero.

Table 9: Unconditional Effects of Exchange Rate Regimes. Dependent Variable: Central Government Primary Fiscal Balance (as percentage of Trend GDP).

	Pooled Cross-Section	*Country Fixed Effects*	*Country Fixed Effects Clustered*
	All	All	All
	(1)	(2)	(3)
Fixed	-0.734	0.367	0.367
	(2.041)**	(0.722)	(0.297)
Dual	-2.267	-2.19	-2.19
	(5.611)***	(4.266)***	(1.496)
Observations	489	489	489
Countries	23	23	23
R^2	0.076	0.133	0.133
p-value: Fixed=Flex.	0.042	0.471	0.769
Dual=Flex.	0	0	0.149
Fixed=Dual	0	0	0.01

Notes: Flexible regime is the omitted category. Intercept estimatior not reported. Estimations are performed with OLS -column 1- and country fixed effects -columns 2 and 3. Standard errors of columns 1 and 2 are adjusted by heteroscedasticity while those reported in column 3 are also clustered by country, that is, the observations are assumed to be independent across countries, but not necessarily within countries.
The value 0 is reported when the first four decimal digits equal zero.
Absolute t-statistics in brackets. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 10: Conditional Effects of Exchange Rate Regimes. Dependent Variable: Central Government Primary Fiscal Balance (as percentage of Trend GDP).

	Clustered All (1)	*GMM* All (2)	*GMM* All (3)	*GMM* All (4)	*GMM* All (5)	*GMM* All (6)	*GMM* All (7)	*GMM* All (8)	*GMM* "Const." (9)
Cgpb (-1)	0.7	0.721	0.727	0.717	0.72	0.718	0.725	0.716	0.721
	(13.960)***	(15.348)***	(15.813)***	(15.835)***	(14.999)***	(14.649)***	(15.297)***	(14.461)***	(14.854)***
Fixed	-0.58	-0.621	-0.514	-0.649	-0.634	-0.626	-0.608	-0.592	-0.609
	(0.099)	(2.093)**	(1.798)*	(2.428)**	(2.130)***	(2.094)**	(2.178)***	(2.445)**	(2.164)**
Dual	-0.783	-1.097	-1.034	-1.102	-1.115	-1.104	-1.127	-1.128	-1.139
	(1.223)	(3.252)***	(3.251)***	(3.404)***	(3.270)***	(3.260)***	(3.471)***	(3.608)***	(3.041)***
GDP Cycle			-0.046					-0.032	-0.011
			(2.196)**					(1.426)	(0.448)
Initial Debt				0.013				0.013	0.014
				(2.770)***				(2.645)***	(2.912)***
TOT Shock					0.003			0.008	0.008
					(0.285)			(0.988)	(0.856)
Real LIBOR						-0.03		-0.065	-0.082
						(0.600)		(1.386)	(1.641)
OECD growth							0.209	0.211	0.21
							(2.886)***	(2.856)***	(2.951)***
Observations	471	471	471	471	471	471	471	471	433
Countries	23	23	23	23	23	23	23	23	23
R^2	0.532								
p-value: OIR test		1	1	1	1	1	1	1	1
m_1		0.004	0.003	0.004	0.004	0.004	0.002	0.002	0.004
m_2		0.101	0.1	0.1	0.103	0.102	0.102	0.109	0.088
p-value: Fixed=Flex.	0.922	0.036	0.072	0.015	0.033	0.036	0.029	0.014	0.03
Dual=Flex.	0.234	0.001	0.001	0.001	0.001	0.001	0.001	0.0003	0.002
Fixed=Dual	0.063	0.047	0.03	0.046	0.047	0.05	0.025	0.024	0.039

Notes: Flexible regimes is the omitted category. Intercept estimatior not reported. All estimations are performed with country fixed effects. Column 1 reports standard errors adjusted for heteroscedasticity clustered by country, that is, the observations are assumed to be independent across countries, but not necessarily within countries. The rest of the columns report Blundell and Bond (1998) system GMM estimators. All regressors, including exchange rate regimes, are treated as exogenous.
Column 9 only considers observations for which the exchange rate regime remains "constant" for at least 4 years.
OIR test refers to the Hansen over-identifying restrictions test. m_1 and m_2 refers to first and second order serial correlation test, respectively.
Absolute t-statistics in brackets. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 11: Conditional Effects of Exchange Rate Regimes Considering Endogeneity Due to *Regime Choice Under Stress*. Dependent Variable: Central Government Primary Fiscal Balance (as percentage of Trend GDP).

	GMM "Tranquil" (1)	*GMM* "Tranquil" (2)	*GMM* "Tranquil" (3)	*GMM* "Tranquil" (4)	*GMM* "Tranquil" (5)	*GMM* "Tranquil" "Const." (6)
Cgpb (-1)	0.737	0.738	0.738	0.73	0.729	0.728
	(15.530)***	(15.577)***	(15.612)***	(15.537)***	(15.743)***	(15.449)***
Fixed	-0.552	-0.551	-0.545	-0.554	-0.567	-0.563
	(2.231)**	(2.267)**	(2.204)**	(2.193)**	(2.284)**	(2.037)**
Dual	-1.086	-1.083	-1.094	-1.18	-1.221	-1.212
	(2.823)***	(2.798)***	(2.848)***	(2.873)***	(2.907)***	(2.659)***
GDP Cycle	-0.033	-0.032	-0.031	-0.03	-0.03	-0.026
	(1.509)	(1.515)	(1.456)	(1.495)	(1.466)	(1.302)
Initial Debt	0.011	0.011	0.01	0.005	0.005	0.005
	(2.346)**	(2.512)**	(2.163)**	(0.921)	(0.992)	(0.910)
TOT Shock	0.003	0.003	0.003	0.002	0.002	0.002
	(0.306)	(0.301)	(0.309)	(0.245)	(0.206)	(0.217)
Real LIBOR	-0.02	-0.02	-0.024	-0.021	-0.023	-0.018
	(0.417)	(0.418)	(0.490)	(0.445)	(0.461)	(0.361)
OECD Growth	0.161	0.162	0.162	0.159	0.156	0.165
	(2.185)**	(2.201)**	(2.189)**	(2.150)**	(2.121)**	(2.283)**
IMF Program		0.013			-0.126	-0.149
		(0.080)			(0.837)	(0.962)
Bank Crisis			0.233		0.14	0.16
			(0.913)		(0.607)	(0.663)
Default				0.702	0.737	0.773
				(2.441)**	(2.644)***	(2.836)***
Observations	395	395	395	395	395	381
Countries	22	22	22	22	22	22
p-value: OIR test	1	1	1	1	1	1
m_1	0.007	0.006	0.007	0.006	0.006	0.006
m_2	0.101	0.101	0.1	0.098	0.1	0.1
p-value: Fixed=Flex.	0.026	0.023	0.028	0.028	0.022	0.042
Dual=Flex.	0.005	0.005	0.004	0.004	0.004	0.008
Fixed=Dual	0.05	0.053	0.045	0.027	0.027	0.029

Notes: Flexible regimes is the omitted category. Intercept estimatior not reported. All estimations are performed with country fixed effects using Blundell and Bond (1998) system GMM approach. In all columns the exchange rate regimes are treated as exogenous. *GDP Cycle* is instrumented using internal instruments following the system GMM approach. Similar results are obtained if the first lag of *GDP Cycle* is used instead.
All columns use observations that are at least two years distant from free falling regimes, which proxy for "tranquil" times. Column 6 only considers observations for which the exchange rate regime remains "constant" for at least 4 years.
OIR test refers to the Hansen over-identifying restrictions test. m_1 and m_2 refers to first and second order serial correlation test, respectively.
Absolute t-statistics in brackets. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 12: Conditional Effects of Exchange Rate Regimes Considering Endogeneity Due to *Regime Choice Under Stress* and *Government Type* Endogeneity. Dependent Variable: Central Government Primary Fiscal Balance (as percentage of Trend GDP).

	GMM "Tranquil" (1)	*GMM* "Tranquil" "Const." (2)	*GMM* "Tranquil" (3)	*GMM* "Tranquil" "Const." (4)	*GMM* "Tranquil" "Const." "Const. ND" (5)
Cgpb (-1)	0.729	0.727	0.717	0.717	0.714
	(15.708)***	(15.613)***	(15.332)***	(15.324)***	(15.217)***
Fixed	-0.565	-0.557	-0.504	-0.481	-0.482
	(2.251)**	(1.984)**	(1.567)	(1.319)	(1.325)
Dual	-1.213	-1.206	-1.058	-1.022	-1.031
	(2.907)***	(2.633)***	(2.360)**	(2.065)**	(2.088)**
Fixed*ND			-0.964	-1.105	-1.467
			(2.030)**	(2.063)**	(3.154)***
Dual*ND			-2.207	-2.263	-2.626
			(3.052)***	(3.109)***	(4.806)***
ND			0.223	0.275	0.636
			(0.397)	(0.462)	(1.855)*
GDP Cycle	-0.03	-0.025	-0.021	-0.019	-0.019
	(1.494)	(1.247)	(1.116)	(0.996)	(1.030)
Initial Debt	0.005	0.005	0.005	0.005	0.005
	(1.000)	(0.916)	(1.063)	(0.937)	(0.912)
TOT Shock	0.002	0.002	-0.002	-0.002	-0.002
	(0.212)	(0.262)	(0.218)	(0.218)	(0.243)
Real LIBOR	-0.023	-0.019	-0.028	-0.022	-0.021
	(0.462)	(0.368)	(0.543)	(0.429)	(0.409)
OECD Growth	0.156	0.165	0.17	0.18	0.181
	(2.126)**	(2.285)**	(2.407)**	(2.552)**	(2.577)***
IMF Program	-0.127	-0.153	-0.179	-0.209	-0.228
	(0.848)	(0.991)	(1.159)	(1.378)	(1.503)
Bank Crisis	0.139	0.161	0.097	0.113	0.114
	(0.605)	(0.672)	(0.446)	(0.508)	(0.513)
Default	0.735	0.775	0.857	0.901	0.909
	(2.640)***	(2.827)***	(2.995)***	(3.230)***	(3.261)***
Observations	395	381	395	381	379
Countries	22	22	22	22	22
p-value: OIR test	1	1	1	1	1
m_1	0.006	0.005	0.006	0.006	0.006
m_2	0.1	0.1	0.091	0.092	0.091
p-value: Fixed=Flex.	0.024	0.047	0.117	0.186	0.185
Dual=Flex.	0.004	0.008	0.039	0.039	0.037
Fixed=Dual	0.028	0.032	0.066	0.076	0.072
Fixed*ND=Flex.*ND			0.042	0.039	0.002
Dual*ND=Flex.*ND			0.002	0.002	0
Fixed*ND=Dual*ND			0.036	0.061	0.061

Notes: Flexible regimes is the omitted category. Intercept estimation not reported. All estimations are performed with country fixed effects using Blundell and Bond (1998) system GMM approach. Exchange rate regimes are instrumented using the first lag of i) Fordebt, ii) Stdebt, iii) Openness and iv) Totvol. *GDP Cycle* is instrumented using internal instruments following the system GMM approach. Similar results are obtained if the first lag of *GDP Cycle* is used instead. All columns use obs. that are at least two years distant from "free falling" regimes. Columns 2, 4 and 5 only consider obs. for which the exchange rate regime remains "constant" for at least 4 years. Column 5 does not include obs. for which the exchange rate regime corresponding to the year in which the natural disaster (ND) is registered does not coincide with the one of the previous year. OIR test refers to the Hansen over-identifying restrictions test. m_1 and m_2 refer to first and second order serial correlation test, respectively. The value 0 is reported when the first four decimal digits equal zero. Absolute t-statistics in brackets. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 13: Conditional Effects of Exchange Rate Regimes Considering Endogeneity Due to *Regime Choice Under Stress*. Dependent Variable: Central Government Primary Fiscal Balance (as percentage of Trend GDP).

	GMM "Tranquil" (1)	*GMM* "Tranquil" "Const." (2)
Cgpb (-1)	0.71	0.709
	(15.812)***	(15.527)***
Fixed	-0.578	-0.577
	(2.228)**	(2.000)**
Dual (Fixed)	-1.61	-1.608
	(3.129)***	(2.943)***
Dual (Flex.)	-0.683	-0.666
	(1.890)*	(1.666)*
GDP Cycle	-0.018	-0.015
	(0.940)	(0.784)
Initial Debt	0.006	0.006
	(1.110)	(0.996)
TOT Shock	0.003	0.004
	(0.398)	(0.406)
Real LIBOR	-0.044	-0.04
	(0.964)	(0.866)
OECD Growth	0.142	0.151
	(1.954)*	(2.125)**
IMF Program	-0.059	-0.075
	(0.402)	(0.493)
Bank Crisis	0.125	0.144
	(0.587)	(0.647)
Default	0.657	0.688
	(2.253)**	(2.441)**
Observations	395	376
Countries	22	22
p-value: OIR test	1	1
m_1	0.007	0.007
m_2	0.091	0.092
p-value: Fixed=Flex.	0.026	0.046
Dual (Fix)=Flex.	0.002	0.003
Dual (Flex)=Flex.	0.059	0.096
Fixed=Dual (Fix)	0.013	0.015
Fixed=Dual (Flex.)	0.639	0.684
Dual (Fix)=Dual (Flex.)	0.024	0.024

Notes: Flexible regimes is the omitted category. Intercept estimatior not reported. All estimations are performed with country fixed effects using Blundell and Bond (1998) system GMM approach. In all columns the exchange rate regimes are treated as exogenous. *GDP Cycle* is instrumented using internal instruments following the system GMM approach. Similar results are obtained if the first lag of *GDP Cycle* was used instead.
All columns use observations that are at least two years distant from free falling regimes, which proxy for "tranquil" times. Column 2 only considers observations for which the exchange rate regime remains "constant" for at least 4 years.
OIR test refers to the Hansen over-identifying restrictions test. m_1 and m_2 refers to first and second order serial correlation test, respectively.
Absolute t-statistics in brackets. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 14: Conditional Effects of Exchange Rate Regimes Considering Endogeneity Due to *Regime Choice Under Stress*. Dependent Variable: Central Government Primary Fiscal Balance (as percentage of Trend GDP).

	GMM "Tranquil" (1)	*GMM* "Tranquil" "Const." (2)
Cgpb (-1)	0.731	0.731
	(15.425)***	(15.281)***
Fixed (IMF)	-0.038	-0.01
	(0.171)	(0.045)
Dual	-0.737	-0.713
	(2.558)**	(2.448)**
GDP Cycle	-0.034	-0.032
	(1.517)	(1.406)
Initial Debt	0.004	0.004
	(0.799)	(0.697)
TOT Shock	0.002	0.002
	(0.236)	(0.236)
Real LIBOR	-0.024	-0.018
	(0.457)	(0.338)
OECD Growth	0.161	0.17
	(2.189)**	(2.381)**
IMF Program	-0.096	-0.109
	(0.631)	(0.700)
Bank Crisis	0.152	0.161
	(0.630)	(0.652)
Default	0.721	0.76
	(2.712)***	(2.885)***
Observations	395	381
Countries	22	22
p-value: OIR test	1	1
m_1	0.006	0.006
m_2	0.1	0.096
p-value: Fixed (IMF)=Flex. (IMF)	0.864	0.964
Dual =Flex. (IMF)	0.011	0.014
Fixed (IMF)=Dual	0.063	0.064

Notes: Flexible regimes is the omitted category. Intercept estimatior not reported. All estimations are performed with country fixed effects using Blundell and Bond (1998) system GMM approach. In all columns the exchange rate regimes are treated as exogenous. *GDP Cycle* is instrumented using internal instruments following the system GMM approach. Similar results are obtained if the first lag of *GDP Cycle* was used instead.
All columns use observations that are at least two years distant from free falling regimes, which proxy for "tranquil" times. Column 2 only considers observations for which the exchange rate regime remains "constant" for at least 4 years.
OIR test refers to the Hansen over-identifying restrictions test. m_1 and m_2 refers to first and second order serial correlation test, respectively.
Absolute t-statistics in brackets. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.