Elections and the timing of devaluations*

Ernesto H. Stein

and

Jorge M. Streb

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Abstract: This paper presents a rational political budget cycle model for the open economy, in which devaluations are delayed in the run-up to elections, in order to increase the electoral chances of the party in office. By concentrating on the closed economy, previous political cycle models had overlooked the influence of elections on the behavior of exchange rates.

We introduce voter uncertainty in two different dimensions. Not only are voters uncertain regarding the competency of the incumbent. They also ignore the degree to which the incumbent is opportunistic, i.e. willing to distort the economy for electoral gain. When there is only uncertainty about competence, we obtain a separating equilibrium, like in the previous political budget cycle literature. However, when uncertainty about opportunism is introduced, a partially pooling equilibrium emerges: an incompetent, opportunistic incumbent delays a devaluation until after elections, mimicking a competent incumbent, while the competent does not distort the optimal pattern of the exchange rate, regardless of the degree of opportunism.

The model's prediction that there is a tendency to delay devaluations until after elections is used to look at the empirical evidence on devaluations around elections.

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* Ernesto H. Stein, Inter-American Development Bank; 1300 New York Ave. N.W., Washington, D.C. 20577; tel. 202-623-2823, e-mail ernestos@iadb.org.

Jorge M. Streb, Universidad del CEMA; Av. Córdoba 374, 1054 Bs. As., Argentina; tel. 54-1-314-2269, e-mail jms@cema.edu.ar.

Elections and the timing of devaluations[**]

Ernesto H. Stein and Jorge M. Streb

I. Introduction

It has long been recognized that devaluations are politically sensitive events. In a classic paper, Cooper (1971) pointed out that devaluations in developing countries impose sizable political costs on finance ministers, who tend to leave shortly after the devaluation takes place. In addition, on occasions devaluations have led to the fall of the government.

To the extent that devaluations impose significant political costs, these costs should affect the government's incentives regarding the timing of exchange rate adjustments. In particular, we expect that governments will try to avoid devaluations in the run-up to elections, and will postpone corrections until elections have taken place. In this paper, we present a political economy model consistent with this pattern.

There are plenty of episodes in which devaluations required to correct exchange rate misalignments have been postponed, in an effort to help the electoral chances of the party in office.

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Among the episodes that motivate our ideas on the political manipulation of exchange rates are the 1986 Cruzado Plan in Brazil, the failed 1989 Primavera Plan in Argentina, and the 1994 Mexican Peso crisis.

In the Cruzado plan, the exchange rate was pegged despite mounting current account deficits. Cardoso (1991) stressed that "another election loomed, and, in the best Brazilian political tradition, corrective actions were placed on hold. This time the new measures (i.e., the devaluation) were announced immediately after the (legislative) elections". The main element of the Primavera plan was the reduction of the rate of crawl, widely interpreted as an attempt to moderate inflation in the run-up to the 1989 presidential elections (Heymann, 1991). However, a speculative attack, amidst the suspension of external financing, led to a sharp devaluation that ended the stabilization attempt before the elections, with disastrous electoral results for the ruling party.

The 1994 Mexican Peso crisis is a recent and much discussed example of waiting until after an election to correct an overvaluation. As Obstfeld and Rogoff (1995) note, the skepticism over exchange rate commitments prevailing in Mexico in 1994 was compounded by the government's previous track record of devaluing in presidential election years. As we point out here, the

government's temptation to devalue has a precise timing: after the elections.[1]

Complementing this evidence at an episodic level, there are more systematic studies that support this pattern. Edwards (1993) studies the timing of 39 large devaluations (15% or more) in democratic regimes, and finds that they tend to occur early on in the term. Gavin and Perotti (1997) include in a recent study of fiscal policy in Latin America a section on the determinants of shifts in exchange rate regimes from fixed to flexible. They find that the likelihood that such a shift will occur increases significantly right after an election has taken place.

Klein and Marion (1994) study the duration of exchange rate pegs to the US dollar for a sample of 17 Latin American countries in the 1956-1991 period. In contrast to Gavin and Perotti, who focus only on regime shifts, these authors consider step devaluations as the end of a spell and the beginning of another. They find that the likelihood a peg will be abandoned increases immediately after an executive transfer.

Although the evidence on the relationship between elections and the timing of devaluations is still scant, it appears to support the hypothesis that devaluations tend to be delayed until

[1] This phenomenon is obviously not limited to Latin American economies. In the case of Israel, for example, Ben-Porath (1975) stresses that the closest a devaluation ever came to preceding an election was eighteen months, suggesting that devaluations are avoided in the run-up to elections.

after elections. There is, however, no theoretical model consistent with this pattern. In this paper, we develop a political cycle model to explain the temptation of the government to manipulate exchange rate policy for political purposes. In addition, we provide new empirical evidence on the relationship between elections and the timing of devaluations.

The traditional political business cycle model, due to Nordhaus (1975), assumes backward-looking voters. Rogoff and Sibert (1988), Rogoff (1990), and Persson and Tabellini (1990), however, obtain political cycles even in the presence of forward-looking voters, as a result of a signaling game between voters and the government, in the presence of incomplete information on the degree of competence of the incumbent.

In Rogoff and Sibert (1988) and Rogoff (1990), the signaling game is not cast in terms of a political *business* cycle, where current employment can be boosted through expansionary aggregate demand policies, at the cost of higher inflation later on. Rather, they stress a political *budget* cycle where visible taxes are lowered, and visible expenditures are raised, before elections. The existence of political budget cycles had been pointed out by Tufte (1978), with data from the U.S. and Europe, and Ames (1987) found a similar pattern in Latin America.

Our model applies the rational political budget cycle approach to exchange rates. It extends Stein and Streb (1998),

which models electoral cycles in an open economy to explain the timing of price stabilizations around elections.

The model has three distinctive features. First, the costs of inflation and devaluation are derived from microfoundations, in a model with a cash-in-advance constraint, where inflation acts as a tax on consumption. The key trade-off is between inflation today and inflation tomorrow, which amounts to giving the unpleasant monetarist arithmetic of Sargent and Wallace (1981) a political economy rationale.

Second, we consider an open economy where inflation and devaluation are identical, so the model is interpreted in terms of its implications for nominal exchange rates. The pattern of devaluations around elections is seen as a political budget cycle, a feature overlooked in conventional stories that concentrate on a closed economy.

The third feature is the basic analytical innovation. The typical assumption in political budget cycle models is that governments share the utility function of voters, but derive additional utility from being in office, which may lead to opportunistic behavior. The only informational asymmetry regards the degree of competence of the government. We introduce a second dimension over which there is incomplete information: voters do

not know whether the incumbent is opportunistic or not. This two-dimensional incomplete information has important implications.[2]

Asymmetric information regarding opportunism can change the nature of the equilibrium in the signaling game, moving it away from a separating equilibrium to a partially pooling equilibrium. Incidentally, we also move away from an implication of previous rational political cycle models, which we do not find particularly attractive: that, in equilibrium, only the competent government manipulates economic policy to signal competency, while the incompetent simply reveals its incompetence and loses the elections.

The plan of this paper is as follows. Section Two introduces the economic model, with a cash-in-advance constraint that makes nominal devaluations a form of distortionary taxation. Section Three studies what happens with the economy once a political system is introduced, in an incomplete information setup where voters are uncertain about how competent and how opportunistic politicians are. Section Four looks at the empirical implications of the model, and how it relates to evidence on elections and the

[2] These twin dimensions of competence and opportunism relate to Covey et al. (1995), p. 240-1, who emphasize the importance of both competence and character. Taking the case of a doctor, they remark that we require a doctor to be both competent (to make the right diagnosis and prescribe the right therapy) and honest (to not submit you to a surgery you don't need). Weinschelbaum (1998) also introduces two-dimensional incomplete information, in a principal-agent model of corruption where purchase costs can be low or high and the honesty of the procurement manager varies.

timing of devaluations drawn from Latin-American countries. Section Five presents the conclusions and the extensions for future work.

II. The economic model: devaluations as distortionary taxation

We work with a two-period model for a small open economy. A key feature of the model is a cash-in-advance constraint, by which agents need to hold money in order to consume. The opportunity cost of holding money is given by the nominal interest rate. In the context of our model, inflation and devaluation are equivalent, and thus devaluation, through its effect on the nominal interest rate, acts as a tax on consumption. A key trade-off in the model is that between present and future devaluation. After deriving this trade-off in Section Two, the political economy model of Section Three will show that, under asymmetric information, the incumbent government may have incentives to exploit this trade-off for political purposes.

Preferences, technology and financial assets

There is a private tradable good, y_{ct}, and a public good, y_{gt}. These goods are non-storable. The government supplies a constant amount g of the public good each period. By the law of one price, the domestic price of the private good depends on the nominal exchange rate e_t and on the international price p^*_{ct}, which we assume constant.

$$p_{ct} \equiv e_t p_c^* \qquad \textbf{(1)}$$

Preferences of the representative consumer are given by a constant relative risk aversion utility function, where CRRA $\rho \geq 1$.[3] Utility is additive over time, with a subjective discount factor of $1/(1+\delta)$.

$$U = \sum_{t=1}^{2} \frac{u(c_t)}{(1+d)^t} \qquad \textbf{(2)}$$

Labor is the only factor of production, and its supply is inelastic.[4] The production functions are linear in private and government employment, l_{ct} and l_{gt}, respectively.

$$\begin{aligned} y_{ct} &= l_{ct}, \\ y_{gt} &= (1+g) l_{gt}, \quad where\ g \geq 0. \end{aligned} \qquad \textbf{(3)}$$

A Central Bank issues fiat money M_t, which has no nominal return. In addition to money, agents can hold bonds B_t, which are indexed to the exchange rate, so they bear no devaluation risk. The nominal return to bonds, i_t, is determined by the rate of devaluation $\varepsilon_t \equiv (e_t - e_{t-1})/e_{t-1}$ and by the constant external interest rate r^*.

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[3] For $\rho=1, u(c_t)=\ln c_t$; for $\rho>1$, $u(c_t)=c_t^{1-\rho}/(1-\rho)$. The degree of risk aversion is typically greater than in log function. Reinhart and Végh (1994), for instance, report that most estimates of the intertemporal elasticity of substitution (the inverse of the relative rate of risk aversion) are significantly different from zero, but below 0.80, so $\rho>1/0.8$.

[4] Labor supply is inelastic at l, and supply of the public good is constant at g, so neither enters explicitly into the utility function.

$$1 + i_t \equiv (1 + e_t)(1 + r^*) \quad \textbf{(4)}$$

Cash in advance and budget constraints

By a cash-in-advance constraint, consumers need to hold money within the period to make consumption expenditures:

$$M_t \geq C_t \quad \textbf{(5)}$$

We assume that the market for bonds and money takes place before the market for goods, so it is not necessary for consumers to hold money between periods. The timing in our cash-in-advance constraint resembles that in Lucas (1980), where bonds can be exchanged for money balances for consumption within each period. In contrast, in Svensson's (1983) version of the cash-in-advance constraint, the market for goods precedes the market for bonds, so consumers need to hold money balances between periods.[5]

We further assume that firms and the government pay wages at the beginning of the period, before the market for bonds takes place. Within our intra-period timing of events, consumers can earn interest i_t on both initial bond holdings B_{t-1} and on current income, by holding bonds throughout the period, whereas, by the cash-in-advance constraint, they forgo interest on cash holdings needed to make consumption expenditures during the period. In this sense, our model in discrete time resembles the cash-in-advance model in continuous time of Calvo (1986).

Both firms and the government receive a cash advance from the Central Bank at the beginning of each period in order to pay wages in advance, which they repay with interest i_t at the end of each period. In competitive equilibrium, the real wage (in both the private and government sectors) depends inversely on the nominal interest rate:[6]

$$\frac{w_t}{p_t} = \frac{1}{1+i_t} \qquad \textbf{(6)}$$

The per period budget constraint for the representative consumer is that total nominal income, $Y_t=w_t(l_{ct}+l_{gt})$, plus interest earned on initial bond holdings and current income, net of cash holdings, equals consumption expenditure, $C_t=p_tc_t$, plus financial asset accumulation: $Y_t + i_t(B_{t-1} + Y_t - M_t) = C_t + \Delta B_t$. With no initial asset holdings, the inter-temporal budget constraint implies that the present value of consumption plus the cost of holding money will equal total wealth W, i.e. the present discounted value of income.[7]

$$W = \Sigma_{t=1}^{2} \frac{(C_t + i_t M_t)/e_t}{(1+r^*)^t}, \quad where\ W \equiv \Sigma_{t=1}^{2} \frac{lp_t/e_t}{(1+r^*)^t} \qquad \textbf{(7)}$$

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[5] The differences between these two timings are discussed in Nicolini (1997), and in Obstfeld and Rogoff (1996).

[6] Financial costs affect the real wage, since in a competitive equilibrium profits $p_{ct}l_t-(1+i_t)w_tl_t$ must be zero.

[7] By non-satiation, no assets are left over at the end of t=2.

The interest earnings consumers lose by holding on to cash accrues to the Central Bank. These seignorage revenues, given by $T_t=i_tM_t$, are transferred back to the government.[8] Devaluation, through the nominal rate of interest, acts as a tax on consumption.[9] Besides revenues T_t, debt D_t can be incurred to pay for public expenditure, and to serve outstanding debt from the previous period. Taking into account financial costs, government spending in nominal terms is $G_t = (1+i_t)w_t l_{gt}$. The per-period government budget constraint is $T_t + \Delta D_t = G_t + i_t D_{t-1}$. The intertemporal budget constraint implies that the present value of taxes equals the present value of government expenditure, Γ (assuming initial debt is zero).[10]

$$\Gamma = \Sigma_{t=1}^{2} \frac{T_t / e_t}{(1+r^*)^t}, \quad where\ \Gamma \equiv \Sigma_{t=1}^{2} \frac{G_t / e_t}{(1+r^*)^t} = \Sigma_{t=1}^{2} \frac{l_{gt}(1+i_t)w_t / e_t}{(1+r^*)^t} \qquad \textbf{(8)}$$

Optimal consumption decisions

The consumer maximizes utility subject to the cash-in-advance and wealth constraints.[11] Replacing constraint (5) in (7), the problem of the consumer can be written as:

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[8] This is akin to the Federal Reserve Board´s measurement of seignorage as the nominal interest rate payments on government bonds avoided by the issue of non-interest bearing liabilities.

[9] Devaluation acts as a consumption tax, rather than an income tax, since interest earnings are not taxed (cf. discussion in Atkinson and Stiglitz, 1980, chapter 3).

[10] Final debt is zero in equilibrium, due to non-satiation.

[11] The cash in advance constraint will be binding if interest rates are positive in equilibrium, which will be the case here.

$$L = \sum_{t=1}^{2} \frac{u(c_t)}{(1+d)^t} + l\Sigma_{t=1}^{2} \frac{lp_t / e_t - (1+i_t)C_t / e_t}{(1+r^*)^t} \quad \textbf{(9)}$$

By the first-order conditions for consumption, the effective price of consumption each period is the price in dollars augmented by the nominal interest rate, as in Calvo (1986).

$$\frac{u'(c_t)}{(1+d)^t} = \frac{l}{(1+r^*)^t}(1+i_t)\frac{p_t}{e_t}, \quad for\ t = 1,2 \quad \textbf{(10)}$$

Letting $\delta = r^*$, the time path of consumption depends on the effective price of consumption each period. These conditions become

$$\frac{u'(c_1)}{u'(c_2)} = \frac{1+i_1}{1+i_2} \quad \Rightarrow \quad with\ CRRA = r, \quad \frac{c_1}{c_2} = \left[\frac{1+i_1}{1+i_2}\right]^{-1/r} \quad \textbf{(11)}$$

Optimal fiscal policy

Labor can be employed by firms, or by the government. The labor market clears when the fixed supply equals demand.

$$l = l_{ct} + l_{gt}, \quad for\ t = 1,2 \quad \textbf{(12)}$$

Production of the public good must equal demand g each period. The consumption good is tradable, so the present value of consumption and production must be equal.[12]

$$y_{gt} = g, \quad for\ t = 1,2,$$
$$\sum_{t=1}^{2} \frac{y_{ct}}{(1+r^*)^t} = \sum_{t=1}^{2} \frac{c_t}{(1+r^*)^t} \quad \textbf{(13)}$$

[12] By Walras' law, the overall equality between demand and supply of tradables follows from the rest of the system.

If the government were a social planner that could implement a solution directly, it would maximize consumer's utility, subject to constraints (12) and (13).

$$L = \sum_{t=1}^{2} \frac{u(c_t)}{(1+d)^t} + l\Sigma_{t=1}^{2} \frac{f_t(l_{ct}) - c_t}{(1+r^*)^t} + \Sigma_{t=1}^{2} \frac{h_t}{(1+d)^t}(f_t(l_{gt}) - g) + \Sigma_{t=1}^{2} \frac{n_t}{(1+d)^t}(l - l_{ct} - l_{gt}) \quad \textbf{(14)}$$

Since $\delta = r^*$, the first order conditions for consumption imply that consumption smoothing is Pareto optimal.

$$\frac{u'(c_t)}{(1+d)^t} = \frac{l}{(1+r^*)^t}, \quad for\ t = 1,2 \quad \textbf{(15)}$$

However, the government cannot impose the Pareto solution directly; it must solve the Ramsey problem of maximizing consumer utility subject to feasibility constraints (12) and (13) and first order conditions (10). Comparing (15) to first order conditions (10) which consumers face in the market, it becomes obvious that the Pareto optimum can be implemented with a constant rate of interest, and hence a constant rate of devaluation (given that r* is constant). Thus, the Ramsey solution with constant tax rates $\tau_t \equiv i_t/(1+i_t)$ is Pareto optimal.[13]

[13] The fact that the Pareto solution is implementable implies that, though exchange rate policy is discretionary, there is no time inconsistency problem. The optimal policy is consistent with the Barro (1979) result that tax smoothing is optimal under distortionary taxation (since the consumption tax is distortionary, Ricardian equivalence does not hold in this model). These results can also be derived maximizing the indirect utility function, subject to the government budget constraint. The crucial point for the argument in the text is that there

What determines the level of the optimal tax rate? From (7) and (8), $\tau^{opt}=i^{opt}/(1+i^{opt})$ is determined by the ratio of the present discounted value of government expenditure to wealth.

$$t^{opt} = \frac{\Gamma}{W}, \quad where \ \frac{\Gamma}{W} = \frac{\Sigma_{t=1}^{2} \frac{p^* l_{gt}}{(1+r^*)^t}}{\Sigma_{t=1}^{2} \frac{p^* l}{(1+r^*)^t}} \ and \ l_{gt} = g/(1+g) \qquad \textbf{(16)}$$

Since g is positive, tax rates and interest rates are positive in equilibrium. A higher level of government productivity, indicated by a larger γ, frees up labor for private production, and reduces the optimal tax rate τ^{opt}.

Trade-off between current and future devaluation

Though tax-smoothing is optimal from a welfare perspective, the government can lower current devaluation incurring debt. Later, it must resort to a higher devaluation to pay off that additional debt, as in the Sargent-Wallace trade-off between present and future inflation. To express future tax rates as a function of current tax rates, we use the identities $\tau_t \equiv i_t/(1+i_t)$, and $(1+i_1)/(1+i_2) \equiv (1-\tau_2)/(1-\tau_1)$.[14]

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exist some level of taxes to implement the Pareto optimal first period consumption (in this case, a flat level of taxes).

[14] By (5), (7) and (11), current consumption is a function of W and interest rates; by (8) and (11), current consumption is a function of Γ and interest rates. Equating both expressions, the result in text can be established.

$$t_2 = ((1+r^*)\left(\frac{1-t_2}{1-t_1}\right)^{1-1/r} + 1)\frac{\Gamma}{W} - (1+r^*)\left(\frac{1-t_2}{1-t_1}\right)^{1-1/r} t_1 \qquad \textbf{(17)}$$

For CRRA $\rho \geq 1$, a strict trade-off between current taxes τ_1 and future taxes τ_2, for values of $\tau_1 \leq \Gamma/W$, can be established (Lemma 1 in Appendix). Figure 1 shows the trade-off between current and future taxes: with log utility (CRRA $\rho=1$), there is a linear trade-off, while in the neighborhood of τ^{opt} the relationship is concave for $\rho>1$.

Figure 1.

By Lemma 1, for $\tau_1 \leq \Gamma/W$ future taxes rise as current taxes fall, so relative future taxes rise; by first order condition (11), current consumption rises in relation to future consumption; because the resource constraint of the economy is given by $W-\Gamma$, a constant, current consumption also increases in absolute terms. This one-to-one relationship between current taxes and current consumption allows us to cast the trade-off in terms of present and future consumption rather than present and future tax rates, which simplifies the signaling game in Section Three: for all values of ρ, it is possible to derive from equations (5), (7), (8) and (13) a linear trade-off between current and future consumption.

$$c_2 = (1+r^*)^2(W-\Gamma) - (1+r^*)c_1 \qquad \textbf{(18)}$$

The purpose of this Section was to establish the trade-off between first and second period devaluation, and the corresponding trade-off between first and second period consumption. In the following Section, we will show how, under incomplete information, an opportunistic incumbent can exploit this trade-off to appear more competent, and increase its chances of reelection.

III. The political model: competence and opportunism

We introduce elections, voters, and politicians under asymmetric information. Voters ignore both the degree of competence and the degree of opportunism of incumbent governments. We work with a two period model, where elections are held at the end of the first period, and voters vote according to how qualified incumbents are at delivering public goods.[15]

The incumbents can be either competent (i=c) or incompetent (i=nc), as in Rogoff and Sibert (1988), to handle future issues. A competent government needs less employment to produce a given amount of the public good in the second period.

$$y_{g2} = (1+g_2^i)l_{g2}, \quad where \ g_2^{nc} = 0, g_2^c = 1 \qquad \textbf{(19)}$$

We assume that future competency is not linked to current competency. The idea is that different periods have different

[15] The two period setup is adopted to focus on the behavior around elections. The results are qualitatively similar if the time horizon is extended. However, distortionary behavior becomes more likely as the number of periods increases, because the

salient issues that the incumbent may be more or less qualified to handle. For example, during the Reagan-Carter campaign the salient issue was the ability to manage an international crisis, while during the Bush-Clinton campaign, the defining issue was clearly the domestic economy. We simply assume that the incumbent has an informational advantage regarding its competence to face the salient issue of the next presidential period, γ_2^i, which may be different from the current one. Thus, voters observe current devaluation and debt, but they do not observe the incumbent's future competency, γ_2^i.[16]

Incumbents can also differ in their opportunism, j=o,no, which in our model is reflected by how much an incumbent values sticking to power, beyond any commitment towards public welfare. Let z_t=1 when candidate j is incumbent, and z_t=0 when not. While a non-opportunistic incumbent has the same CRRA utility function as the representative consumer, an opportunistic incumbent derives additional pleasure K from holding office,

$$Z = U + \sum_{t=1}^{2} \frac{z_t k^j}{(1+d)^t}, \quad k^o = K > 0, k^{no} = 0, \quad for \quad j = o, no \qquad \textbf{(20)}$$

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political stakes rise, reflecting the option value of future reelections.

[16] If current competency were relevant for future competency, current government debt would have to be unobservable, as in Stein and Streb (1998), in order to preserve the informational asymmetry.

A justification for this assumption of heterogeneity regarding opportunism can be found in Tufte (1978). He presents quotes from politicians and economic advisors that show that, while some politicians would be willing to go to great lengths in order to be reelected, others won't. Nixon, for example, is portrayed as a politician who is well aware of the importance of manipulating the economy in order to win elections, particularly after losing the 1960 election by a narrow margin. Gerald Ford, in contrast, appears to have been non-opportunistic. Tufte reports that, shortly before the 1976 presidential elections, William Seidman, a top economic advisor to Ford, said:

> "I think Mr. Ford's chances of reelection are very good. As for the economic lull, we considered the use of stimulus to make sure we didn't have a low third quarter, but the president didn't want anything to do with a short-term view".

The timing of the game is as follows. Each period, voters form their priors about the candidate's types. Nature then endows candidates with a set of characteristics, which is private information. The government sets taxes, and consumers decide the level of consumption. At the end of the first period, elections are held.

The voters priors about candidates are that they are competent with probability q (incompetent with probability 1-q) and opportunistic with probability s (non-opportunistic with probability 1-s).

The signaling game is carried out in terms of consumption levels, taking advantage of the simple linear trade-off between current and future consumption implied by tax rates. This puts the implications of Calvo (1986) in a political economy setting: lower devaluation leads to a consumption boom that can help the government get reelected.[17] By the informational asymmetries, voters may not know if it is a temporary boom (which would be the case if the devaluation rate is unsustainable) or a permanent improvement.

After the benchmark case of complete information, incomplete information on competency is analyzed. We then concentrate on the consequences of incomplete information on both the incumbent's competency and opportunism.

Complete information

For given levels of resources $W-\Gamma_i$ available under i=c,nc, second period decisions are trivial: to close the budget, $c_2^i=c_2^i(c_1)$ depends on whether second-period incumbent is competent or not (i=nc,c).

In the first period, under complete information the incumbent cannot affect its chances of reelection. The best it can do is pick the optimal policy, for a given probability θ that second period incumbent is competent: the marginal utility of

[17] In Calvo (1986), the consumption boom in exchange rate-based stabilizations arises from the temporary character of the reduction in the rate of devaluation.

consumption today must equal the expected utility of consumption tomorrow.[18]

$$u'(c_1) = qu'(c_2^c(c_1)) + (1-q)u'(c_2^{nc}(c_1)) \qquad \textbf{(21)}$$

Optimal first period consumption is increasing in the probability θ that future competency is high.[19] Indirect utility of voters is also increasing in θ. For this reason, optimizing voters reelect an incumbent when the conditional probability θ that it is competent is larger than q, which is the probability that the opponent will be competent. Under complete information voters reelect competent incumbents, since $\theta=1$, but replace incompetents, since the probability of high future competency rises from $\theta=0$ to $\theta=q$ with an opposition candidate.

An incumbent that is competent to handle future issues can assure high current consumption, which we denote c_1^c. An incumbent that is incompetent will not be reelected: denote consumption c_1^m, the optimum given the probability $\theta=q$ that the second period replacement may be competent. This consumption is above c_1^{nc}, the first period consumption that would obtain if the incumbent were incompetent to handle future issues, and it could

[18] To implement the Pareto solution, taxes must be set at a level that leads to first period consumption determined by (21).

[19] An increased probability that the second period incumbent is competent, i.e. a greater θ, increases the probability of the high consumption state in the second period. By decreasing

not be replaced by elections (in which case $\theta=0$). First period consumption as a function of θ is represented in Figure 2.

Figure 2.

Working by backward induction, the subgame-perfect equilibrium is separating: elections help sort out better candidates for the job of government.

One-dimensional incomplete information

The key assumption is that competency is not directly observable. However, the degree of opportunism, K, is known to be high. We analyze the perfect Bayesian equilibrium in the ensuing signaling game. The incumbent decides the level of current taxes, and hence consumption, taking into account voter reactions.

In a separating equilibrium, consumption will be either low or high. The high level is that signal c_1^s only a competent incumbent is willing to send. This signal guarantees reelection, since voters infer $\theta=1$. For out of equilibrium values of consumption, we assume the following updating scheme:

$$\begin{aligned} c_1 < c_1^s \quad &\Rightarrow \quad \Pr(reel\ i) = 0 \\ c_1 \geq c_1^s \quad &\Rightarrow \quad \Pr(reel\ i) = 1 \end{aligned} \qquad \textbf{(22)}$$

To find the actual c_1^s, the signaling game can be couched in terms of the gains and costs, for the different types of incumbents, of sending c_1^s.

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marginal utility of consumption, optimal consumption must rise in the first period.

Figure 3.

The gain G is the utility K of being in office in the second period. The cost C of signaling depends on the incumbent's type: it is the difference between indirect utility V at c_1^m, when the incumbent does not signal and is not reelected, and at c_1^s, when it signals and is reelected.

$$G = \frac{K}{(1+d)^2}, \quad and, \quad for \quad i = nc, c, \qquad \textbf{(23)}$$
$$C(c_1^s|i) = V(c_1^m|i) - V(c_1^s|i) = \left[V(c_1^m|i) - V(c_1^s = c_1^i|i)\right] + \left[V(c_1^s = c_1^i|i) - V(c_1^s|i)\right]$$

The costs are broken down into the two terms in brackets, the fixed and variable components. The fixed component is evaluated at the optimal intertemporal consumption for each type of incumbent. For the case of an incompetent incumbent (i=nc), it is a fixed cost for signal $c_1^s = c_1^{nc}$: the probability a competent is in office in the second period falls from q to 0. For a competent incumbent (i=c), it is a fixed benefit for signal $c_1^s = c_1^c$: the probability a competent is in office in the second period jumps from q to 1. The variable component is due to the distortion in the optimal time profile of consumption.

$$\frac{\partial C(c_1^s|i)}{\partial c_1^s} = -\frac{\partial V(c_1^s|i)}{\partial c_1^s} = -\frac{1}{1+d}\left[u'(c_1^s) - u'(c_2^i(c_1^s))\right], \quad i = nc, c \qquad \textbf{(24)}$$

By the concavity of the utility function, marginal costs of i=nc are positive for $c_1^s > c_1^{nc}$, so its cost function is increasing beyond this point, while in the case of i=c they are positive for $c_1^s > c_1^c$. Over the relevant range of signals $c_1^s \geq c_1^c$, an

incompetent's costs are always above those of a competent: at c_1^c, $C(c_1^s=c_1^c|i=nc)>0>C(c_1^s=c_1^c|i=c)$, and by (24) the slope of the cost function for the incompetent is steeper than that for a competent, which ensures that the cost curves do not cross.

If the cost for an incompetent of sending the signal c_1^c were larger than the gain K from reelection, $c_1^s=c_1^c$ would become the separating signal and consumption would be constant over time. To obtain a cycle, we assume K is high enough to lead to a consumption signal $c_1^s>c_1^c$.[20] Hence,

Proposition 1: with incomplete information on competency, and high opportunism, there is always a separating equilibrium, where a competent incumbent picks $c_1^s>c_1^c$ and an incompetent incumbent picks c_1^m.

A pooling equilibrium can be ruled out using equilibrium dominance arguments, as in Rogoff and Sibert (1988) and Rogoff (1990), applying the Cho-Kreps intuitive criterion to restrict out-of-equilibrium beliefs.[21]

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[20] At the point where an incompetent is just indifferent between sending the signal or not, we assume it does not signal. A competent, however, will wish to signal, since it has the same gain but lower costs at that point.

[21] There is an interior solution with a separating equilibrium because marginal utility tends to infinity as period two consumption goes to zero, so the marginal cost of signaling becomes prohibitive for incompetent incumbent (likewise, there is an interior solution in taxes, since $c_2\rightarrow 0$ as $\tau_2\rightarrow 1$).

Two-dimensional incomplete information

If the uncertainty of voters is not only about the incumbent's competency, but also about its opportunism, the nature of the game changes. We assume there can be two levels of opportunism: opportunistic incumbents with k=K, large enough to mimic the signal c_1^c necessary for reelection; and non-opportunistic incumbent with k=0 that are not willing to distort economic policy to be reelected. This setup leads to a partially pooling equilibrium. The problem is represented in Table 1.

The crucial issue for the partially pooling equilibrium is quite intuitive: the non-opportunistic, incompetent, incumbent always picks c_1^m (and loses the election). A high level of consumption c_1^c can thus work as an informative signal.

Table 1. Signals picked by different types of incumbents

	Low competency (probability=1-q)	High competency (probability=q)
Not opportunistic (probability=1-s)	c_1^m	c_1^c
Opportunistic (probability=s)	c_1^c	c_1^c

From the viewpoint of voters, the conditional probability that the incumbent is competent, if c_1^c is observed, is $\theta=q/(q+(1-q)s)$. As long as $s<1$, this probability will be higher than q, the probability that somebody elected at random is competent, since a non-opportunistic incompetent never sends that signal. Voters that maximize expected utility thus reelect an incumbent that delivers c_1^c, and replace an incumbent with c_1^m. Given this behavior of voters, competent governments have no incentive to signal with a higher level of consumption, because it does not increase their chances of reelection and it distorts the optimal time profile of consumption. To put it differently, incumbents don't need to prove their competence. They just need to show that the probability that they are competent is greater than the probability q that a replacement is competent. The signal c_1^c is enough to achieve that goal.

Proposition 2: with incomplete information on competency and opportunism, there is a partially pooling equilibrium. A non-opportunistic incompetent picks c_1^m. A competent, and a highly opportunistic incompetent, pick c_1^c.[22]

The incumbent that distorts economic policy is not the competent, as in the conventional story, but rather the incompetent who tries to masquerade as a competent incumbent.

[22] If no one were highly opportunistic, there would be a separating equilibrium, and no political budget cycle.

Continuum of types of opportunism

The results derived before do not depend on the existence of a non-opportunistic incumbent. The key point is that politicians can differ in their degree of opportunism, and hence in the extremes to which they are willing to go to get reelected.

Suppose the types of opportunism are uniformly distributed between $\underline{k}$ and K, $k \in [\underline{k}, K]$. Let k* be the level of opportunism that leads exactly to separating signal $c_1^s = c_1^c$, under incomplete information on the degree of competency, and let $0 \leq \underline{k} < k^* < K$. Propositions 1 and 2 change as follows:

Proposition 3: With asymmetric information on competency, but knowledge of opportunism k, the separating signal for competent is $c_1^s = c_1^c$ when $k \leq k^*$, and $c_1^s > c_1^c$ when $k > k^*$. An incompetent always picks c_1^m.

Proposition 4: With asymmetric information on competency and opportunism, a competent always pick c_1^c. An incompetent with type $k > k^*$ mimics c_1^c, while an incompetent with $k \leq k^*$ picks c_1^m.

Note that by Proposition 3 there is a distortion in the separating equilibrium when opportunism is known to be high, i.e. $k > k^*$. By Proposition 4, there is a probability $1-s = k^*/K > 0$ that an incompetent, opportunistic incumbent will send a distortionary signal in the partially pooling equilibrium. In both cases, political budget cycles arise with positive probability.

IV. Empirical implications of the model

In this Section, we compare the implications of the different information structures for the behavior of exchange rates around elections, and confront the predictions to empirical evidence on devaluations taken from the Latin-American experience.

Political cycles implied by asymmetric information

Under complete information, there is no political budget cycle. A competent incumbent is reelected, smoothing taxes and setting a constant rate of devaluation. An incompetent incumbent loses the elections, setting the devaluation rate optimally given that it will be replaced by a competent with probability q and by an incompetent with probability (1-q): in expected value, there is no distortion before elections.

In contrast, the incomplete information setups deliver electoral cycles. With a continuum of types of opportunism, its occurrence depends on the proportion s of incumbents with high opportunism (i.e., above the critical k* defined in Section Three) and the proportion q of incumbents with high competency.

Under incomplete information about competence only, the incompetent always chooses high devaluation and loses the elections for sure. The competent incumbent tilts the optimal time profile of devaluation, downwards in the present and upwards

in the future, with probability qs. Hence, an electoral devaluation cycle is possible.

Under incomplete information about competency and opportunism, an incompetent government that is not very opportunistic chooses a high devaluation and loses elections. A competent incumbent smoothes the devaluation rate and is reelected. An very opportunistic, incompetent, incumbent mimics the competent to win the election, so a partially pooling equilibrium emerges. A tilt in the optimal time profile of devaluation again takes place, with probability (1-q)s.

Obviously, although in the model competence is observed ex-post, empirically it is not easy to distinguish either the degree of competence or of opportunism. Distinguishing empirically between the implications of both informational setups is beyond the scope of this paper. However, the model does suggest an important difference between the two informational setups: while one dimensional informational asymmetry implies that there are no surprises after elections (only competent incumbents are reelected), two dimensional information asymmetry implies there can be surprises after elections (the reelected incumbent can be competent or incompetent).

In spite of these differences, both setups produce similar implications with regard to one important point: they both imply that when governments manipulate the exchange rate, they

manipulate it in the same direction as the episodes that motivate our study: postponement of devaluations until after elections. This is done by a highly opportunistic competent, if the level of opportunism is common knowledge, and by a highly opportunistic incompetent, if the level of opportunism is private information.

The evidence

Having discussed the empirical implications of the model, we now turn to some new evidence, drawn from the experience of 26 countries in Latin America and the Caribbean, regarding the pattern of exchange rates around elections.[23]

This evidence is meant to complement the work of others such as Klein and Marion (1994) and Gavin and Perotti (1997). Klein and Marion studied the abandonment of pegs. Therefore, they do not capture changes in the rate of crawl of the exchange rate, which is one of the ways in which devaluations may be delayed. Gavin and Perotti focus only on regime switches from fixed to flexible. Therefore, they disregard episodes of step devaluations. Our methodology is intended to encompass all possible ways in which delayed devaluations may occur.

The sample period is 1960 to 1994, and the list of countries included in the sample is presented in the Appendix. Data on nominal exchange rates is taken from the International Finance Statistics of the IMF. Data on election dates is based on the

"Enciclopedia Electoral Latinoamericana y del Caribe", coordinated by Nohlen (1993), and on the Lijphart Elections Archive in the World Wide Web.

The methodology we use is very simple. We pull together all elections in Latin America and the Caribbean over the sample period (there are 242 of them, counting both presidential and parliamentary elections). We consider a 19-month window centered around each election. For each episode, month 0 corresponds to the month of the election, month –1 to the month prior to the election, and so on. We then average, for each of the 19 months in the window (-9 through 9), the rate of nominal depreciation across all episodes. The average nominal rate of depreciation, month by month, is presented in Figure 4. In order to lessen the effects of outliers, we worked with geometric averages rather than arithmetic averages.

Figure 4

The pattern in the figure is striking, and provides strong support to the hypothesis that devaluations are delayed until after elections. In months 2, 3 and 4 after an election, the average rate of nominal depreciation is 2 percentage points higher than it is for other months, and the average rate of

[23] The empirical evidence draws from joint work with Piero Ghezzi.

depreciation is more than doubled. The larger effect occurs two months after the election.[24]

The pattern is even stronger when only presidential elections are considered, as shown in figure 5. In this case, the average rate of nominal depreciation in month 2 reaches 7%, around 4.5 percentage points higher than in other months. The behavior of the nominal exchange rate around parliamentary (non-presidential) elections, in contrast, did not show any interesting pattern.

Figure 5

V. Conclusions

We presented a rational political budget cycle model for an open economy, where elections play a key role in explaining the timing of movements in nominal exchange rates. To the standard setup of this class of models, which introduces incomplete information regarding the competence of the government, we added a twist: incomplete information regarding the degree to which the incumbent is opportunistic. As a result, we obtained a partially pooling equilibrium where the opportunistic incompetent deviates

[24] Ghezzi, Frieden and Stein (1998) distinguish between delaying devaluations until after elections, or until after government changes. They find that the fact that devaluations occur 2-4 months after elections is a reflection of the fact that the lag between the election and the change in government is in most cases between 1 and three months. This suggests that while in some cases, such as Mexico pre-1994, the outgoing administration implemented the devaluation after the party won the elections, in

from optimal policy, rather than the standard separating equilibrium where the competent deviates to signal its competence. In the run-up to an election, an incompetent, opportunistic government can be tempted to reduce the rate of devaluation, increasing it after the elections take place.

In addition, we have provided new evidence on the effect of elections on the timing of devaluations. The findings are consistent with the main implication of our theoretical model: the rate of devaluation is significantly higher in the months following an election, as compared to the months preceding it.

The fact that governments tend to postpone devaluations until after elections can also be used to explain why exchange rates can become over-valued before elections. However, this implication cannot be derived in a one good economy, so the distinction between tradables and non-tradables must be introduced to address this issue. We intend to do this in a future paper.

Appendix

Lemma 1: For CRRA $\rho \geq 1$, there exists a strict trade-off between current taxes τ_1 and future taxes τ_2, for values of $\tau_1 \leq \Gamma/W$.

Proof: differentiating (17),

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most cases the incumbent does not want to endure the political cost of the devaluation, even once the election has taken place.

$$\frac{dt_2}{dt_1} = \frac{-(1+r^*)\left(\frac{1-t_2}{1-t_1}\right)^{1-1/r}(1-t_1+(t_1-\frac{\Gamma}{W})(1-\frac{1}{r}))}{1-t_1-(1+r^*)(t_1-\frac{\Gamma}{W})(1-\frac{1}{r})\left(\frac{1-t_2}{1-t_1}\right)^{-1/r}}$$

When $\tau_2=\tau_1$, both tax rates equal $\tau^{opt}=\Gamma/W$, so the derivative at that point equals $-(1+r^*)<0$. If $\tau_1<\Gamma/W$, the denominator is positive; since $0\leq(1-1/\rho)\leq1$, and $1-\tau_1\geq\Gamma/W-\tau_1$, $1-\tau_1\geq(\Gamma/W-\tau_1)(1-1/\rho)$, the numerator is negative. Note that τ_2 cannot exceed one, so a lower bound on τ_1 exists. For the trade-off to continue to hold for $\tau_1<0$, an additional assumption is necessary to avoid negative interest rates being used to speculate and accumulate cash, which leads to a liquidity trap; it suffices to assume that cash balances outstanding at the end of the first period are worthless in the second period, since once the "old currency" can only be used to consume more in the first period, the cash in advance constraint will also be binding for negative interest rates.

List of countries in elections sample: Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Suriname, Trinidad & Tobago, Uruguay and Venezuela.

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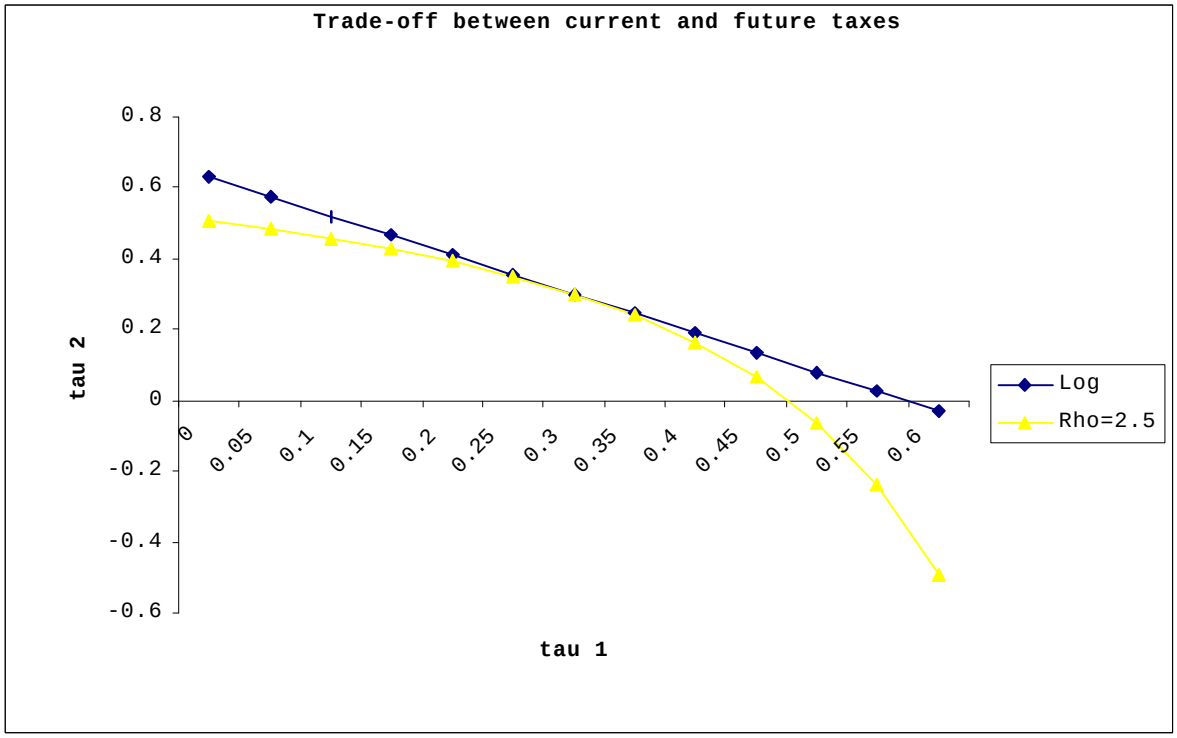
Trade-off between current and future taxes
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
tau 2
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
tau 1
Log
Rho=2.5

Figure 1

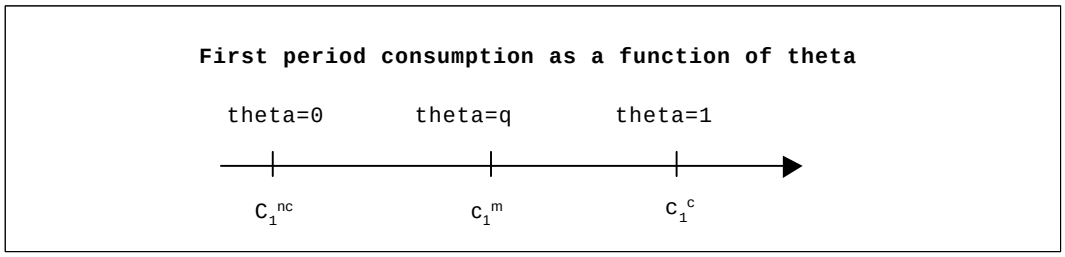
First period consumption as a function of theta
theta=0
theta=q
theta=1
c_1^{nc}
c_1^{m}
c_1^{c}

Figure 2

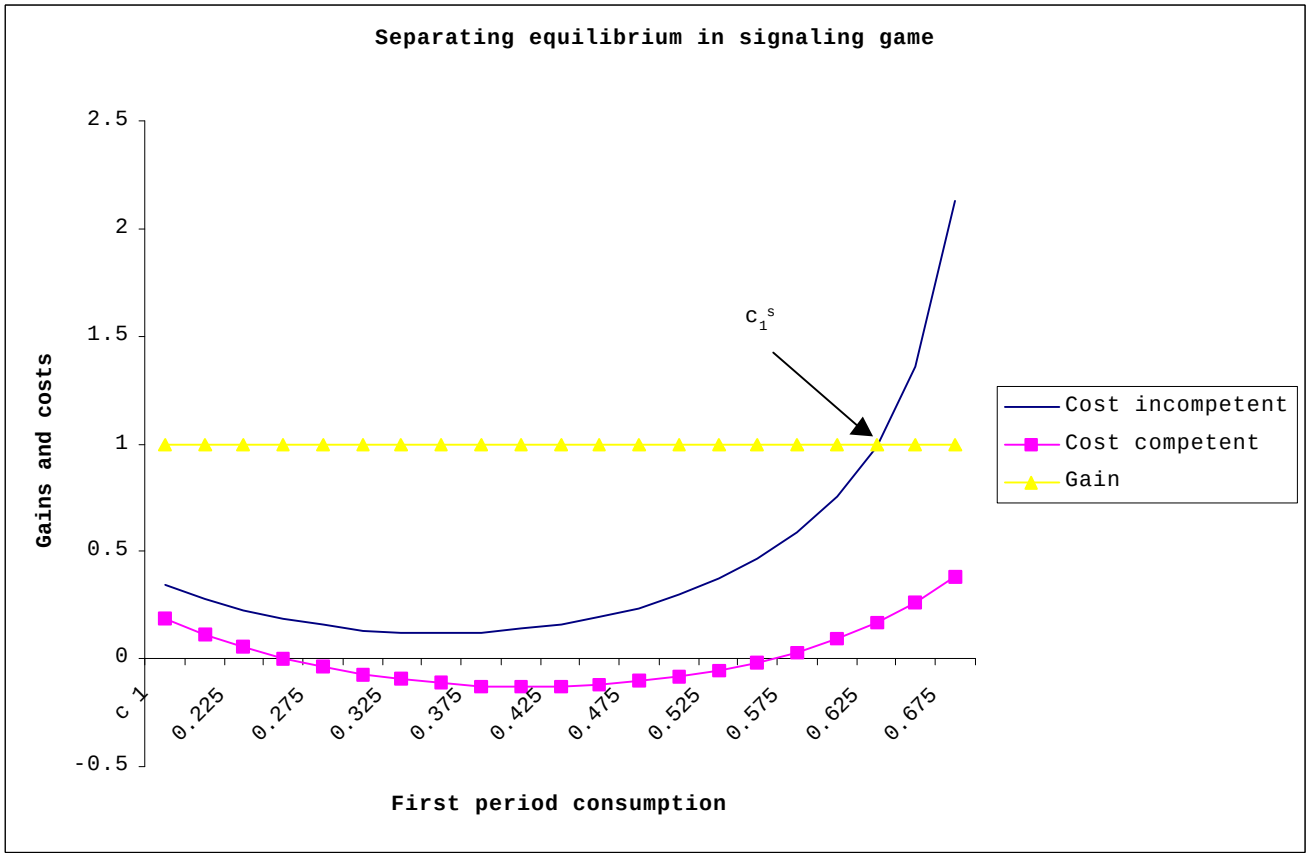
Separating equilibrium in signaling game
Gains and costs
2.5
2
1.5
1
0.5
0
-0.5
c_1^s
Cost incompetent
Cost competent
Gain
c 1
0.225
0.275
0.325
0.375
0.425
0.475
0.525
0.575
0.625
0.675
First period consumption

Figure 3

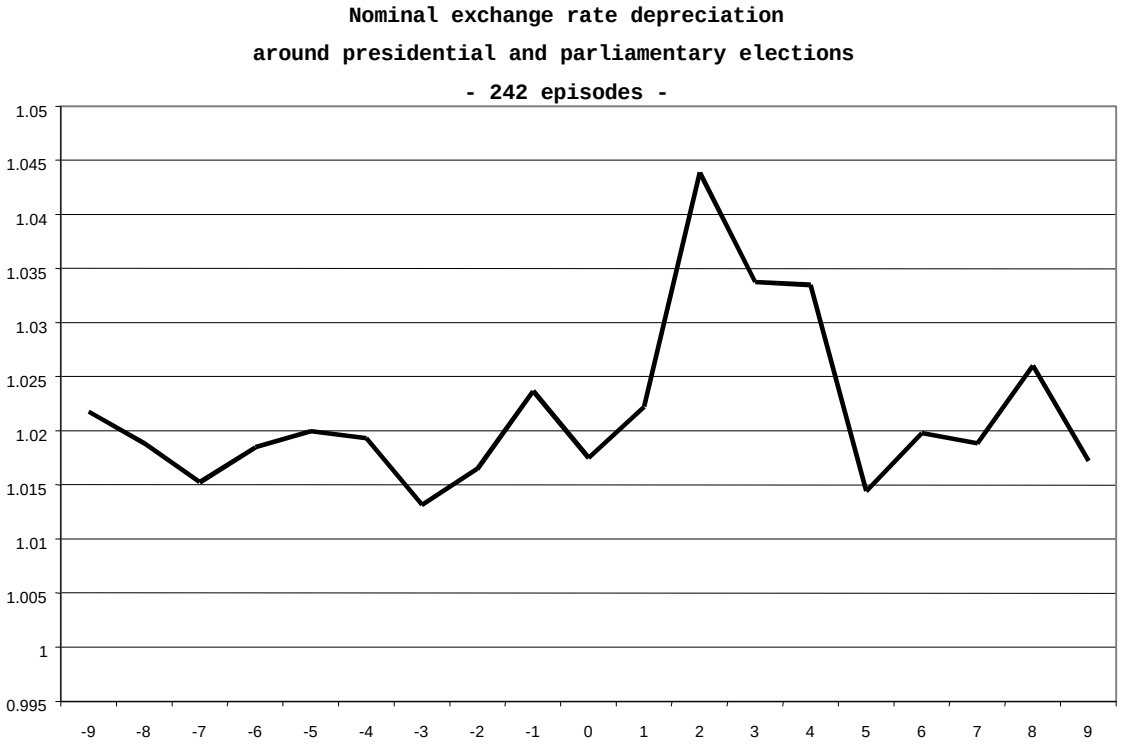
Nominal exchange rate depreciation
around presidential and parliamentary elections
- 242 episodes -
1.05
1.045
1.04
1.035
1.03
1.025
1.02
1.015
1.01
1.005
1
0.995
-9
-8
-7
-6
-5
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
9

Figure 4

Nominal exchange rate depreciation
around presidential elections
- 131 episodes-

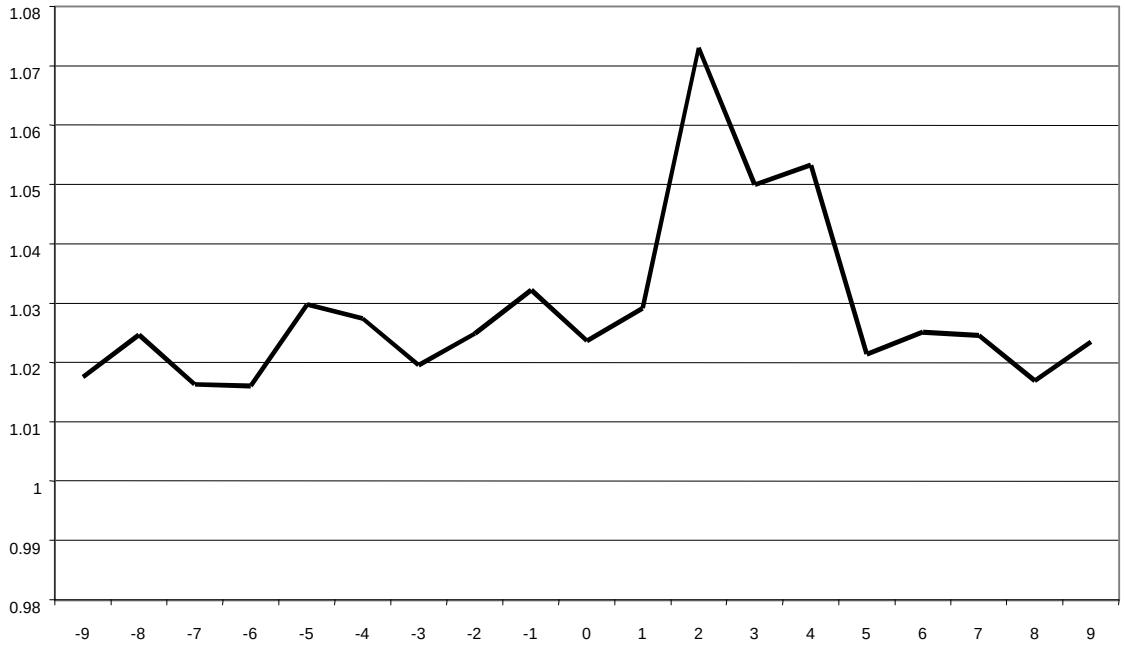

Figure 5