Exchange rate regimes and fiscal discipline: The role of capital controls*

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November 2011

Abstract

This paper offers both theoretical arguments and empirical evidence regarding the influence of capital controls on fiscal discipline. It expands the literature on the influence of monetary and exchange rate arrangements on fiscal policy which typically assume perfect capital mobility.

JEL Classification: *E50, E60,F31, F41.*

Keywords: *Fiscal discipline, Exchange rate regimes, Capital controls.*

*I would like to thank Carmen Reinhart, Carlos Végh, Roger Betancourt, Pablo Druck, Herman Kamil, John Shea and seminar participants at the University of Maryland, Virginia Polytechnic Institute and State University, Queens College (CUNY), Colby College, Central Bank of Argentina, Bank of Spain, Bank of Canada, Federal Reserve Bank of Boston, and Research Department at the World Bank for their useful comments.

1. Motivation

This paper studies the effects of temporary stabilization plans on fiscal discipline under different monetary and exchange rate arrangements. The theoretical literature exploits the classic dichotomy of fixed vs. flexible assuming perfect capital mobility (**PCM**). Conventional wisdom 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 (Aghevli et al, 1991; Giavazzi and Pagano, 1988). Tornell and Velasco (1998) (**TV**) show 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.[1]

A key limitation of this literature is that it assumes PCM, even though unrestricted capital flows seem to be the exception rather than the rule. In developing countries, diverse forms of capital controls (**CC**) were pervasive until mid-nineties (Reinhart and Rogoff, 2004) and recently regained policy popularity to cope with massive capital inflows. This paper offers both theoretical arguments and empirical evidence regarding the influence of CC on fiscal discipline.

The rest of the paper is structured as follows. Section 2 presents the model. Section 3 turns to the empirical analysis. Final thoughts are presented in Section 4.

2. Model

We basically extend the two period model in TV considering a regime of CC, or equivalently dual exchange rate (Guidotti and Végh, 1992). This means that the commercial exchange rate (E) is held fix, while the exchange rate for financial transaction (Q) is let free to vary. In particular, since the amount of international assets (f) that domestic private agents can hold

[1] The empirical literature seems to support TV's argument (TV, 1998 and 2000; Fatás and Rose, 2001; Alberola and Molina, 2004).

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 (**CB**), whose stance (exchange rate regime and money growth) is treated as predetermined. In period 1 the CB 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] 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. CC are also abandoned (i.e., $Q_2 = E_2$). Assuming that the law of one price holds, $\pi_t = \varepsilon_t$. Therefore, while the stabilization plan last, inflation under CC equals that of fixed regimes under PCM (i.e., $\pi_1 = \varepsilon_1 = 0$).

Private agents (**PA**) have perfect foresight and are rational, 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 $\epsilon \in (0, 1)$ to guarantee that the economy is always on the upward-sloping side of the Laffer curve.[3] 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 $\beta^{PA} = (1+r)^{-1}$. The PA's intertemporal

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

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

budget constraint under CC is given by

$$\left(\frac{1}{1+\rho_1}+r\right)f_0+(1+r)m_0+y\left(\frac{2+\rho_1}{1+\rho_1}\right)+\tau_1+\frac{\tau_2}{1+\rho_1}= \tag{3}$$
$$c_1+(r+\pi_1)m_0+\frac{c_2}{1+\rho_1}+\frac{(\rho_1+\pi_2)m_1}{1+\rho_1},$$

where y and τ are endowment income and lump-sum transfers, respectively.

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

$$\alpha\Big[ln(\tau_1)+\beta ln(\tau_2)\Big]+(1-\alpha)\Bigg[ln(c_1)+\left(\frac{\epsilon}{\epsilon-1}\right)m_0^{\frac{\epsilon-1}{\epsilon}}+\beta^{FA}\left[ln(c_2)+\left(\frac{\epsilon}{\epsilon-1}\right)m_1^{\frac{\epsilon-1}{\epsilon}}\right]\Bigg], \tag{4}$$

where $\alpha\in(0,1)$. Government transfers give utility, possibly because they provide political power or prestige; this factor carries a weight of α. The FA also internalizes the PA's objective function with a weight $(1-\alpha)$, but the FA's discount factor β^{FA} does not necessarily match that of the PA.[4] Hence, a shortsighted FA would not only be delighted to have a "fiscal party" where $\tau_1>\tau_2$, but would also like the PA to have a "consumption party" where $c_1>c_2$.

The government's intertemporal budget constraint under CC is given by

$$\tau_1+\frac{\tau_2}{1+r}=(1+r)(b_0-m_0)+m_0(r+\pi_1)+\frac{m_1(r+\pi_2)}{1+r}. \tag{5}$$

Combining (3) and (5), the economy's resource constraint under CC is given by

$$(1+r)(b_0+f_0)+y\left(\frac{2+r}{1+r}\right)=c_1+\frac{c_2}{1+r}. \tag{6}$$

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

2.1. Optimal fiscal policy

This Section solves the Ramsey planner's problem under *capital controls*. For comparison purposes, we also reproduce TV's results under *fixed* and *flexible* regimes operating under PCM.

Proposition 1. *Fixed* regimes induce more [less] net fiscal transfers than *flexible* regimes if the FA is more [less] impatient than the PA. Both regimes provide the same net fiscal transfers if $\beta^{FA} = \beta^{PA}$.[5]

This is TV'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 CB 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, hence higher inflation. If instead the CB sticks to a fixed exchange rate, the drop in money demand leads to capital outflows with no effect on current inflation, implying larger inflation when the stabilization plan ends. These reactions have opposite implications for the incentives of the FA to increase net transfers. The FA draws utility from net transfers and partly from the welfare of PA. This means that any increase in net transfers raises the government's utility, while inflation reduces it by eroding real balances. If the FA is also more impatient than the PA, exchange rate based stabilization entails a lower cost of expansionary fiscal policy than money based plans, hence induces a looser fiscal discipline.

Proposition 2. *Capital controls* induce more net fiscal transfers than *fixed* and *flexible* regimes under PCM while the stabilization plan last.[6]

As discussed in Section 2, under CC 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 PA. It follows that an increase in net transfers, and the deriving rise in expected inflation,

[5] See TV for this derivation.
[6] Appendix I shows this derivation.

translate into a depreciation of the financial exchange rate, which does not generate inflation, but rather a decrease in the real domestic interest rate relative to the international one (i.e., $\rho_1 < r$) which ultimately increases current consumption. This means that fiscal expansions are not only less costly, on impact, in terms of inflation (as in the case of exchange rate based plans under PCM), but also more convenient for the FA in terms of increased consumption. Therefore, an impatient FA has even more incentives to raise net transfers than under fixed exchange rate stabilization plans under PCM.

Proposition 3. The diferential effects of alternative regimes described in propositions 1 and 2 become stronger the more shorsighted the FA is.[7]

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

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 asses empirically if the effects of the different exchange rate regimes become stronger as presidential elections get closer.

We use annual data corresponding to 23 emerging countries for the period 1970-2001.[8] These countries have at least 15 years of continuous fiscal data, and more importantly, they fit our theoretical model since they have experienced diverse macroeconomic problems related to fiscal, inflation and debt difficulties and have weak central banks that recurrently finance governments via seigniorage and the inflation tax. For example, the average annual inflation rate for the whole sample is 23 percent, almost 20 percent of the observations involve foreign currency default, and 35 percent have either a Stand-by Arrangement or an Extended Fund Facility IMF program.

[7] Appendix II shows this derivation.

[8] 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.

Net transfers are proxied with central government primary fiscal deficit as percentage of trend GDP.[9] We use the de facto exchange regime classification by Reinhart and Rogoff (2004). We define fixed [flexible] regimes under PCM 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.[10]

Given the path dependent nature of fiscal deficit, we use –as it has become practice in this literature– dynamic panel data models. In particular, we use the system GMM approach developed by Blundell and Bond (1998) with a one-year lag of the dependent variable as 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 omitted dummy variable.

3.1. Benchmark results

Following the empirical literature, we examine the effects of alternative exchange rate regimes (**ERRs**) on the fiscal deficit treating all regressors as exogenous (TV, 1998 and 2000; Fatás and Rose, 2001; Alberola and Molina, 2004). Table 1, column 1 shows the unconditional effect in a dynamic model. The findings support both our model as well as TV's predictions. In quantitative terms, dual regimes induce fiscal deficits (as share of trend GDP) that are 0.488 percent and 1.089 percent higher than fixed and flexible regimes operating under PCM, respectively. Fixed regimes cause deficits 0.601 percentage points higher than flexible arrangements. These differences are statistically significant at 5% level and are economically important considering that the average fiscal deficit in the sample is 1.25 percent of GDP. The long-run effect of alternative

[9] 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.

[10] 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.

ERRs are larger due to the persistence in the dependent variable. Dual regimes are associated with 1.7 percent and 3.8 percent higher long-run fiscal deficit than fixed and flexible regimes operating under PCM. Fixed regimes cause long-run deficits 2.1 percentage points higher than flexible arrangements.[11]

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 position in the business cycle captures the procyclicality or countercyclicality of fiscal policies.[12] Second, initial government debt measures the debt burden.[13] Third, the real LIBOR interest rate and average real GDP growth in OECD countries are intended to capture the world business cycle (Calvo and Végh, 1999). 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 this control variables "regular."

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 3 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 9 percent.

3.2. Endogeneity concerns

We now address genuine endogeneity concerns; in paricular, those related to ERRs. The latter is still an open subject in this literature.

We instrument country's business cycle using internal instruments following the system

[11] 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. $\beta^{LR}_{dual-fixed} = (1.089 - 0.601)/(1 - 0.712) = 1.7$, $\beta^{LR}_{dual-flexible} = 1.089/(1 - 0.712) = 3.8$, and $\beta^{LR}_{fixed-flexible} = 0.601/(1 - 0.712) = 2.1$.

[12] Approximately 47 percent, 59 percent and 62 percent of fixed, flexible and dual regime observations are classified as recessions respectively.

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

GMM approach.[14] World's business cycle, global liquidity, and terms of trade shocks do not pose endogeneity concerns because the sample includes relatively small economies. Government's initial indebtness refers to previous's year.

It is more likely that governments facing persistent fiscal deficits or other financial and debt difficulties adopt fixed regimes or capital controls instead of flexible regimes under PCM. Fixed regimes under PCM could serve as a nominal anchor. Capital controls could help to avoid the effects of a depreciation on domestic prices while maintaining some degree of control over capital flows and international reserves. To ameliorate this concern we also exclude observations that are two years apart from "free falling" events (Table 1, column 4); we denominate this sample as "tranquil." 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 this control variables "stress."[15,16] Previous findings remain robust (Table 1, columns 5 and 6).

We also instrument ERRs using: i) the percentage of total long-term debt contracted in US$ (proxies for liability dollarization), ii) short-term external debt as a percentage of total external debt (proxies for maturity imbalance), iii) trade openness, and iv) terms of trade volatility. The first two variables are proposed by Avellán (2005) to instrument dual regimes while the last two are from the optimal currency areas literature. If there is a negative shock that puts pressure on the exchange rate and the liability dollarization is perceived to be critical, policymakers would rather implement a partial devaluation through a dual regime than a unified devaluation. If a negative shock occurs, a policymaker whose interest payments are concentrated in the near future would prefer a dual regime as opposed to a unified devaluation because the debt service remains unchanged. The literature on optimal currency areas suggests that fixed regimes are preferable for more open countries while flexible arrangements are preferable for economies subject to volatile real shocks such as terms of trade.[17] Instrumental variables regressions

[14] Similar results are obtained if the first lag of country's business cycle is used instead.

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

[16] Using the first lag of the three distress indicators provide similar results.

[17] Because of potential contemporaneous feedback from the ERR to these instruments, we use the first lag of instruments the first three instruments.

support previous findings (Table 1, columns 7 and 8).[18]

3.3. 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 asses empirically if the effects of the different exchange rate regimes become stronger as presidential elections get closer. 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 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, 38 presidential pre-electoral years are recorded, representing around 6 percent of the total sample. The shares of elections occurring under each type of regime

[18] To investigate the exclusivity assumption we run regressions like the one of column 8, but adding one-at-a-time each proposed instrument as additional regressor. In each case we instrument ERRs with the remaining three instruments. The coefficient on each instrument is indistinguishable from zero. This hints that each instrument does not affect fiscal deficit directly, but rather through ERRs. These regressions are not reported for brevity.

[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.

are 50 percent, 11 percent and 39 percent for fixed, flexible and dual regimes respectively. These proportions are similar to the distribution of regimes in the overall sample. Columns 9 and 10 in Table 1 show the estimation outcomes using interaction effects. In addition to the differences induced by alternative ERRs, during pre-electoral years capital controls produce deficits that are 1.93 percent and 1.04 percent of GDP higher than flexible and fixed arrangements under PCM. Fixed regimes cause deficits that are 0.89 percent higher than flexible arrangements. These findings support propositon 3.

4. Conclusions

This paper offers both theoretical arguments and empirical evidence regarding the influence of CC on fiscal discipline. Using a simple Ramsey planner's problem we show that CC induce larger deficits than fixed and flexible regimes operating under PCM while the stabilization plan lasts. We also show the incentives to loosen fiscal policy in the model are stronger the more shortsighttened the government is.

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

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Appendix I. Proof of proposition 2

I.1 Optimal fiscal policy under fixed and flexible regimes operating under PCM

From TV we obtain

$$\tau^*_{1,fixed} = \frac{1}{(1+r)\,\beta^{FA}}\frac{\alpha}{1-\alpha}\frac{1-\epsilon}{\epsilon}\bar{c}, \tag{7}$$

$$\tau^*_{1,flex} = \frac{1}{(1+r)\,\beta^{FA}}\frac{\alpha}{1-\alpha}\frac{1-\epsilon}{\epsilon}\bar{c}\left[\frac{1+x\beta^{FA}(1+r)}{1+x}\right], \tag{8}$$

where consumption equals permanent income (i.e., $\bar{c} = \frac{(1+r)^2}{2+r}(b_0+f_0)+y > 0$) and $x \equiv \left(\frac{1}{\beta^{FA}}\right)\left(\frac{r+\pi^*_{1,flex}}{r+\pi^*_{2,flex}}\right)\left(\frac{1}{(1+r)+[(1-\epsilon)/\epsilon](r+\pi^*_{1,flex})}\right) > 0$.

I.2 Optimal fiscal policy under capital controls

The PA optimizes with respect to c_1, c_2, m_0 and m_1 to maximize (2) subject to (3), taking as given τ_1, τ_2, π_1, π_2 and ρ_1.[20] The PA's optimal conditions under capital controls (cc) are

$$\frac{c^*_{1,cc}}{c^*_{2,cc}} = \frac{1+r}{1+\rho_1}, \tag{9}$$

$$m_{0,cc} = {c^*_{1,cc}}^{\epsilon}(r+\pi_{1,cc})^{-\epsilon}, \tag{10}$$

$$m_{1,cc} = {c^*_{2,cc}}^{\epsilon}\,(\rho_1+\pi_{2,cc})^{-\epsilon}. \tag{11}$$

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

[20] In period 0 the CB announces its ERR policies, and subsequently the FA announces the net fiscal transfers that will occur in the future, τ_1 and τ_2. Right after these news, the PA 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 regimes and capital controls the government acts "honestly" in the sense of Auernheimer (1974). That definition of honesty rules out capital levies (or transfers) inflicted in the private sector through unanticipated changes in the price level or the exchange rate. The remedy suggested by Auernheimer requires that the government instantaneously sells (or buys) the necessary money balances to prevent prices from jumping.

initial stock of a bonds must satisfy the following inequalities:

$$\tau_1^u + \frac{\tau_2^u}{1+r} - (1+r)b_0 \quad \leq \quad \bar{c}^{\epsilon}\frac{1}{(1+r)^{\epsilon}}, \tag{12}$$

$$\tau_1^l + \frac{\tau_2^l}{1+r} - (1+r)b_0 \quad > \quad -\bar{c}^{\epsilon}\frac{1}{(1+r)\,r^{\epsilon}}, \tag{13}$$

where $\tau_t^u = \max\left[\tau_{t,fixed}^*,\ \tau_{t,flex}^*,\ \tau_{t,cc}^*\right]$ and $\tau_t^l = \min\left[\tau_{t,fixed}^*,\ \tau_{t,flex}^*,\ \tau_{t,cc}^*\right]$ for t=1,2.

We now solve the Ramsey planner's problem in which the FA effectively chooses $\tau_{1,cc}$, $\tau_{2,cc}$, $c_{1,cc}$, $c_{2,cc}$, $m_{0,cc}$ and $m_{1,cc}$ to maximize (4) subject to (5), (6), $\pi_{1,cc} = 0$, $\pi_{2,cc} = c_{2,cc}m_{1,cc}^{-1/\epsilon} - \rho_1$ from (11) and $\rho_1 = (1+r)(c_{2,cc}/c_{1,cc}) - 1$ from (9). Combining the optimal conditions we obtain

$$\tau_{1,cc}^* \quad = \quad \frac{1}{(1+r)\beta^{FA}}\frac{\alpha}{1-\alpha}\frac{1-\epsilon}{\epsilon}c_{1,cc}^*, \tag{14}$$

$$c_{1,cc}^* \quad = \quad \bar{c}\ \left[\frac{(2+r)(1+r)}{(2+r)(1+r)+(\rho_1 - r)}\right]. \tag{15}$$

The Ramsey planner's problem uniquely determines $\tau_{1,cc}^*$, $\tau_{2,cc}^*$, $c_{1,cc}^*$, $c_{2,cc}^*$, $m_{0,cc}^*$, $m_{1,cc}^*$, $\pi_{2,cc}^*$, Q_1^*, ρ_1^*.

Combining $m_1(1-\mu_1) \equiv m_0(1-\pi_1)$ from the definition of real balances, (9), (10), and (11) with (6) we obtain that $\rho_1^* = r - (1+r)\pi_2^*$. Because of assumption (13), $\pi_2^* > 0$; therefore, it follows that $\rho_1^* < r$. Consequently, $Q_1^* > E_1$ from (1), and $c_{1,cc}^* > \bar{c}$ from (15). Considering (7), (8), (14) and (15) it follows straightfowrd that $\tau_{1,cc}^* > \tau_{1,fixed}^* > \tau_{1,flex}^*$ for an impatience FA (i.e., $\beta^{FA} < \beta^{PA}$).

Appendix II. Proof of proposition 3

From TV's solutions it is straightforward to show that

$$\frac{d\tau_{1,fixed}^*}{d\beta^{FA}} \quad = \quad -A < 0. \tag{16}$$

$$\frac{d\tau_{1,flex}^*}{d\beta^{FA}} \quad = \quad -A\left(\frac{1+x\beta^{FA}(1+r)}{1+x}\right)^2\left(\frac{w - r\epsilon\pi_1^*}{w + r\epsilon + r^2\epsilon + r\pi_1^*}\right) < 0, \tag{17}$$

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 total differential of (5), (14), (15), $\tau_{2,cc}^*$, (9), (10), (11), 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

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

Since $\rho_1^* < r$ from proposition 2, then $\left|\frac{d\tau^*_{1,cc}}{d\beta^{FA}}\right| > \left|\frac{d\tau^*_{1,fixed}}{d\beta^{FA}}\right|$. The term $\frac{w-r\epsilon\pi_1^*}{w+r\epsilon+r^2\epsilon+r\pi_1^*}$ in equation (17) 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, $\left|\frac{d\tau^*_{1,fixed}}{d\beta^{FA}}\right| > \left|\frac{d\tau^*_{1,flex}}{d\beta^{FA}}\right|$ when $\beta^{FA} < \beta^{PA}$.

Appendix III. 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 (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 primary fiscal deficit (as percentage of GDP trend). GDP trend was calculated using the Hodrick-Prescott filter with a smoothing parameter of 100. Source: Kaminsky et al (2004).

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: Kaminsky et al (2004).

Initial government debt: Total public and private guarantee debt as percentage of GDP at the end of last year. Source: Global Development Finance 2005.

Real LIBOR interest rate: 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.

Average real GDP growth in OECD countries: Average annual Real GDP growth for OECD countries. Source: World Development Indicators 2006.

Terms of trade shocks: 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. Source: Kaminsky et al (2004).

Debt default: 1 if foreign currency bank or bond debt defaults. 0 otherwise. Source: Standard & Poor's.

Bank crisis: 1 if there is a systematic banking crisis. 0 otherwise. Source: Caprio and Klingebiel (1999 and 2003).

IMF program: 1 if there is either a Stand-by Arrangement or an Extended Fund Facility IMF program for at least 7 months in the year under consideration. 0 otherwise. Source: Policy Development and Review Department, IMF.

*Percentage of total long-term debt contracted in US$*: Percentage of total long-term debt contracted in US$. Source: Global Development Finance 2005.

Short-term external debt as a percentage of total external debt: Short-term external debt as percentage of total external debt. Source: Global Development Finance 2005.

Trade openness: Imports and Exports as percentage of GDP. Source: World Development Indicators 2006.

Terms of trade volatility: Terms of trade volatility calculated as standard deviation of terms of trade in the last five years. Source: Kaminsky et al (2004).

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: from Beck et al (2001).

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

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

The presence of civil war or violence corresponds to categories "cv" or "cw". Source: "Major Episodes of Political Violence 1946-2006" from Center for Global Policy at George Mason University.

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

	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*
Deficit (-1)	0.712***	0.713***	0.712***	0.725***	0.715***	0.715***	0.715***	0.715***	0.724***	0.725***
	(14.4)	(13.6)	(14.2)	(14.5)	(14.7)	(14.5)	(14.7)	(14.5)	(14.7)	(14.6)
Fixed	0.601**	0.551**	0.546**	0.562**	0.592**	0.585**	0.593**	0.585**	0.559**	0.538*
	(2.1)	(2.4)	(2.1)	(2.3)	(2.3)	(2.1)	(2.3)	(2.1)	(2.1)	(1.8)
Dual	1.089***	1.087***	1.078***	1.100***	1.261***	1.246***	1.261***	1.246***	1.113**	1.086**
	(3.3)	(3.7)	(3.0)	(2.8)	(2.9)	(2.6)	(2.9)	(2.7)	(2.4)	(2.1)
*Fixed*Electoral year*									0.763	0.892*
									(1.5)	(1.7)
*Dual*Electoral year*									1.906**	1.934**
									(2.4)	(2.4)
Electoral year									-0.43	-0.465
									(-1.2)	(-1.2)
Statistics:										
Observations	471	471	433	395	395	381	395	381	395	381
Countries	23	23	23	22	22	22	22	22	22	22
Control variables:										
Regular	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stress	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Sample:										
Constant ERR	No	No	Yes	No	No	Yes	No	Yes	No	Yes
Tranquil	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Instrumental variables for ERRs	No	No	No	No	No	No	Yes	Yes	Yes	Yes
Tests (p-value):										
Ho: Fixed ≤ Flex.	0.0171	0.009	0.018	0.012	0.01	0.019	0.009	0.019	0.019	0.039
Ho: Dual ≤ Flex.	0	0	0.001	0.002	0.002	0.004	0.002	0.004	0.008	0.016
Ho: Dual ≤ Fixed	0.0235	0.013	0.021	0.024	0.012	0.013	0.012	0.013	0.046	0.047
*Ho: Fixed*EY ≤ Flex.*EY*									0.064	0.044
*Ho: Dual*EY ≤ Flex.*EY*									0.007	0.008
*Ho: Dual*EY ≤ Fixed*EY*									0.017	0.028

Notes: Flexible regime is the omitted 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 by heteroscedasticity. The value 0 is reported when the first three decimal digits are equal to zero. t-statistics in parenthesis.
Regular control variables include: 1) country's business cycle, 2) initial government debt, 3) real LIBOR 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.
Tranquil sample excludes observations that are two years apart from "free falling" events (Reinhart and Rogoff, 2004).
Instrumental variables for ERRs include: 1) percentage of total long-term debt contracted in US$, 2) short-term external debt as a percentage of total external debt, 3) trade openness, and 4) terms of trade volatility.
*, ** and *** denote significance at 10%, 5% and 1% levels, respectively.