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 exploiting the classic dichotomy of fixed vs. flexible exchange rate regimes assuming perfect capital mobility. However, the role of capital controls cannot be neglected, particularly in 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 the fiscal policy is endogenously determined by a non-benevolent fiscal authority, dual regimes induce politicians to have higher fiscal deficits than under fixed and flexible regimes operating under perfect capital mobility. The model also shows this effect increases as fiscal authorities become more impatient.

Dynamic panel regressions confirm that dual regimes lead to higher fiscal deficits than fixed and flexible regimes operating under unified rates. Using a dummy for pre-electoral year as an indicator of fiscal authorities' shortsightedness, we also confirm that dual exchange rate has a more adverse effect on fiscal deficits as the authorities become more impatient.

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1. Introduction

The influence of exchange rate regimes (ERRs) on fiscal discipline has long been debated in both academic environments and policy makers' circles. The theoretical literature discusses the influence of ERRs on fiscal discipline exploiting the classic dichotomy of fixed vs. flexible ERRs and assuming perfect capital mobility. Conventional wisdom – represented by papers like Aghevli, Khan, and Montiel (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, Tornell and Velasco (1998, 2000) take issue with the previous view by considering political economy arguments. They argue 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 than fixed regimes by forcing the cost to be paid up-front. Empirical studies tend to support Tornell and Velasco's arguments (Tornell and Velasco, 1998 and 2000; Fatás and Rose, 2001; Alberola and Molina, 2004; Alberola, Molina, and Navia, 2005).

A limitation of this literature is that it assumes perfect capital mobility, even though unrestricted capital flows seem to be the exception rather than the rule. Diverse forms of capital controls were pervasive until the mid-nineties (Reinhart and Rogoff, 2004) and recently regained popularity to cope with massive capital inflows since the recent global financial crisis. The fact that even the IMF – presumably a bulwark of macroeconomic orthodoxy – has come out in favor of using tools such as Tobin taxes under some recent circumstances, illustrates the renaissance of capital controls in this much-changed post-

Lehman world.

This paper contributes to the literature on the disciplining effect of ERRs for fiscal policy. It extends the argument of the effects of flexible and fixed ERRs on fiscal discipline – as described by Tornell and Velasco (1998, 2000) – by adding a third ERR: dual exchange rate regime. In a dual exchange rate system, there are both fixed and floating exchange rates in the market. The fixed rate is only applied to certain segments of the market, such as current account transactions (commercial exchange rate). In the meantime, the price of capital account transactions is determined by a market driven exchange rate (financial exchange rate). This type of capital control has been a recurrent tool used by countries when trying to avoid a depreciation on domestic prices while maintaining some degree of control over the capital account and international reserves (Guidotti and Vegh, 1992). Indeed, using the Reinhart and Rogoff (2004) ERR classification, we find that more than 35 percent of countries had dual regimes during the 1970s and 1980s and about 20 percent still had them in the 1990s and 2000s (Figure 1). These figures reach about 45 and 30 percent respectively for the developing world.

What are the consequences of running lax fiscal deficits under dual ERRs? Similar to fixed and flexible ERRs under perfect capital mobility, unsound fiscal policies increase future anticipated monetization, consequently reducing desired future money holdings. The latter change creates excess demand for foreign bonds which, due to the presence of dual exchange rates, increases the financial exchange rate and reduces the current domestic real interest rate. This last factor increases current consumption, augmenting the current account deficit. In other words, this capital control enables to maintain temporarily low inflation rates like fixed regimes, since the commercial exchange rate is assumed to be fixed, but it also boosts current consumption as private agents attempt

to reduce their real balances because of the expected inflation tax.

As Tornell and Velasco make clear, 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. There is a stronger tendency for the fiscal authority to increase early fiscal spending under dual ERRs compared to either fixed or flexible ERRs. This occurs because dual exchange rates 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. Therefore, while the anticipated reaction of the exchange rate market moderates fiscal spending under flexible rates, it encourages lax fiscal policies under dual regimes. Here we show that this effect increases as the fiscal authority becomes more impatient.

Using a sample of 94 countries for the period 1970-2010 we confirm that dual ERRs lead to larger deficits than fixed and flexible regimes operating under unified rates. Specifically, dual regimes induce fiscal deficits (as share of trend GDP) that are 0.802 percent and 1.412 percent higher than fixed and flexible regimes, respectively. Moreover, given the strong inertia of fiscal policies, dual regimes are associated with long-run deficits that are 1.96 percent and 3.44 percent higher than fixed and flexible regimes. Our findings are robust to the inclusion of additional determinants of fiscal policy, alternative de facto ERR classifications, and even after ameliorating endogeneity concerns. In line with previous empirical papers, our evidence also support Tornell and Velasco's core prediction that fixed regimes induce less discipline than flexible arrangements under perfect capital mobility – fixed regimes cause deficits 0.610 percentage points higher than flexible arrangements. In the long-run the difference increases to 1.49 percentage points. Using a dummy for pre-electoral year as an indicator of fiscal authorities' shortsightedness, we also confirm that fiscal differences across ERRs

increase when authorities become more impatient.

The rest of the paper is structured as follows. Section 2 presents the model. Section 3 turns to the empirical analysis. Section 4 concludes.

2. Model

We basically extend the two period model in Tornell and Velasco (1998) now accounting for a dual ERR (Flood and Marion, 1982; Obstfeld, 1984; Guidotti and Vegh, 1992).[1] This means that the commercial exchange rate (E) is held fixed, while the exchange rate for financial transactions (Q) is allowed to vary. In particular, since the amount of international assets (f) that domestic private agents can hold is fixed, any change in money and asset demand induces a variation in the financial exchange rate. This in turn creates a wedge between the international (r) and the domestic real interest rate (ρ) in period 1:

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

A positive [negative] exchange rate premium is associated with a ρ lower [higher] than r.

Monetary policy is conducted by the central bank, whose stance (exchange rate regime and money growth) is treated as predetermined. As in Tornell and Velasco, we assume that the central bank can precommit to an independent monetary policy that ignores the behavior of the fiscal authority only for a finite period of time – period 1 in our model. The assumption of finite precommitment to an independent ERR is not

[1] The modeling structure borrowed from Tornell and Velasco (1998) does not come free of limitations. Our model does not articulate the potential strategic use of ERR announcements; see Alberola, Molina, and Navia (2005) for empirical evidence on this regard. It does not analyze either the role of ideology (Chang, 2007) or the endogenous end of stabilization plans associated to IMF programs (Díaz Cassou, García Herrero, and Molina, 2006).

based on the idea that central banks are independent of government's influence, rather it aims to capture the idea that stabilization plans are subject to "temporariness" or "imperfect credibility" as described in Calvo (1991) and Drazen and Helpman (1987).

In period 1 the central bank sets the nominal devaluation rate of the commercial exchange and the growth rate of nominal money equal to zero (i.e., $\varepsilon_1 \equiv (E_1 - E_0)/E_1 = 0$ and $\mu_1 \equiv (M_1 - M_0)/M_1 = 0$).[2] Assuming that the law of one price holds, $\pi_t = \varepsilon_t$.[3] Therefore, while the stabilization plan lasts, inflation under dual ERR equals that of fixed regimes under perfect capital mobility (i.e., $\pi_1 = \varepsilon_1 = 0$). The central bank does not intervene in the financial exchange market and there is no private capital mobility (i.e. $f_0 = f_1$); however, it sells [buys] foreign bonds for [with] money for current account purposes. The financial exchange rate and real domestic interest rate become endogenous.

In period 2, as in Sargent and Wallace (1981), the stabilization plan is abandoned and inflation must adjust to ensure the government's budget constraint. For comparison purposes, we assume that the dual exchange rate is also abandoned (i.e., $Q_2 = E_2$). The latter assumption is also supported by empirical evidence that shows that dual exchange rates are eventually abandoned, not because they are no longer needed or desired, but because they are no longer useful in insulating reserves and maintaining low inflation due to the apearance of different "leakages" that reduce the effectiveness of this capital control (Fleming, 1971; Bhagwati, 1978; May, 1985; Guidotti, 1988; O'Connel, 1991; Kamin, 1993; Kiguel, Lizondo, and O'Connell, 1997). In particular, these papers find that dual exchange rates are abandon when exchange rate premiums are fairly high and are commonly associated with large devaluations of the "artificially

[2] Similar qualitative results hold if ε_1 and/or μ_1 differ from zero.

[3] Under our definition, the inflation rate is bounded above by one, and can directly be interpreted as a tax rate.

low" commercial exchange rate. Therefore, it makes no difference what the ERR is in period 2. In other words, period 1 can be thought of as the interval of time in which the stabilization plan is sustained, and period 2 as the time in which the stabilization plan reaches its end.

Private agents have perfect foresight, are rational, and draw utility from consumption (c) and real balances (m):

$$ln(c_1) + \left(\frac{\epsilon}{\epsilon - 1}\right) m_0^{\frac{\epsilon-1}{\epsilon}} + \beta^{PA}\left[ln(c_2) + \left(\frac{\epsilon}{\epsilon - 1}\right) m_1^{\frac{\epsilon-1}{\epsilon}}\right], \tag{2}$$

where β^{PA} stands for the private agents' discount factor. $\epsilon \in (0, 1)$ to guarantee that the economy is always on the upward-sloping side of the Laffer curve.[4] 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 balances prevailing in periods 1 and 2 respectively. Without loss of generality, we use logarithmic expressions for consumption utility in order to obtain analytical solutions. As usual, we assume that $\beta^{PA} = (1 + r)^{-1}$.

As in Tornell and Velasco, we assume that the private agent receives an exogenous endowment income y of tradable goods in periods 1 and 2.[5] The private agent's budget constraint for period 1 under dual ERR is[6]

$$\frac{Q_1}{E_1} f_0 + r f_0 + m_0 + y + \tau_1 = c_1 + \pi_1 m_0 + m_1 + \frac{Q_1}{E_1} f_1, \tag{3}$$

where τ is the lump-sum transfer. Under a dual exchange rate system, the principal

[4] This assumption guarantees that inflation tax revenue increases with inflation.

[5] Assuming an endowment economy is an important limitation of the model as it does not allow spending and taxation policies to be endogenously determined upon the effectiveness of fiscal policies under alternative ERRs. Moreover, it does not allow movements in the real exchange rates to affect production.

[6] 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 tradable good which is used as the numeraire (i.e. real terms).

on foreign bonds must be acquired at the financial exchange rate Q but the interest income (a current account item) must be repatriated at the commercial exchange rate. The ratio Q_1/E_1 may be interpreted as the real price of foreign bonds in the domestic economy.

Since we assume $Q_2 = E_2$, the budget constraint in period 2 is given by

$$(1+r)(f_1+m_1)+y+\tau_2 = c_2+(r+\pi_2)m_1. \tag{4}$$

Combining (1), (3) and (4) we obtain the private agent's intertemporal budget constraint under dual ERR:

$$\left(\frac{1}{1+\rho_1}+r\right)f_0+(1+r)m_0+y\left(\frac{2+\rho_1}{1+\rho_1}\right)+\tau_1+\frac{\tau_2}{1+\rho_1} = \tag{5}$$
$$c_1+(r+\pi_1)m_0+\frac{c_2}{1+\rho_1}+\frac{(\rho_1+\pi_2)m_1}{1+\rho_1}.$$

Fiscal policy is run by a non-benevolent fiscal authority that gives private agents net lump-sum transfers that are financed with seigniorage revenues and international assets (b). The fiscal authority's objective is to maximize

$$\alpha\left[ln(\tau_1)+\beta ln(\tau_2)\right]+(1-\alpha)\left[ln(c_1)+\left(\frac{\epsilon}{\epsilon-1}\right)m_0^{\frac{\epsilon-1}{\epsilon}}+\beta^{FA}\left[ln(c_2)+\left(\frac{\epsilon}{\epsilon-1}\right)m_1^{\frac{\epsilon-1}{\epsilon}}\right]\right], \tag{6}$$

where $\alpha \in (0,1)$. Government transfers give utility, possibly because they provide political power or prestige, the weight of which depends on α. The fiscal authority also internalizes the private agent's objective function with a weight $(1-\alpha)$, but the fiscal authority's discount factor β^{FA} does not necessarily match that of the private agent.[7]

[7] Sun (2003) proves that the distortions exogenously assumed in the proposed objective function can be rationalized from a microfoundation point of view through fragmented fiscal policymaking. The interaction among the fiscal authorities or interest groups over time generates the intrinsic desire to

Hence, a shortsighted fiscal authority would not only be delighted to have a "fiscal party" where $\tau_1 > \tau_2$, but would also like the private agent to have a "consumption party" where $c_1 > c_2$.

The government's intertemporal budget constraint is given by

$$\tau_1 + \frac{\tau_2}{1+r} = (1+r)(b_0 - m_0) + m_0(r + \pi_1) + \frac{m_1(r+\pi_2)}{1+r}. \tag{7}$$

Combining (5) and (7), the economy's resource constraint is given by

$$(1+r)(b_0 + f_0) + y\left(\frac{2+r}{1+r}\right) = c_1 + \frac{c_2}{1+r}. \tag{8}$$

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

$$\tau_1^u + \frac{\tau_2^u}{1+r} - (1+r)b_0 \leq \bar{c}^{\epsilon}\frac{1}{(1+r)^{\epsilon}}, \tag{9}$$

$$\tau_1^l + \frac{\tau_2^l}{1+r} - (1+r)b_0 > -\bar{c}^{\epsilon}\frac{1}{(1+r)\,r^{\epsilon}}, \tag{10}$$

where $\tau_t^u = \max\left[\tau_{t,fixed}^*,\ \tau_{t,flexible}^*,\ \tau_{t,dual}^*\right]$ and $\tau_t^l = \min\left[\tau_{t,fixed}^*,\ \tau_{t,flexible}^*,\ \tau_{t,dual}^*\right]$

spend more than socially optimal (α parameter) because of competitive externality (intratemporal distortion), and higher impatience of the fiscal authority (β^{FA} parameter) due to tragedy of commons (intertemporal distortion).

for t=1,2. Meanwhile, $\bar{c} \equiv \frac{(1+r)^2}{2+r}(b_0 + f_0) + y > 0$ (i.e., permanent income).

2.1. Optimal fiscal policy

This section solves the Ramsey planner's problem under dual exchange rates. For comparison purposes, we also reproduce Tornell and Velasco's results under fixed and flexible regimes operating under perfect capital mobility.

Proposition 1. *Fixed regimes induce more [less] net fiscal transfers than flexible regimes if the FA is more [less] impatient than the PA. Meanwhile, both regimes provide the same net fiscal transfers if* $\beta^{FA} = \beta^{PA}$.

This is Tornell and Velasco's main result. The stabilization plan is temporary, and all agents in the economy know when it will be abandoned and what the inflation rate will be at that date (i.e., the monetization needed to repay the outstanding debt). In this context, any increase in net transfers will generate inflation at the end of the stabilization plan, thereby immediately raising the nominal interest rate. If the central bank is committed to a fixed money growth rate, the drop in the demand for real balances immediately translates into a depreciation of the exchange rate, raising inflation. If instead the central bank sticks to a fixed exchange rate, the drop in money demand leads to capital outflows with no effect on current inflation, causing larger inflation when the stabilization plan ends. These reactions have opposite implications for the incentives of the fiscal authority to increase net transfers. The fiscal authority draws utility from net transfers and partly from the welfare of private agent. This means that any increase in net transfers raises the government's utility, while inflation reduces it by eroding real balances. If the fiscal authority is also more impatient than the private agent, exchange rate based stabilization entails a lower cost of expansionary fiscal policy than money based plans, inducing a looser fiscal discipline.

Formally, from Tornell and Velasco (1998) we obtain

$$\tau^*_{1,fixed} = \frac{1}{(1+r)\,\beta^{FA}} \frac{\alpha}{1-\alpha} \frac{1-\epsilon}{\epsilon} \overline{c}, \tag{11}$$

$$\tau^*_{1,flexible} = \frac{1}{(1+r)\,\beta^{FA}} \frac{\alpha}{1-\alpha} \frac{1-\epsilon}{\epsilon} \overline{c} \left[\frac{1 + x(\beta^{FA}/\beta^{PA})}{1+x} \right], \tag{12}$$

$\tau^*_{1,fixed} = (\beta^{PA}/\beta^{FA})\tau^*_{2,fixed}$, and $\tau^*_{1,flexible} = (\beta^{PA}/\beta^{FA})\tau^*_{2,flexible}$, where $x \equiv \left(\frac{1}{\beta^{FA}}\right)\left(\frac{r+\pi^*_{1,flexible}}{r+\pi^*_{2,flexible}}\right)\left(\frac{1}{(1+r)+[(1-\epsilon)/\epsilon](r+\pi^*_{1,flexible})}\right) > 0$. If $\beta^{FA} = \beta^{PA}$, then $\tau^*_{i,fixed} = \tau^*_{i,flexible}$ for t=1,2. If the fiscal authority is impatient (i.e., $\beta^{FA} < \beta^{PA}$), then $\tau^*_{i,fixed} > \tau^*_{i,flexible}$ for t=1,2. The opposite occurs if the fiscal authority is patient (i.e., $\beta^{FA} > \beta^{PA}$).

Proposition 2. *Dual exchange rates induce more net fiscal transfers than fixed and flexible regimes under perfect capital mobility while the stabilization plan lasts.*

As discussed earlier in this section, under dual ERR any change in money and asset demand induces a variation in the financial exchange rate. This in turn creates a wedge between the international and the domestic real interest rate, which brings an intertemporal distortion in the consumption of the private agent. It follows that an increase in net transfers, and the derived rise in expected inflation, translate into a depreciation of the financial exchange rate. This does not generate inflation, but rather decreases in the real domestic interest rate relative to the international one (i.e., $\rho_1 < r$) which ultimately increases current consumption. Thus fiscal expansions are not only less costly, on impact, in terms of inflation (as in the case of exchange rate based plans under perfect capital mobility), but they are also more convenient for the fiscal authority to increase consumption. Therefore, an impatient fiscal authority has even more incentives to raise net transfers than under fixed exchange rate stabilization plans under perfect capital mobility.

Formally, the private agent optimizes with respect to c_1, c_2, m_0 and m_1 to maximize (2) subject to (5), taking as given τ_1, τ_2, π_1, π_2 and ρ_1.[8] The private agent's optimal conditions under dual ERR are

$$\frac{c^*_{1,dual}}{c^*_{2,dual}} = \frac{1+r}{1+\rho_1}, \tag{13}$$

$$m_{0,dual} = {c^*_{1,dual}}^{\epsilon}(r+\pi_{1,dual})^{-\epsilon}, \tag{14}$$

$$m_{1,dual} = {c^*_{2,dual}}^{\epsilon}(\rho_1+\pi_{2,dual})^{-\epsilon}. \tag{15}$$

We now solve the Ramsey planner's problem in which the fiscal authority effectively chooses $\tau_{1,dual}$, $\tau_{2,dual}$, $c_{1,dual}$, $c_{2,dual}$, $m_{0,dual}$ and $m_{1,dual}$ to maximize (6) subject to (7), (8), $\pi_{1,dual}=0$, $\pi_{2,dual}=c_{2,dual}m_{1,dual}^{-1/\epsilon}-\rho_1$ from (15) and $\rho_1=(1+r)(c_{2,dual}/c_{1,dual})-1$ from (13). Combining the optimal conditions we obtain

$$\tau^*_{1,dual} = \frac{1}{(1+r)\beta^{FA}}\frac{\alpha}{1-\alpha}\frac{1-\epsilon}{\epsilon}c^*_{1,dual}, \tag{16}$$

$$c^*_{1,dual} = \bar{c}\left[\frac{(2+r)(1+r)}{(2+r)(1+r)+(\rho_1-r)}\right]. \tag{17}$$

The Ramsey planner's problem uniquely determines $\tau^*_{1,dual}$, $\tau^*_{2,dual}$, $c^*_{1,dual}$, $c^*_{2,dual}$, $m^*_{0,dual}$, $m^*_{1,dual}$, $\pi^*_{2,dual}$, Q^*_1, ρ^*_1.

Combining $m_1(1-\mu_1)\equiv m_0(1-\pi_1)$ from the definition of real balances, (13), (14), and (15) with (8) we obtain that $\rho^*_1 = r-(1+r)\pi^*_2$. Because of assumption (10),

[8] In period 0 the central bank announces its ERR policies, and subsequently the fiscal authority announces the net fiscal transfers that will occur in the future, τ_1 and τ_2. Right after this news, the private agent rearranges her portfolio from (m_{0-}, f_{0-}) to (m_0, f_0). m_{0-} and f_{0-} refer to the initial asset conditions. In order to make a consistent comparison across ERRs, it is necessary to offset the government's extra revenue capacity that occurs in period 0 as a result of any unanticipated jump in the exchange rate. To guarantee that, we require that under flexible and dual regimes the government act "honestly" in the sense of Auernheimer (1974). That definition of honesty rules out capital levies (or transfers) inflicted in the private sector through unanticipated changes in the price level or the exchange rate. The remedy suggested by Auernheimer requires that the government instantaneously sell (or buy) the necessary money balances to prevent prices from jumping.

$\pi_2^* > 0$, it follows that $\rho_1^* < r$. Consequently, $Q_1^* > E_1$ from (1), and $c_{1,dual}^* > \bar{c}$ from (17). Considering (11), (12), (16) and (17) it follows that $\tau_{1,dual}^* > \tau_{1,fixed}^* > \tau_{1,flex}^*$ for an impatient fiscal authority (i.e., $\beta^{FA} < \beta^{PA}$).

Proposition 3. *The diferential effects of alternative regimes described in propositions 1 and 2 become stronger the more shortsighted the fiscal authority.*

This result is a natural extension of propositions 1 and 2. As described above, an increase in fiscal authority's impatience raises the incentives for a fiscal and consumption "party" in period 1.

Formally, from Tornell and Velasco's solutions it is straightforward to show that

$$\frac{d\tau_{1,fixed}^*}{d\beta^{FA}} = -A < 0. \tag{18}$$

$$\frac{d\tau_{1,flexible}^*}{d\beta^{FA}} = -A\left(\frac{1+x\beta^{FA}(1+r)}{1+x}\right)^2\left(\frac{w-r\epsilon\pi_1^*}{w+r\epsilon+r^2\epsilon+r\pi_1^*}\right) < 0, \tag{19}$$

where $A \equiv (1+r)^{-1}\left(\beta^{FA}\right)^{-2}\frac{\alpha}{1-\alpha}\frac{1-\epsilon}{\epsilon}\bar{c} > 0$ and $w \equiv r^2+r\epsilon+r\pi_1^*+r\pi_2^*+\epsilon\pi_2^*+(1-\epsilon)\pi_1^*\pi_2^*$.

Taking the total differential of (7), (16), (17), $\tau_{2,dual}^*$, (13), (14), (15), and $\rho_1 = r-(1+r)\pi_2$, and solving the system considering $\bar{c} = \frac{(1+r)^2}{2+r}(b_0+f_0)+y$ and $\pi_1 = 0$ we obtain

$$\frac{d\tau_{1,dual}^*}{d\beta^{FA}} = -A\frac{(2+r)(1+r)}{(2+r)(1+r)+(\rho_1^*-r)} < 0 \tag{A.3}$$

Since $\rho_1^* < r$ from proposition 2, then $\left|\frac{d\tau_{1,dual}^*}{d\beta^{FA}}\right| > \left|\frac{d\tau_{1,fixed}^*}{d\beta^{FA}}\right|$. The term $\frac{w-r\epsilon\pi_1^*}{w+r\epsilon+r^2\epsilon+r\pi_1^*}$ in equation (19) is between zero and one and the term $\frac{1+x\beta^{FA}(1+r)}{1+x}$ is smaller than one when $\beta^{FA} < \beta^{PA}$. Therefore, $\left|\frac{d\tau_{1,fixed}^*}{d\beta^{FA}}\right| > \left|\frac{d\tau_{1,flexible}^*}{d\beta^{FA}}\right|$ when $\beta^{FA} < \beta^{PA}$.

3. Evidence

In Sections 3.1 and 3.2 we test propositions 1 and 2. Since the incentives to loosen fiscal policy in the model are stronger the more impatient the government is relative to the private sector (proposition 3), in Section 3.3 we empirically assess if the effects of the different ERRs become stronger as presidential elections get closer.

We use annual data from 94 countries for the period 1970-2010.[9] Net transfers are proxied with central government fiscal deficit as percentage of trend GDP.[10] We use the de facto ERR classification by Reinhart and Rogoff (2004). We define fixed [flexible] regimes under perfect capital mobility when the course Reinhart-Rogoff classification codes are 1 or 2 [3 or 4] under unified exchange markets. We identify dual (legal or illegal) exchange rates when at least two exchange rates coexists simultaneously. As usual, "free falling" observations are excluded.[11] Figure 1 shows the share of fixed, flexible, and dual ERRs across time in the sample. Countries have on average dual, fixed, and flexible regimes about 29, 57, and 14 percent of the time.

Given the path dependent nature of fiscal deficit, we use – as has become practice in this literature – dynamic panel data models. In particular, we use the system GMM

[9] The countries in the sample are Angola, Argentina, Australia, Austria, Bangladesh, Belgium, Benin, Bolivia, Brazil, Cambodia, Cameroon, Canada, Cape Verde, Central African Rep., Chad, Chile, China, Colombia, Costa Rica, Côte d'Ivoire, Dem. Rep. of Congo, Denmark, Dominican Rep., Ecuador, Egypt, El Salvador, Finland, France, Gabon, Gambia, Germany, Ghana, Greece, Guatemala, Honduras, Hong Kong, India, Indonesia, Iran, Ireland, Italy, Jamaica, Japan, Kenya, Korea, Laos, Madagascar, Malaysia, Mali, Mauritius, Mexico, Morocco, Mozambique, Myanmar, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Portugal, Rep. of Congo, Russia, Rwanda, Saudi Arabia, Senegal, Seychelles, Sierra Leone, South Africa, Spain, Sri Lanka, Sudan, Sweden, Switzerland, Syrian Arab Rep., Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, United Kingdom, United States, Uruguay, Venezuela, Zambia, and Zimbabwe.

[10] We divide by trend GDP and not GDP itself because, as Kaminsky, Reinhart, and Vegh (2004) argue, normalizing by GDP understates (overstates) fiscal behavior when governments pursue procyclical (countercyclical) fiscal policies.

[11] Reinhart and Rogoff create a separate category called "free falling," which includes extreme macroeconomic distress situations associated with inflation of over 40 percent per year. This category allows the researcher to avoid mixing the effects of regimes under modest inflation situations with those related to severe stressful circumstances.

approach developed by Blundell and Bond (1998) with a one-year lag of the dependent variable as a regressor. For brevity, we do not report the over-identification test as well as the first and second order correlation test either. In all cases, we cannot reject the over-identification tests. As expected, we always reject the null of no first order correlation, and never reject the null of second order correlation. We do not report the coefficients associated with the constant term and additional control variables either. Flexible regime is the base category.

3.1. Benchmark results

Following the empirical literature, we examine the effects of alternative exchange rate regimes on the fiscal deficit treating all regressors as exogenous (Tornell and Velasco, 1998 and 2000; Fatás and Rose, 2001; Alberola and Molina, 2004; Alberola, Molina, and Navia, 2005). Column 1 of Table 1 shows the unconditional effect in a dynamic model. The findings support both our model as well as Tornell and Velasco's predictions. In quantitative terms, dual regimes are associated with fiscal deficits (as a share of trend GDP) that are 0.802 percent and 1.412 percent higher than fixed and flexible regimes, respectively. Fixed regimes are associated with deficits 0.610 percentage points higher than flexible arrangements. These differences are statistically significant at 5% level and are economically important considering that the median fiscal deficit in the sample is 2.91 percent of GDP.[12] The long-run effect of alternative ERRs are larger due to the persistence in the dependent variable. Dual regimes are associated with 1.96 percent and 3.44 percent higher long-run fiscal deficits than fixed and flexible regimes. Fixed regimes are associated with long-run deficits 1.49 percentage points higher than flexible

[12] The standard deviation of fiscal deficits in the total sample is 5.7. The standard deviation of fiscal deficits in the total sample dual, fixed, and flexible ERRs are 5.3, 5.1, and 4.5.

arrangements.[13]

In order to test the conditional influence of ERRs on the fiscal deficit we also include other potential fiscal regressors that could be related to ERRs. First, the country's initial position in the business cycle captures the procyclicality or countercyclicality of fiscal policies.[14] Second, initial government debt measures the debt burden.[15] Third, an adaptive-expectations global interest rate and average real GDP growth in OECD countries are intended to capture the world business cycle (Calvo and Vegh, 1999; Ilzetzki and Vegh, 2008; Vegh and Vuletin, 2012). Last, terms of trade shocks represent another external shock that could affect fiscal performance (Lane and Tornell, 1999). These findings prevail even after controlling for the country's and world's business cycles, government's initial indebtness, and terms of trade shocks (Table 1, column 2); we denominate these control variables "regular." We also control for other regressors that are symptoms of macroeconomic, debt, and financial distress, such as episodes of debt default, bank crisis, and the presence of IMF programs; we denominate these control variables "stress." Previous findings remain robust (Table 1, column 3).

ERR changes over time are the primary source of identifying variation in our panel study. However, since the fiscal process is continuous and inertial by nature, some concern might exist as to whether "rapid" ERR variability truly allows us to identify the precise influence of ERRs on fiscal deficit. Table 1, column 4 considers only observations for which the ERR remains constant for at least four years; we denominate this sample as "Constant ERR." The results strongly hold, even though the sample size is reduced by almost 3 percent.

[13] The long-run differential effect between two ERRs is given by the the ratio of the difference in ERRs coefficients to one minus the auto-regressive coefficient. $\beta^{LR}_{dual-fixed} = (1.412-0.610)/(1-0.590) = 1.96$, $\beta^{LR}_{dual-flexible} = 1.412/(1-0.590) = 3.44$, and $\beta^{LR}_{fixed-flexible} = 0.610/(1-0.590) = 1.49$.

[14] Approximately 49 percent, 52 percent and 48 percent of fixed, flexible and dual regime observations are classified as recessions respectively.

[15] The mean level of indebtedness is similar across observations under different ERRs.

So far we have used the de facto Reinhart and Rogoff (2004) classification. We now consider alternative ERR classifications to test for the robustness of our findings. First, we consider the de facto Levy Yeyati and Sturzenegger (2005) classification for those ERRs operating under unified rates.[16] The results are presented in Table 1, column 5. Dual regimes are still associated with higher fiscal deficits than either regime operating under unified rates. Moreover Tornell and Velasco's predictions are confirmed: fixed regimes are associated with higher deficits than flexible arrangements. We now consider instead the de jure IMF classification for those ERRs operating under unified rates. The results are presented in column 6 of Table 1. Dual regimes are still associated with higher fiscal deficits than either regime operating under unified rates; however, considering the de jure IMF classification, fixed regimes are associated with similar deficits as flexible arrangements. Therefore, distinguishing between what countries claim to do (i.e., announcement) and what they actually do clearly matters when analyzing the influence of ERRs on diverse macroeconomic variables, including the primary fiscal balance (Alberola and Molina, 2004; Alberola, Molina, and Navia, 2005).

We now address endogeneity concerns; in paricular, those related to ERRs.[17] It is more likely that governments facing persistent fiscal deficits or other financial and debt difficulties adopt fixed or dual regimes instead of flexible arrangements. Fixed regimes could serve as a nominal anchor. Dual regimes could help to avoid the effects of a depreciation on domestic prices while maintaining some degree of control over capital flows and international reserves. As it became practice in the empirical literature, we ameliorate this concern by using lagged ERRs. Table 1, column 7 shows that our results

[16] We define fixed [flexible] regimes under perfect capital mobility when the 5-way Levy Yeyati-Sturzenegger classification codes are 4 or 5 [2 or 3] under unified exchange markets. "Free falling" observations are also excluded.

[17] The world's business cycle, global liquidity, and terms of trade shocks do not pose endogeneity concerns. Government's initial indebtness and business cycle position refer to the previous year.

strongly hold after this consideration.

To sum up, our findings strongly support that dual ERRs lead to larger deficits than fixed and flexible regimes operating under perfect capital mobility (proposition 2). In line with previous empirical papers, our evidence also support Tornell and Velasco's core prediction that fixed regimes induce less discipline than flexible arrangements under perfect capital mobility (proposition 1).

3.2. Politicians' degree of short-sightedness

Since the incentives to loosen fiscal policy in the model are stronger the more impatient the government is relative to the private sector (proposition 3), we empirically assess if the effects of the different exchange rate regimes become stronger as presidential elections get closer.[18] We classify a particular observation as a presidential pre-election year according to the following criteria:

i) There is a democratic presidential election in the second half of the current year or in the first half of the following one. Arguably, this captures the most intense pre-electoral period.

ii) We exclude presidential elections that take place in the context of civil war or violence, like the ones that took place during the Salvadoran civil war. Such exclusions allow us to focus on relatively peaceful and normal electoral processes.

Since the timing of presidential elections are subject to endogeneity concerns, we exclude:

i) Electoral processes that take place after the breakdown of military regimes. There is a vast literature in political science that shows the importance of debt crisis, increasing fiscal deficits, and inflation as the main factors driving the collapse of military regimes

[18] There is a very important theoretical and empirical literature that investigates the political business and budget cycles. Drazen (2001) and Brender and Drazen (2008) offer a very exhaustive review of it.

and the reestablishment of democracy (Gasiorowski, 1995).

ii) Unscheduled "early elections" that take place after presidential resignations. Most of these events are triggered by unmanageable economic and social tensions including growing fiscal deficits.[19]

Considering this definition, 127 presidential pre-electoral years are recorded, representing around 5 percent of the total sample. The shares of elections occurring under each type of regime are 52 percent, 24 percent and 24 percent for fixed, flexible and dual regimes respectively. These proportions are similar to the distribution of regimes in the overall sample. Columns 8 and 9 in Table 1 show the estimation outcomes using interaction effects. Column 8 use current ERRs, while column 9 uses (as in column 7) lagged ERRs to ameliorate endogeneity concerns. In addition to the differences induced by alternative ERRs, during pre-electoral years dual regimes produce deficits that are 3.11 percent and 1.93 percent of GDP higher than flexible and fixed arrangements. Fixed regimes cause deficits that are 1.18 percent higher than flexible arrangements. These findings strongly support propositon 3, that fiscal differences across ERRs increase as authorities become more impatient.

4. Conclusions

This paper offers both theoretical arguments and empirical evidence regarding the influence of dual regimes on fiscal discipline. Using a simple Ramsey planner's problem we show that this fairly common type of capital control induces larger deficits than fixed and flexible regimes operating under perfect capital while the stabilization plan

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

lasts. We also show the incentives to loosen fiscal policy in the model are stronger the more shortsighted the government.

The empirical evidence confirms these theoretical predictions as well as Tornell and Velasco's even when controlling for potential rival determinants of fiscal deficits, alternative de facto ERR classifications, and after ameliorating endogeneity concerns. Using presidential pre-electoral data, we also show that fiscal differences across ERRs become stronger as presidential elections get closer.

Our theoretical arguments and empirical evidence have important policy implications both for industrial and developing countries. Many developing countries have recurrently (including in recent times) used several forms of capital controls to cope with the "excesively efficient international money markets" (Tobin, 1978) and avoid some of the well-known undesired implications of "excessive" capital movements such as intense and sudden exchange rate fluctuations as well as sudden stops and capital flight. Our findings give some new dimension regarding some of the unintended and undesired effects of having some type of restrictions on the capital account. In the presence of fiscal distortions, the induced higher fiscal deficits might exsacerbate some of the already important fiscal problems some of these countries typically suffer from. Up-to-date arguments against different types of capital controls point to their especially long-run undesired effect on the financial system (in terms of financial repression); they have also been associated with persistent overvaluation of official exchange rates, protection of ineficient import-substituting industries, and low economic growth (Fry, 1988; McKinnon, 1973; Eichengreen, Mussa, Dell'Ariccia, Detragiache, Milesi-Ferretti, and Tweedie, 1999; Barro and Lee, 1993; Bhagwati, 1978; Avellán, 2005). Our argument calls attention to their lax fiscal policy implications. Industrial countries have not intensively used capital controls since the late 1960s and early 1970s. Finally, our findings

regarding the interaction between ERR and political cycles also point out how countries operating under fixed regimes (such as the Euro zone) could face important fiscal deficits, particularly in pre-electoral periods.

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Appendix. Variable names, definitions, and sources.

Fixed: 1 if Reinhart and Rogoff coarse exchange rate regime classification equals 1 or 2 under unified market, i.e. fixed or limited flexibility not dual. 0 for any other category. Source: Reinhart and Rogoff (2004).

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 (2004).

Dual: 1 if there exists a dual exchange rate regime, i.e. a market-determined and an official exchange rate. 0 for any other category. Source: Reinhart and Rogoff (2004).

Free falling: 1 if Reinhart and Rogoff's coarse exchange rate regime classification equals 5, i.e. if inflation is above 40%. 0 for any other category. Source: Reinhart and Rogoff (2004).

Deficit: Central government fiscal deficit (as percentage of trend GDP). Source: Kaminsky et al (2004) and World Economic Outlook (WEO-IMF).

Country's business cycle: Calculated as ((RGDP - RGDP Trend)/RGDP Trend)*100. RGDP is real GDP and its trend was calculated using the Hodrick-Prescott filter. Source: World Economic Outlook (WEO-IMF).

Initial government debt: World Economic Outlook (WEO-IMF), World Development Indicators (WDI-World Bank), and Reinhart and Rogoff (2011) were the main data sources. Measured as total central government debt over GDP at the end of last year. For Azerbaijan we used public and publicly guaranteed debt service. For Côte d'Ivoire, Haiti, Italy, Kuwait, Myanmar, Netherlands, New Zealand, Niger, Poland, Qatar, Romania, Singapore, Tanzania, and United Arab Emirates we used total general government debt.

Global interest rate: It was calculated by deflating the returns on U.S. Treasuries by the CPI inflation rate of the previous year. As Ilzetzki and Vegh (2008) and Vegh and Vuletin (2012), we use an adaptive-expectations measure of real interest rates. These variables were obtained from International Financial Statistics (IFS-IMF).

Average real GDP growth in OECD countries: Average annual RGDP growth for OECD countries. Source: World Development Indicators 2012.

Terms of trade shocks: Calculated as ((TOT - TOT(-1))/TOT(-1))*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. Source: Kaminsky et al (2004) and World Economic Outlook (WEO-IMF).

Debt crisis: 1 if foreign currency bank or bond debt defaults. 0 otherwise. Source: Reinhart and Rogoff (2011).

Bank crisis: 1 (i) if there are bank runs that lead to the closure, merging, or takeover by the public sector of one or more financial institutions, or, (ii) if there is large-scale government assistance of an important financial institution (or group of financial institutions), that marks the start of a string of similar outcomes for other financial institutions. 0 otherwise. Source: Reinhart and Rogoff (2011).

IMF program: 1 if there is a Stand-by Arrangement IMF program in the year under consideration. 0 otherwise. Source: Policy Development and Review Department (IMF), and IMF website.

Presidential pre-electoral year dummy (Electoral year): 1 if there is a democratic presidential election in the last 6 months of the current year or in the first 6 months of the following year. Such election cannot be an unscheduled "early election" or occurs after the breakdown of a military regime or in the context of civil war or violence. 0 otherwise.

Existence and date of a presidential election correspond to variables "exelec" and "dateexec" respectively. Numbers of years left in current term correspond to variable "yrcurnt". Source: Beck et al (2001).

A system is considered democratic if variable "polity2" is equal or greater than 0. Source: Polity4 Project. Center for International Development and Conflict Management at University of Maryland.

A government regime is considered military if variable "s20f7" is equal to 2 or 3. Source: The Cross-National Time-Series Data Archive (CNTS) of the Center for Comparative Political Research of the State University of New York (Binghamton).

The presence of civil war or violence corresponds to categories "cv" or "cw". Source: "Major Episodes of Political Violence 1946-2012" from Center for Global Policy at George Mason University.

Figure 1. Share of exchange rate regimes over time

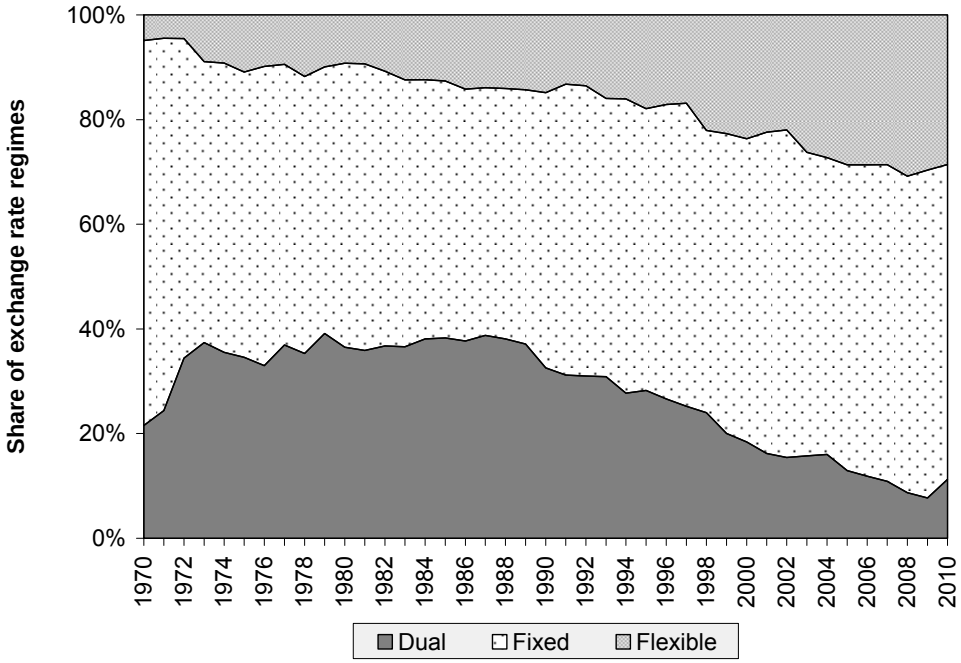

Table 1. Dynamic panel regressions. Dependent variable: Central government fiscal deficit as percentage of trend GDP (Deficit).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Deficit (-1)	0.590*** [12.2]	0.641*** [10.3]	0.713*** [16.2]	0.704*** [15.7]	0.625*** [11.7]	0.711*** [15.5]	0.715*** [15.9]	0.712*** [15.9]	0.710*** [15.2]
Fixed *Reinhart-Rogoff*	0.610** [2.2]	0.639** [2.5]	0.672*** [3.0]	0.788*** [3.4]				0.597*** [2.7]	
Dual	1.412*** [3.8]	1.418*** [3.5]	1.221*** [3.7]	1.386*** [3.9]	0.948** [2.5]	0.798*** [2.8]		1.014*** [3.1]	
Fixed *Levy Yeyati-Sturzenegger*					0.286* [1.7]				
Fixed *IMF*						0.100 [0.6]			
Fixed *Reinhart-Rogoff* (-1)							0.592** [2.5]		0.539** [2.3]
Dual (-1)							1.276*** [3.5]		1.115*** [3.0]
Fixed *Reinhart-Rogoff* × *Electoral year*								1.318* [1.9]	
Dual × Electoral year								3.401*** [2.8]	
Fixed *Reinhart-Rogoff* (-1) × *Electoral year*									1.179* [1.9]
Dual (-1) × Electoral year									3.113*** [2.6]
Electoral year								-0.014 [-0.0]	0.157 [0.4]
Statistics:									
Observations	2809	2124	1980	1923	1259	1961	1972	1850	1839
Countries	94	85	67	67	59	67	67	67	67
Control variables:									
Regular	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stress	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample:									
Constant ERR	No	No	No	Yes	No	No	No	No	No
Tests (p-value):									
Ho: Fixed ≤ Flexible	0.0156	0.0065	0.0012	0.0004	0.0441	0.2630	0.0065	0.0033	0.0117
Ho: Dual ≤ Flexible	0.0001	0.0002	0.0001	0.0000	0.0065	0.0023	0.0002	0.0011	0.0013
Ho: Dual ≤ Fixed	0.0026	0.0076	0.0164	0.0125	0.0343	0.0053	0.0045	0.0635	0.0194
Ho: Fixed × EY≤ Flexible × EY								0.0262	0.0285
Ho: Dual × EY ≤ Flexible × EY								0.0028	0.0048
Ho: Dual × EY ≤ Fixed × EY								0.0374	0.0397

Notes: Flexible regime is the base category. Intercept and control variables estimates are not reported. Estimations are performed using dynamic panel data country fixed effects Blundell and Bond (1998) system GMM approach. All regressions adjust their standard errors for heteroscedasticity. t-statistics in parenthesis. Regular control variables include: 1) initial country's business cycle, 2) initial government debt, 3) adaptive-expectations global interest rate, 4) average real GDP growth in OECD countries, and 5) terms of trade shocks. Stress control variables include: 1) debt default, 2) bank crisis, and 3) IMF program. Constant ERR sample considers only observations for which the ERR remains constant for at least four years.
*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.