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2024

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# Intersectoral Conflict and Delays in Macroeconomic Stabilization

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## Abstract

An important body of literature explores the political economy reasons underlying delays in macroeconomic stabilization. This paper develops a framework to analyze conflict between two groups of economic actors, one that has an endowment of internationally tradable goods and another that is endowed with non-tradable goods. The focus is on the exchange rate policy in a developing country set-up where the government employs seigniorage revenue to finance spending pre-stabilization, and faces fiscal and balance of payments problems that necessitate stabilization with a step devaluation. The presence of exchange rate and endowment uncertainty, the role of forward-looking expectations, and the possibility of IMF aid influence the likelihood, timing, and terms of a national consensus on stabilization in interesting ways.

**JEL classification:** E31, F34, F41

**Keywords:** Macroeconomic stabilization, seigniorage, inflation, devaluation, capital flight, IMF programs.

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*When the [villager] was caught stealing onions, the Panchayat [village council] gave him the option of choosing between two punishments: eating a 100 onions or suffering a 100 lashes. He chose onions, gave up after eating 10 and asked for lashes; then changed his mind after receiving 10 lashes, and so on. Ultimately, he ended up bearing the agony of both.*

– Folk story from northern India.<sup>1</sup>

## 1 Introduction

On December 13, 2023 the Argentine government announced a 50 percent devaluation of the peso against the US dollar (see Figure 1). This was after a long period of relatively gentle but steady depreciation of the peso against major international currencies, high and increasing inflation, and large fiscal and current account deficits. A similar if slightly less dramatic pattern played out thousands of miles away in Pakistan as the country negotiated terms for a new IMF stabilization and adjustment program. Many if not most economists would argue that these devaluations (and other accompanying measures) were long overdue.

More broadly, macroeconomic stabilization programs in developing countries typically follow sustained periods of expanding fiscal and current account deficits. These deficits, in turn, are often manifestations of deeper underlying macroeconomic problems such as an inability to collect tax revenues, inappropriate aggregate demand policies that lead to exchange rate overvaluation, and a resort to seigniorage to finance government spending in the face of declining demand for domestic money. The question, however, is why don't these stabilizations occur sooner than they typically do, especially once the necessity of stabilization becomes obvious to important segments of the economy? Why do some actors, in other words, delay decisive action only to eventually end up, like the villager in the proverbial story, receiving both onions and lashes (i.e., bearing the costs of delay *and* finally agreeing on less favorable terms). This paper contributes to the literature addressing this question by analyzing the political economy of delays in stabilization from an under-explored angle, i.e., conflict over the desirable post-stabilization level of the exchange rate and the expectations and uncertainty involved therein.

This paper is motivated by several observed empirical regularities:

- The abandonment of a fixed exchange rate regime or crawling peg often accompanies macroeconomic stabilization in developing countries (see, for example, Cornia (2020) for a detailed discussion). Further, this abandonment often involves devaluing the currency to bring its value closer to the open/parallel market rate. As noted above, this meant a 50 percent devaluation in the case of Argentina where, according to reports, the

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<sup>1</sup>This version is cited for its brevity from the October 7, 2013 edition of *India Today* (<https://www.indiatoday.in/magazine/cover-story/story/19900131-militant-movement-holds-kashmir-in-a-state-of-violent-siege-separatism-gets-new-legitimacy-812287-1990-01-30>).

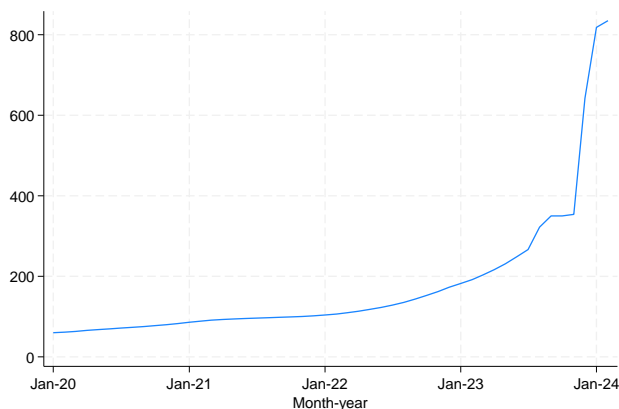


Figure 1: Argentinian peso per US dollar (monthly rate).  
 Source: The Central Bank of the Argentine Republic  
 (([https://www.bcra.gob.ar/PublicacionesEstadisticas/Principales\\_variables\\_datos\\_i.asp](https://www.bcra.gob.ar/PublicacionesEstadisticas/Principales_variables_datos_i.asp))).

gap between the two rates was as high as 150 percent at the time of the devaluation.

- IMF-supported programs have typically involved a significant nominal depreciation against the US dollar. Often this is motivated by IMF conditionalities that require unification of the official and unofficial exchange rate. Gündüz and Darius (2021) report, for example, that the bilateral exchange rate vis-a-vis the U.S. dollar depreciated, on average, by about 13 percent over the period between 6 months prior to and 36 months after IMF program approval.<sup>2</sup> This issue was also salient during recent IMF negotiations with countries such as Argentina and Pakistan.
- Devaluations are unpopular among important segments of society since these result in income redistribution. More than half a century ago, Cooper (1971) termed devaluations “one of the most dramatic – even traumatic – measures of economic policy that a government may undertake.” A vivid illustration of this trauma is the calculation by Steinberg and Malhotra (2014) that military dictators lost power during 17 percent of their 48 devaluation episodes and democratic leaders in 38 percent of their devaluations between 1973 and 2006.
- In particular, producers in the non-tradable goods producing sectors oppose devaluations. Broz et al. (2008) use firm level data from the World Bank’s World Business Environment Survey and find that owners and managers of firms producing tradable (manufacturing) goods are more

<sup>2</sup>See also Krueger et al. (2003) and Agenor (2008, chap. 11).

likely to report an exchange rate appreciation as a business concern compared to producers of non-tradables (construction and services). Based on OLS and GMM estimates of a baseline panel of 68 developing and 39 developed countries between 1989-2013, Ugurlu and Razmi (2023) find that a higher share of non-tradable sector output is correlated with less undervalued RERs. This finding is consistent with the view that undervalued RER policies are unpopular among non-tradable industries

- There is some evidence that this dislike for devaluations increases with the share of imported intermediate costs in production. Again, (Ugurlu and Razmi (2023)) provide some econometric evidence in this regard. The firm-level empirical evidence presented by Egan (2017) supports the view that firms with a high dependence on imported inputs are unhappy with real depreciation. Interestingly, as noted by Steinberg (2015), even the producers of highly tradable goods sometimes oppose devaluations (or, the case of flexible exchange rates, undervaluation), if their imported intermediate content is high. Consistent with these findings, Weldzius (2021) argues that an increase in tradable inputs stemming from the globalization of production networks has lowered support for undervaluation even in countries that have intervened in foreign exchange markets to undervalue their currencies.
- There is significant uncertainty about not just the magnitude of effects that a given degree of exchange rate change will induce but also the degree to which an official announcement of change actually pins down the market exchange rate. This uncertainty, in turn, tends to influence how fervent proponents and opponents of stabilization are in their attitudes. See McNamara (2001) for a more detailed discussion.
- Finally, theory and evidence suggest that expectations of devaluation that result from high inflation increase trade misinvoicing and other forms of evasion of taxes on revenues from tradable production (Patnaik et al. (2012)). Trade misinvoicing, in other words, is endogenous to expected exchange rate policy.

This paper analyzes the political economy of stabilization with the level of the exchange rate as the central focus. This is important since, apart from being one of the most important macroeconomic prices in the economy, the exchange rate is also different as a variable from tax rates or government spending since it is directly affected *ahead* of the time of actual policy change by expectational changes. This focus on the exchange rate and its interplay with the extent of dependence on imported inputs helps shed interesting new light on the possible reasons often underlying delays. The analysis also demonstrates the ambiguous role of foreign aid and aid-related conditionalities – in particular those affecting future exchange rate levels – in facilitating or inhibiting delay.

The work here is related to several strands of literature including those analyzing: (1) the role of expectations and instrument uncertainty in influencing

economic agents with diverse preferences over a given choice set, (2) the political economy of delayed stabilizations, (3) the preference among large sectors of population for overvaluation, (4) the preference for undervaluation among tradable sector agents, (5) the opposition to undervaluation sometimes even among manufacturers, (6) the political economy of currency crises and IMF stabilization programs.

The next section provides some more background. Section 3 develops the formal analytical framework starting with the baseline case where no foreign/IMF aid is involved, then incorporates the possibility of IMF aid in “bad” times, and finally analyzes the case where pre-announced IMF recommendations take away uncertainty about the future, post-stabilization exchange rate. Section 4 concludes.

## 2 Background and Literature

One could argue, with a lot of justification, that the delay in macroeconomic stabilization commonly experienced in countries on the verge of fiscal and balance of payments crises leaves almost everyone worse off. This poses interesting questions to ponder for social scientists. Not surprisingly, then, interest in the political economy of macroeconomic stabilization surged during the 1990s following the limited success of numerous programs across the developing world. Drazen (2000) provides a comprehensive, if dated, survey of the initial literature.

Among models that explicitly incorporate temporal dynamics to address this question, Alesina and Drazen (1991) provide an early treatment. In their model, rising fiscal deficits require a change in the policy regime which is delayed by an ongoing “war of attrition” between two sides. Each side prefers to shift the bulk of the adjustment costs to the other side but has imperfect information about the latter’s cost structure. Delay results as each side hopes to wait it out.

Casella and Eichengreen (1996) extend the Alesina and Drazen model to incorporate expectations of foreign aid, and show that an announcement of aid that lowers the expected burden of adjustment for private groups has ambiguous effects on the likelihood of delay. The lower cost of adjustment facilitates expedition. On the other hand, if there is a lag between the announcement of the aid and its disbursement, this will tend to delay stabilization. With an ongoing war of attrition, an early announcement serves the purpose of accelerating information dispersal, encouraging the loser to concede sooner. Lags between announcements and dispersals, by contrast, present incentives to delay admission of defeat until the arrival of aid. Thus the role of aid depends on the timing of the transfer.

The previous two papers assumed an exogenous fiscal deficit. Velasco (1999) changes this in a dynamic context. The benefits of the fiscal spending are group-specific while the costs are jointly borne. This distorts incentives, leading to overspending and debt accumulation.

Drazen (1996) provides a useful big picture taxonomy by pointing out that there are two broad approaches to analyzing delays in macroeconomic policy change and stabilization, each based in a different manner on heterogeneity of interests. One approach focuses on imperfect information about the net benefits that the *other* group will receive post-stabilization, although the net benefits of reform they themselves would receive are known to each group beforehand. This lack of information creates uncertainty about the willingness of the former to pay for reforms which, in turn, means that reforms may be shunned even if they would benefit a majority if undertaken. The other approach centers around the status quo bias created by uncertainty about the benefits of reforms that individual groups will themselves receive.

The present contribution falls in the second category, although I focus on the conflict caused by the heterogenous effects of exchange rate changes for different groups. In addition to its practical relevance as a macroeconomic variable – exchange rate and balance of payments issues have been at the core of many a round of IMF negotiations and macroeconomic stabilization programs – focusing on it also enables me to incorporate the role of expectations in a qualitatively different manner. This comes out starkly in section 3.3 where knowledge about the post-stabilization level of the exchange rate influences the value of the open market exchange rate *today*.

The two papers closest to my framework are Alfaro (2002) and Laban and Sturzenegger (1994). Laban and Sturzenegger (1994) model delay as the rational outcome of distributional conflict between two risk-averse groups, the “rich” and the “poor” in a two-period framework. Stabilization involves transfer of resources from the former to the government for onward transfer to the latter. Also, the former have access to technology that allows them to hide income through financial adaptation; a skill that develops over time. If post-stabilization payoff uncertainty is sufficiently high, the two groups may end up delaying adjustment even though the relative position of the poor deteriorates over time in the absence of an agreement. This is true even though, unlike in the war of attrition framework, the identity of the side that loses more from undervaluation is known *ex-ante* to all, and seems to be more in line with the experiences of developing countries such as Argentina and Pakistan discussed briefly earlier.

I develop a two-period framework to argue, in the spirit of Laban and Sturzenegger (1994), that delays in undertaking much-needed and much-anticipated exchange rate reforms are not best understood as a planner attempting to maximize the welfare of a representative individual. Instead inter-group conflict often plays the lead role. The above-mentioned paper directly inspires my model and the logical structure followed by my argument, even though the conflict in my case is between two groups that have endowments that differ in a different dimension. One group has an endowment that can be traded freely international markets a while the other has a non-tradable endowment. Moreover, there is no direct tax transfer from one group to the other. The endogenous variable of interest in my case is the nominal exchange rate rather than the tax rate. These changes are motivated by my interest in the scenario where the country faces



serious problems on both the fiscal *and* balance of payments fronts, and wishes to reform by shifting to tax collection rather than seigniorage-based financing of deficits. There is a conflict of interest between the tradable sector (which experiences a boost in income following a devaluation) and the non-tradable sector (which experiences a loss of income), and this leads to delay in stabilization if the two groups are sufficiently risk-averse. The focus on the nominal exchange rate and the balance of payments adds to the existing literature in important ways. First, it is of significant practical importance. The conflict of interests between the tradable and nontradable sectors, lies at the heart of Frieden (1991)’s seminal “interest group theory of exchange rate preferences”. Second, focusing on the exchange rate instead of taxes sheds light on additional new aspects of the issue since, unlike taxes: (1) the level of the exchange rate is less determinate; there often exist gaps between the official and open/black markets exchange rates – the latter being more widely accessible – even under fixed exchange rate regimes in developing countries facing external account problems, and (2) changing expectations can modify the exchange rate relevant to market participants even before a change in policy is actually implemented.

The other paper close to the present one, Alfaro (2002), has a similar set-up to the extent that it analyzes an economy with a tradable sector and a non-tradable one. However, the paper significantly diverges in that it employs a cash-in-advance set-up and analyzes the political economy of exchange rate based stabilizations. In contrast to the case here, that paper analyzes a *temporary* stabilization that involves a temporary reduction in the rate of devaluation and a resulting real appreciation to control inflation. This policy hurts the tradable goods owners and has ambiguous effects on the non-tradable good owners. In the present paper, a *permanent* devaluation hurts the relative position of non-tradable producers, who may still agree to stabilization under certain conditions, albeit with a delay that further weakens their relative position.

Finally, as mentioned earlier, Casella and Eichengreen (1996) analyze the role of the timing of the announcement of foreign aid in influencing the likelihood of delay in stabilization. However, unlike the present contribution, they do so in a continuous time “war of attrition” set-up. A major implication is that aid reduces the burden of adjustment on the group that is the first to concede, which expedites concession. In the present set-up, each group has perfect information about the cost structure of the other group so that early announcement does not resolve informational ambiguities and does not induce an earlier concession. Also, their focus is on taxes rather than the exchange rate so that the policy instrument (the tax rate) is completely non-stochastic.

### 3 Intersectoral Conflict: The Model and Analytics

As in Laban and Sturzenegger (1994), consider a two-period set-up but with an economy consisting of two types of agents, one called  $T$  (for owning a tradable

endowment) and the other called  $N$  (for owning a non-tradable endowment). The endowments are received at the beginning of each period. Both types of agents are distributed uniformly along the unit interval and have an aggregate mass of one. The former have an endowment denominated (and transacted) in foreign currency and can conceal part of it abroad through the use of misinvoicing technology that allows them to evade taxes. This technology improves with experience (learning) but at a diminishing rate (low-hanging fruit gets picked first). The  $N$ -agents have an endowment denominated (and transacted) in domestic currency, and do not have access to this misinvoicing technology. Each agent loses part of the endowment to imported inputs (with prices denominated in the foreign currency) that are required for consumption of their endowment.

Thus, there are two key differences between the two sets of agents. The agents with a tradable endowment get better at concealing their earnings over time, increasing the costs of inflation for  $N$ -agents. Second, the currencies that the endowments and imports are priced in ensure that devaluations increase the relative income of  $T$ -agents. These differences, in turn, allow us to explore the role of the exchange rate (measured as the domestic currency price of foreign currency so that a devaluation means an upward movement in the level). Each agent consumes their endowment net of taxes, concealment, and import costs over each time period.

The economy faces inflation, fiscal deficits, and balance of payments issues. In order to tackle the first two, the adjustment program involves bringing everyone under a pre-announced tax regime with an identical tax rate for both sets of agents. Crucially, addressing the current account deficit requires, in addition, a devaluation of the currency. Given the size of the trade deficit, and given signals from the parallel market, agents know approximately how much devaluation will be required to address underlying macroeconomic issues. However, there is *ex-ante* uncertainty about the new level of the exchange rate after an agreement has been reached on stabilization. This uncertainty could arise from speculation in the currency market or differences in perceptions between private agents and the monetary authority about the credibility of the newly announced level or about the size of the devaluation that will ultimately be required to fix the external deficit. It is important to note that this is the only form of uncertainty in the baseline version of the model (although we introduce endowment uncertainty later). This uncertainty is resolved post-adjustment.

Risk-averse agents decide at the beginning of each period whether or not they are willing to agree to stabilization. If both parties agree, there is stabilization, which involves switching away from the inflationary tax for government revenues and a step devaluation to address balance of payments issues. Both parties have perfect information about the post-stabilization tax rate and rationally negotiate over the new higher exchange rate level to be targeted (given instrument uncertainty mentioned in the previous paragraph). Bargaining is done between the two sets of agents at the aggregate level, i.e., they negotiate as groups. Each group maximizes the expected utility of its representative agent under conditions of perfect foresight.

### 3.1 Stabilization absent uncertainty about income or possibility of IMF aid

Let's start with a scenario where there is no uncertainty in Period 1 about endowment income in the next period. Also, let's for now ignore the possibility of foreign (specifically, IMF) stabilization aid. The pre-stabilization nominal exchange rate  $S_1$  equals one. Both sets of agents have access to international transactions at this level. Stabilization occurs when the two sides reach an agreement. Such an agreement, which involves a subsequent devaluation and shift to non-distortionary taxes, could occur in either of the two periods.

Pre-stabilization, the government finances spending ( $g$ ) through seigniorage revenues so that the budget constraint is given by:

$$g_t = \frac{\varepsilon_t}{1 + \varepsilon_t} (e_N + e_T - \bar{H}_t) \quad (1)$$

where  $e_i$  ( $i = N, T$ ) denotes the respective *gross* endowments,  $\varepsilon_t$  is the rate of gradual crawl of the exchange rate in period  $t$ , and, assuming for simplicity that non-tradable inflation follows international inflation, of overall inflation. The degree of tax base shielding by  $T$ -agents through trade misinvoicing is denoted by  $H$  (which is an aggregation of individual choices of investment into misinvoicing technology,  $h$ ), while  $\frac{\varepsilon_t}{1 + \varepsilon_t}$  represents the (distortionary and endogenous) tax rate.<sup>3</sup> Given  $g$ , the rate of seigniorage tax adjusts in response to the degree of tax evasion chosen by the  $T$ -agents (Proposition 1 below explores the implications). This level of evasion, in turn, is the aggregation of individual choices of costly investment in shielding/misinvoicing technology. Again, as in Laban and Sturzenegger (1994), the cost of using this technology for each  $T$ -agent increases with the amount of shielding and decreases with the aggregated level of accumulated learning about misinvoicing at the beginning of period  $t$ . That is,  $c_t = c(h_t, \bar{H}_t)$ , where  $c_h \geq 0$ ,  $c_{hh} > 0$  (i.e., diminishing returns to learning),  $\bar{H}_t = \sum_{z=0}^{t-1} H_z$ ,  $c_{\bar{H}} < 0$ , and  $c_{h\bar{H}} < 0$ . There is learning-by-doing, so that the stock of knowledge increases while the cost declines with practice. Finally, to exclude equilibria with no financial adaptation, we will also assume that  $c(0, \bar{H}_t) = c_h(0, \bar{H}_t) = 0$ . Equilibrium is characterized by the property that:

$$h_t^* = h_t = \bar{H}_t \quad \forall t \quad (2)$$

The share of the distortionary tax burden borne by  $T$ -agents is defined as:

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<sup>3</sup>One may later notice somewhat of a tension between having a crawling peg while assuming that the exchange rate is fixed in the absence of a stabilization agreement. To clarify things, one can think in terms of capital stock. While investment in capital changes the stock of capital, it is common for macroeconomic models to treat the level of capital as a stock variable whose value is taken as a given in the short run. The crawling peg leads to small changes between periods but not in magnitudes approaching that of a large step devaluation.

$$\theta_t = \frac{e_T - \bar{H}_t}{e_N + e_T - \bar{H}_t} > 0 \quad (3)$$

Post-stabilization, taxes on the endowments fully finance an unchanged level of government spending (where  $\tau$  represents the uniform tax rate).<sup>4</sup>

$$g_t = \tau(e_N + e_T) \quad (4)$$

Each agent loses part of the endowment to imported inputs that are required for consumption of the endowment. Let  $\psi$  denote the share of imported inputs (which is the same for both sets of agents) denominated in foreign currency. Then the net endowment for each  $T$  and  $N$  agent is given by  $(1 - \psi)S_1 e_T$  and  $(1 - \psi S_1)e_N$ , respectively which, since  $S_1 = 1$  before stabilization, simplify to  $(1 - \psi)e_T$  and  $(1 - \psi)e_N$ . The difference in expressions (when  $S_1 \neq 1$ ) reflects the fact that, unlike the non-tradable endowment, the tradables are denominated in foreign currency. This means that a given devaluation (revaluation) hurts (helps) the  $N$ -agents relative to the  $T$ -agents, giving rise to a conflict of interest between the two groups. Agents negotiate at the beginning of each period the size of the devaluation (i.e., after stabilization,  $S_t > 1$ ) that they will agree to as part of the stabilization package to address balance of payments problems.

The distortionary effects of inflation are captured, again as in Laban and Sturzenegger (1994), by an additive decline in each endowment denoted by  $\delta(\varepsilon_t)$ , with  $\delta', \delta'' > 0$ .<sup>5</sup> This means that the respective flow utilities are given by the functions  $U_i(c_i)$ , which are specified to be continuous, twice differentiable, and monotonically increasing, constant absolute risk aversion (CARA) functions.

$$U_T(c_{T,t}) = U [(1 - \psi)S_t e_T - \delta(\varepsilon_t) - \theta_t g - c(h_t, \bar{H}_t)] \quad (5)$$

$$U_N(c_{N,t}) = U [(1 - \psi S_t)e_N - \delta(\varepsilon_t) - (1 - \theta_t)g] \quad (6)$$

The post-stabilization exchange rate agreed upon after bargaining has some uncertainty associated with it. That is, neither group is certain what value  $S$  will actually settle at once a stabilization program is embarked upon. As alluded to earlier, the variance around the negotiated levels could arise from different sources including (actual or perceived) differences of opinion about the appropriate exchange rate between the political and monetary authorities, the potential inadequacy of any initially agreed upon depreciation to the objective assigned (i.e., improved balance of payments), an explicit policy to let the exchange rate move between a narrow band after the initial large devaluation, and speculative pressures, among other factors. This means that the bargaining occurs over risk-adjusted expected values. The resulting risk premium  $R$  plays a

<sup>4</sup>The tax rate is specified here is on the physical endowments rather than on their values. One could see this as the “iceberg” cost often employed in trade models. Alternatively, one could specify in terms of prices or values but that forces us to keep track of various valuation effects that complicate the expressions without adding anything crucial to the analysis.

<sup>5</sup>See Tommasi (1994) for a discussion of some of the distortionary effects of inflationary taxation.

key role in determining the conditions under which agreement takes place. Under the assumption of normally distributed expected values the risk premium can be written as:

$$R = \eta\sigma^2/2 \quad (7)$$

where  $\sigma$  is the standard deviation and  $\eta$  is a parameter representing the coefficient of absolute risk aversion. Thus, depending on the identity of the bargaining party, the *certainty equivalent* exchange rate is given by  $S \pm \eta\sigma^2/2$ .

The rest of this section shows the key role of the degree of risk aversion in determining the conditions under which stabilization will occur in Period 2, and given satisfaction of those conditions, the likelihood of delay in stabilization in Period 1. The presentation of proofs in the baseline version will follow Laban and Sturzenegger (1994) in its broad contours. However, instead of the tax rate, it is the exchange rate that is endogenous and, in addition to the risk premium, I explore the role of imported inputs. Later, I incorporate extensions including endowment uncertainty, the possibility of IMF adjustment aid, and a conditionality-mandated exchange rate in Period 2. Table below helps provide a big picture guide to help keep track of the differences between this and later sections.

Table 1: Flow of the analysis through sub-sections

	Section 3.1	Section 3.2	Section 3.3
Possibility of recession in Period 2	No	Yes	No
Possibility of IMF program in Period 2	No	Yes	Yes
Exchange rate uncertainty in Period 2	Yes	Yes	No
Open market premium in Period 1	No	No	Yes

*Proposition 1: Given that the assumptions on  $U(\cdot)$  and  $c(h, K)$  are satisfied, if stabilization is not achieved in either period, we have for the stable equilibrium: (i)  $h_1^* > 0$  (positive equilibrium level of concealment), (ii)  $h_2^* > h_1^*$  (i.e., increasing misinvoicing with time), (iii)  $\varepsilon_2 > \varepsilon_1$  (endogenously increasing inflation), and (iv)  $\theta_2 < \theta_1$  (increasing relative tax burden on  $N$ -agents with time).*

Proof: The  $T$ -agents maximize their lifetime utility employing the level of technological adaptation for misinvoicing in each period as the choice variable.

$$\begin{aligned} \max_{\{f_1, f_2\}} U & \left[ (1 - \psi)e_T - c(h_1, \bar{H}_1) - \delta(\varepsilon_1) - \frac{\varepsilon_1}{1 + \varepsilon_1}\theta_1 g \right] \\ & + \gamma \left[ U(1 - \psi)e_T - c(h_2, \bar{H}_2) - \delta(\varepsilon_2) - \frac{\varepsilon_2}{1 + \varepsilon_2}(1 - \theta_2)g \right] \end{aligned}$$

where  $\gamma$  ( $< 1$ ) is the subjective discount factor. The first order conditions are:

$$\begin{aligned} U' \left( -c_h + \frac{\varepsilon_t}{1 + \varepsilon_t} \right) &\leq 0 \text{ if } h_t = 0, \\ \text{and } U' \left( -c_h + \frac{\varepsilon_t}{1 + \varepsilon_t} \right) &= 0 \text{ if } h_t > 0, t = 1, 2 \end{aligned} \quad (8)$$

Now since  $g > 0$ , therefore, equation (1) and (3) ensure that  $\frac{\varepsilon_i}{1 + \varepsilon_i} > 0$ . Also,  $c_h(0, \bar{H}_t) = 0$  along with (8) ensure that  $h_t = 0$  is not a solution; thus Proposition 1 (i) follows for  $t = 1, 2$ . In equilibrium,  $h = h^* = \bar{H}$ . Also, based on the first order condition, and the aggregate level of financial adaptation,

$$\begin{aligned} \frac{dh}{d\bar{H}} &= \frac{g}{(e_N + e_T - H_t)^2 c_{hh}} = \frac{1}{g} \frac{c_h^2}{c_{hh}} > 0 \\ \frac{d^2h}{d\bar{H}^2} &= \frac{1}{g} \frac{c_h \left( 2 - \frac{c_h c_{hhh}}{c_{hh}} \right)}{c_{hh}} > 0 \end{aligned} \quad (9)$$

under our maintained assumptions about the signs of the partials and the additional (sufficient but not necessary) assumption that  $c_{hhh} < 0$ .

There are zero, one, or two possible equilibria depending on the initial stock of knowledge.<sup>6</sup> In the case with 2 equilibria, the lower inflation one is stable, and in the neighborhood of this equilibrium,  $dh^*/d\bar{H} > 0$ .<sup>7</sup> Given (i), and the fact that the stock of knowledge is increasing in accumulated innovation, this proves 1 (ii) for the stable case. And since  $h_2^*(= H_2^*) > h_1^*(= H_1^*)$ , equations (1) and (3) imply Propositions 1 (iii) and 1 (iv), respectively. ■

The optimal level of misinvoicing increases over time. With increased concealment of tradable endowment, the need for seigniorage to finance the given level of government spending rises, as does the burden of taxation on the  $N$ -agents. We have accelerating inflation and a rising incentive for the latter to reach a deal to stabilize.

*Proposition 2: Provided that  $2R \leq -\frac{\tau}{\psi(1-\psi)} + \frac{\delta(\varepsilon_2) + (1-\theta_2)g}{\psi e_N} + \frac{\delta(\varepsilon_2) - \theta_2 g - c(h_2^*, \bar{H})}{(1-\psi)e_T}$ , the set of possible agreements to achieve stabilization in Period 2 is non-empty.*

<sup>6</sup>See Laban and Sturzenegger (1994) for a more detailed graphical treatment of the multiple equilibria that arise in a similar case.

<sup>7</sup>In equilibrium, where  $h = h^* = H^*$ , we can use (8) to derive:

$$\frac{dh^*}{d\bar{H}} = \frac{c_h \bar{H}}{(e_N + e_T - H)^2 - c_{hh}} > 0$$

and, since, in the neighborhood of the stable equilibrium,  $dh/dH < 1$ , so that (9) implies that  $\frac{g}{(e_N + e_T - H)^2} < c_{hh}$ , this yields a positive sign for  $dh^*/d\bar{H}$ .

Proof: Both sets of agents will agree to stabilize if their utility from stabilization in Period 2 exceeds that from not stabilizing. For  $N$ -agents, based on equation (6) and the definition of the risk premium in equation (7), this can formally be expressed as follows:

$$U \{ [1 - (S_{2N} + R)\psi - \tau] e_N \} \geq U [(1 - \psi)e_N - \delta(\varepsilon_2) - (1 - \theta_2)g]$$

where  $S_{2N}$  is the relevant value of the exchange rate for  $N$ -agents in Period 2. Or, isolating the exchange rate, it must be true that:

$$S_{2N} \leq -R + 1 - \frac{\tau}{\psi} + \frac{\delta(\varepsilon_2) + (1 - \theta_2)g}{\psi e_N} \quad (10)$$

Similarly, for  $T$ -agents, based on equation (5),

$$U \{ [(1 - \psi)(S_{2T} - R) - \tau] e_T \} \geq U [(1 - \psi)e_T - \delta(\varepsilon_2) - \theta_2 g - c(h_2^*, \bar{H}_2)]$$

or,

$$S_{2T} \geq R + 1 + \frac{\tau}{1 - \psi} - \frac{\delta(\varepsilon_2) + \theta_2 g + c(h_2^*, \bar{H}_2)}{(1 - \psi)e_T} \quad (11)$$

Combining (10) and (11), recalling that the utility function is monotonically increasing, and recognizing that, for an agreement to be feasible, the maximum exchange rate that the  $N$ -agents are willing to allow must be at least as high as the minimum devaluation that the  $T$ -agents demand, i.e.  $S_{2N} \geq S_{2T}$ , yields the condition under which a non-empty set of agreements exists.

$$2R \leq -\frac{\tau}{\psi(1 - \psi)} + \frac{\delta(\varepsilon_2) + (1 - \theta_2)g}{\psi e_N} + \frac{\delta(\varepsilon_2) + \theta_2 g + c(h_2^*, \bar{H}_2)}{(1 - \psi)e_T} \quad (12)$$

■  
 Uncertainty about the future level of the exchange rate among risk-averse actors plays a crucial role here. Stabilization occurring in Period 2 is made more likely by a lower risk premium, and higher distortionary costs in either sector. The aggregate gains of stabilization to both sets of agents must outweigh the uncertainty associated with the degree of devaluation. The more risk averse the agents, the worse must be the pre-stabilization distortionary burden (and the lower the post stabilization taxes) for them to take the leap of faith that stabilization involves.

What is the role played by the share of imported inputs, which after all is of central interest here?

*Corollary 1: Provided that their relative foreign currency burden of imports is low enough so that  $\frac{\psi}{1 - \psi} < \frac{e_T}{e_N}$ , a higher pre-stabilization tax burden for  $N$ -agents makes stabilization in Period 2 more likely.*

*Proof:* Mathematically, the right hand side of (12) can easily be shown to increase with  $1 - \theta_2$  if  $\psi e_N < (1 - \psi)e_T$  and decrease otherwise. ■

Intuitively, recall that a devaluation reduces  $N$ -agent consumption by  $\psi e_N$  while increasing  $T$ -agent consumption by  $(1 - \psi)e_T$ . Thus, the effect of the elimination of in relative pre-stabilization distortionary tax burdens depends on the share of imported inputs. The higher this share, the greater the relative damage to  $N$ -agents from a devaluation, and hence the less likely it is that they will agree to stabilize.

*Corollary 2: Provided that: (a)  $\delta(\varepsilon_2) + (1 - \theta_2)g > \tau e_N$ , i.e., the distortionary tax burden pre-stabilization exceeds the post-stabilization tax costs to the  $N$ -sector, and (b)  $S_2 > 1$ , i.e., a devaluation follows an agreement, a higher share of imported inputs shrinks the possible set of agreements in Period 2 for a given risk premium.*

Proof: Perhaps the best way to show this is by recalling that policy makers make devaluation a precondition for stabilization in light of the balance of payments situation, and by then considering (12) written in a slightly different form:

$$R < 1 + \frac{\delta(\varepsilon_2) + (1 - \theta_2)g - \tau e_N}{\psi e_N} - \left[ R + 1 - \frac{\delta(\varepsilon_2) + \theta_2 g + c(h_2^*, K) - \tau e_T}{(1 - \psi)e_T} \right] \quad (13)$$

Given a step devaluation as a necessary background condition, the term in the square brackets on the right hand side – which is also the right hand side of inequality (11) – must by necessity be greater than one. Since  $R > 0$ , this means in turn that  $\delta(\varepsilon_2) + (1 - \theta_2)g > \tau e_N$  is a necessary condition for stabilization. Given the satisfaction of this condition (and that  $S_2 > 1$ ), the second term on the right hand side of (13) implies that a higher share of imported inputs reduces the likelihood of an agreement. ■

$N$ -agents are hurt by a devaluation in proportion to the intermediate share of output. If the share of imported inputs is high enough, the costs of a step devaluation for them outweigh the costs from inflation in the absence of stabilization.

For later reference, let's denote the exchange rate agreed on for stabilization in Period 2 by  $S_2^*$  ( $> 1$ ). Thus, for stabilization to occur in Period 2,  $S_{2N} \geq S_2^* \geq S_{2T} > 1$ .

*Proposition 3: Given that  $\varepsilon_2 > \varepsilon_1$ , and  $\theta_2 < \theta_1$  from Proposition 1, the relative equilibrium position of  $N$ -agents in terms of the exchange rate deteriorates over time (i.e.,  $S_2^* > S_1^*$ ).*

Proof: The proof follows from the result that positive financial adaptation (greater misinvoicing) in Period 1 results in greater inflation in order to finance the higher tax burden in Period 2. To understand this, consider that  $N$ -agents will be willing to stabilize in Period 1 rather than Period 2 if their discounted expected utility from doing so is greater. That is,



$$(1 + \gamma)U \{ [1 - \psi (S_{1N} + R) - \tau] e_N \} \geq U [(1 - \psi)e_N - \delta(\varepsilon_1) - (1 - \theta_1)g] \\ + \gamma U \{ [1 - \psi(S_2^* + R) - \tau] e_N \}$$

Let  $\bar{S}_{1N}$  be the maximum jump devaluation that  $N$ -agents are willing to accept in Period 1 given that there will be stabilization in Period 2. Then the expression above will hold with equality.

$$(1 + \gamma)U \{ [1 - \psi (\bar{S}_{1N} + R) - \tau] e_N \} = U [(1 - \psi)e_N - \delta(\varepsilon_1) - (1 - \theta_1)g] \\ + \gamma U \{ [1 - \psi(S_2^* + R) - \tau] e_N \} \quad (14)$$

Inequality (10) tells us that:

$$[1 - \psi (\bar{S}_{2N} + R) - \tau] e_N = (1 - \psi)e_N - \delta(\varepsilon_2) - (1 - \theta_2)g$$

Using this equation and the results from Proposition 1, namely,  $\varepsilon_2 > \varepsilon_1$ , and  $\theta_2 < \theta_1$ , allows us to rewrite and simplify expression (14):

$$(1 + \gamma)U \{ [1 - \psi (\bar{S}_{1N} + R) - \tau] e_N \} > (1 + \gamma)U [1 - \psi(S_2^* + R) - \tau] e_N$$

or,

$$\bar{S}_{1N} < S_2^*$$

and, since  $\bar{S}_{1N}$  is the maximum devaluation acceptable to  $N$ -agents,  $S_1^* < \bar{S}_{1N}$ , so that

$$S_1^* < S_2^* \blacksquare \quad (15)$$

With time, the  $T$ -agents are able to conceal a greater proportion of their income abroad so that, barring stabilization, their share of the distortionary tax burden is lower in Period 2, improving their bargaining position.

*Proposition 4: If  $2R > -\frac{\tau}{\psi(1-\psi)} + \frac{\delta(\varepsilon_1) + (1-\theta_1)g}{\psi e_N} + \frac{\delta(\varepsilon_1) + \theta_1 g + c(h_1^*, \bar{H}_1)}{(1-\psi)e_T}$ , it is an equilibrium strategy to delay agreement even as the  $N$ -agents lose bargaining power over time and there is a non-empty set of possible agreements in Period 2.*

Proof: Again, let  $\bar{S}_{1N}$  be the implied devaluation that leaves  $N$ -agents indifferent between agreeing or not to stabilization in Period 1, *given* that stabilization is desirable in Period 2. Then  $\bar{S}_{1N}$  is the solution to:

$$(1 + \gamma)U \{ [1 - \psi (\bar{S}_{1N} + R) - \tau] e_N \} = \\ U \{ (1 - \psi) e_N - \delta(\varepsilon_1) - (1 - \theta_1)g \} + \gamma U \{ [1 - \psi (S_2^* + R) - \tau] e_N \} \quad (16)$$

Similarly, the implied devaluation that leaves  $T$ -agents indifferent,  $\underline{S}_{1T}$  is give by:

$$(1 + \gamma)U \{[(1 - \psi - \tau)(\underline{S}_{1T} - R) - \tau]e_T\} = U \{(1 - \psi)e_T - \delta(\varepsilon_1) - \theta_1g - c(h_1, \bar{H}_1)\} + \gamma U \{[(1 - \psi)(S_2^* - R) - \tau]e_T\} \quad (17)$$

Linearizing after assuming that, for each group, the difference between net endowments is small under the different tax regimes, and then solving for the two exchange rates, yields,

$$\bar{S}_{1N} \approx \frac{1}{1 + \gamma} \left\{ -R + 1 - \frac{\tau}{\psi} + \frac{\delta(\varepsilon_1) + (1 - \theta_1)g}{\psi e_N} + \gamma S_2^* \right\} \quad (18)$$

$$\underline{S}_{1T} \approx \frac{1}{1 + \gamma} \left\{ R + 1 + \frac{\tau}{1 - \psi} - \frac{\delta(\varepsilon_1) + \theta_1g + c(h_1^*, \bar{H}_1)}{(1 - \psi)e_T} + \gamma S_2^* \right\} \quad (19)$$

and recognizing that a delay in stabilization requires that  $\bar{S}_{1N} < \underline{S}_{1T}$ , yields the following condition for delay to be an equilibrium strategy:

$$2R > -\frac{\tau}{\psi(1 - \psi)} + \frac{\delta(\varepsilon_1) + (1 - \theta_1)g}{\psi e_N} + \frac{\delta(\varepsilon_1) + \theta_1g + c(h_1^*, \bar{H}_1)}{(1 - \psi)e_T} \quad \blacksquare \quad (20)$$

Again, the degree of exchange rate uncertainty plays a key role in delay. In the case of low uncertainty, delay is unlikely. Intuitively, forward-looking  $N$ -agents realize that their bargaining position deteriorates over time in the absence of stabilization and, therefore, have an incentive to reach an agreement. With high uncertainty about the post-stabilization exchange rate, however, the costs of inflation are dominated by the potential cost of agreeing to a devaluation which raises imported input costs.

How does the share of imported inputs influence the likelihood of delay?

*Proposition 5: As long as  $S_t > 1$ , that is, stabilization involves a devaluation, a higher imported input share  $\psi$  increases the likelihood of delay in Period 1 if  $\delta(\varepsilon_1) + (1 - \theta_1)g > \tau e_N$  (the costs of inflation exceed the post-stabilization tax burden for  $N$ -agents).*

Proof: Expression (20) can be rewritten as:

$$R > \left[ 1 + \frac{\delta(\varepsilon_1) + (1 - \theta_1)g - \tau e_N}{\psi e_N} + \gamma S_2^* \right] - \left\{ R + 1 + \frac{\tau e_T - [\delta(\varepsilon_1) + \theta_1g + c(h_1^*, \bar{H}_1)]}{(1 - \psi)e_T} + \gamma S_2^* \right\} \quad (21)$$

From (19), we know that the expression in the curly parentheses must be greater than  $1 + \gamma$  as long as there is a devaluation ( $S_t > 1$ ). A look at the

expression in the first set of square parentheses on the right hand side reveals that, as long as  $\delta(\varepsilon_1) + (1 - \theta_1)g > \tau e_N$ , this term is greater than 1. This, in turn, means that a higher value of  $\psi$  renders the satisfaction of (21) more likely. ■

Expressions (18) and (19) tell us that an increase in  $\psi$  lowers the level of  $S$  at which both parties are indifferent if pre-stabilization inflation costs exceed their post-stabilization tax burden, and reduce that level in the opposite case. Intuitively, higher import intensity raises the cost of a devaluation for  $N$ -agents relative to the distortionary costs of inflation, making them more likely to delay agreement.

To see the role of uncertainty starkly, consider the case where the burden of post-stabilization taxes on  $N$ -agents exactly equals that of the pre-stabilization distortionary costs (i.e.,  $\tau e_T = [\delta(\varepsilon_2) + \theta_1 g + c(h_1^*, \bar{H}_1)]$ ). Then, if  $R = 0$ , expression (21) tells us that there is no delay in the presence of a devaluation as long as  $\delta(\varepsilon_1) + (1 - \theta_1)g > \tau e_N$ . If stabilization involves a devaluation, delay will not happen unless there is exchange rate uncertainty.

To summarize the results from this sub-section, in our baseline set-up, a high level of uncertainty will lead to delay in Period 1 and agreement on a level of the exchange rate in Period 2 in the presence of high inflation if the uncertainty associated with the level of the exchange rate is high enough to outweigh the costs of inflation in Period 1 but not sufficiently high to outweigh those costs in Period 2. The ability of the  $T$ -agents to adapt to the inflationary tax underlies the dynamics of the model. Increased imported input use lowers the ceiling for the exchange rate that is acceptable to the  $N$ -agents, making delay more likely at a given level of uncertainty. In the presence of a step devaluation, and relatively high inflation costs, a non-zero risk premium is a necessary condition for a delay.<sup>8</sup>

As mentioned in earlier sections, IMF programs often accompany macroeconomic adjustment in developing countries. Such programs, moreover, typically come with an agreement in favor of a large devaluation to address balance of payment concerns. The next section explores these important aspects.

### 3.2 Income uncertainty and the possibility of foreign aid

The last subsection focused on the role of uncertainty and imported inputs. I now add two new elements: (1) the possibility of foreign (say IMF) aid following a stabilization agreement, and (2) an expected possible recession (decline in endowment) in Period 2.

Many countries eventually opt for an IMF adjustment program once they are at the precipice of a major downturn. Suppose that there is a probability  $\lambda$  of a symmetrical fall in endowments in Period 2. That is, the expected endowments

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<sup>8</sup>Notice that, as in Laban and Sturzenegger (1994), a social planner who weighs the utility of both groups will have no incentive to pursue financial adaptation since it simply increases the rate of distortionary inflation.

in that period are given by:

$$e_{2i} = \lambda\alpha e_i + (1 - \lambda)e_i \equiv Ae_i; \quad i = N, T \quad (22)$$

where  $\alpha < 1$  and  $A \equiv \lambda\alpha + (1 - \lambda)$  represents the expected endowment in Period 2. Moreover, suppose that if there is a recession (i.e., things are bad), *and* if stabilization is agreed upon between the two groups, then IMF aid arrives. Put differently, agents negotiate the exchange rate knowing that IMF aid will arrive following an agreement and conditional on the occurrence of a recession. This aid uniformly reduces the post-stabilization tax burden by a factor  $1 - \beta$  (where  $0 < \beta < 1$ ). Thus, if there is no recession, (4) will continue to apply. Otherwise, in Period 2, with IMF aid,

$$g_t = \beta\tau(e_N + e_T)$$

Thus, the expected effective tax rate multiple conditional on agreement being reached in Period 2 is given by:

$$B = [1 - \lambda(1 - \alpha\beta)]$$

Note that,  $0 < B < A < 1$  and keep in mind that  $\beta \neq 1$  iff  $\alpha < 1$ . Nothing else changes relative to the baseline set-up and the two sets of agents negotiate over the level of the exchange rate following stabilization, and in an environment of uncertainty regarding the post-stabilization value of the exchange rate. In the next sub-section, we will stipulate that the IMF dictates the level of the nominal exchange rate which is pre-announced and known to everyone.

It can be shown to still be the case that inflation increases while the pre-stabilization distortionary tax share of the  $N$ -agents increases over time; nothing changes here. Moreover, Proposition 3 from the previous subsection continues to hold with the difference that the equilibrium position of  $N$ -agents in terms of the exchange rate now deteriorates even more from Period 1 to Period 2 (see the Appendix for the proof). As shown below, for there to be a non-empty set of agreements in Period 2 (see Proposition 2 in the previous subsection), the respective exchange rates and the aggregate condition are now somewhat different.

All of which leads to our next two propositions.

*Proposition 6: The possibility of foreign aid in Period 2 (i.e.  $\beta < 1$ ): (i) expands the possible set of values of  $S$  which allow an agreement in Period 2, and (ii) provides the necessary medium through which expectations of a recession (i.e.,  $\alpha < 1$ ) allow a similar expansion of the possible set of values of  $S$ , and (iii) increases the likelihood of an agreement at a given level of  $R$ .*

*Proof:* To prove that the possibility of foreign aid expands room for agreement in Period 2, consider that the modified conditions for such an agreement corresponding to (10), (11), and (12) are as follows. For  $N$ -agents:

$$U \{[1 - \psi(S_{2N} + R)A - B\tau] e_N\} \geq U \{(1 - \psi)Ae_N - \delta(\varepsilon_2) - (1 - \theta_2)g\}$$

$$\Rightarrow S_{2N} \leq -R + 1 - \frac{\tau}{\psi} \frac{B}{A} + \frac{\delta(\varepsilon_2) + (1 - \theta_2)g}{\psi A e_N} \quad (23)$$

For  $T$ -agents,

$$U \{[(1 - \psi)(S_{2T} - R)A - B\tau] e_T\} \geq U [(1 - \psi)Ae_T - c(h_2, \bar{H}_2) - \delta(\varepsilon_2) - \theta_2g]$$

$$\Rightarrow S_{2T} \geq R + 1 + \frac{\tau}{1 - \psi} \frac{B}{A} - \frac{\delta(\varepsilon_2) + \theta_2g + c(h_2^*, K)}{(1 - \psi)Ae_T} \quad (24)$$

and the aggregate condition corresponding to (12) becomes:

$$2R \leq -\frac{\tau}{\psi(1 - \psi)} \frac{B}{A} + \frac{\delta(\varepsilon_2) + (1 - \theta_2)g}{\psi e_N} + \frac{\delta(\varepsilon_2) + \theta_2g + c(h_2^*, K)}{(1 - \psi)e_T} \quad (25)$$

The difference from the corresponding expressions (10), (11), and (12) in the previous subsection is the presence of the term  $B/A$  ( $< 1$ ) on the right hand sides. The possibility of IMF aid in the case of an agreement raises the maximum level of  $S$  that  $N$ -agents are willing to allow while reducing the minimum level acceptable to  $T$ -agents. This expands the set of possible values of the exchange rate over which an agreement can be reached, making stabilization in Period 2 more likely, and proving (i).

To establish (ii), notice that, once the possibility of foreign aid is removed, i.e.,  $\beta = 1$ , then  $B/A = 1$ , which yields the same expression as the corresponding expression (12) in the previous subsection where foreign aid was absent. Thus, expectation of a recession does not in itself influence the likelihood of agreement in Period 2 unless  $\beta < 1$ .

Finally, the presence of the term  $B/A$  ( $< 1$ ) in (25), but not in (12), proves (iii). ■

Intuitively, the probability of a recession, does not by itself affect the values of the exchange rate that leave the two sets of agents indifferent unless foreign aid is conditional on the occurrence of that recession. This means that the two sides relax their bargaining positions in Period 2 if and only if foreign aid (which lowers their tax burdens) is a possibility.

Do the two sides react similarly in Period 1 by relaxing their bargaining positions in response to the possibility of foreign aid conditional on a recession in Period 2?

*Proposition 7: Given that foreign aid is conditional on a recession, i.e.,  $\beta \neq 1$  iff  $\alpha < 1$ , the possibility of a recession in Period 2 (i.e.,  $\alpha < 1$ ) increases the likelihood, at a given level of  $R$ , that an agreement to stabilize will be delayed in Period 1.*

The proof builds on expression (25) and follows the proof for Proposition 4 from the previous subsection. Given the possibility of aid,  $N$ - and  $T$ -agents,

respectively, will be indifferent if:

$$U \{ [1 - \psi (\bar{S}_{1N} + R) - \tau] e_N \} + \gamma U \{ [1 - \psi (\bar{S}_{1N} + R) A - \tau] e_N \} = \\ U \{ (1 - \psi) e_N - \delta(\varepsilon_1) - (1 - \theta_1)g \} + \gamma U \{ [1 - \psi (S_2^* + R) A - B\tau] e_N \}$$

$$U \{ [(1 - \psi) (\underline{S}_{1T} - R) - \tau] e_T \} + \gamma U \{ [(1 - \psi) (\underline{S}_{1T} - R) A - \tau] e_T \} = \\ U \{ (1 - \psi) e_T - \delta(\varepsilon_1) - \theta_1 g - c(h_1, \bar{H}_1) \} + \gamma U \{ [(1 - \psi) (S_2^* - R) A - B\tau] e_T \}$$

Linearizing and simplifying as in the previous section, yields the indifference levels corresponding to (18) and (19) and the condition under which delay occurs.

$$\bar{S}_{1N} = \frac{1}{1 + \gamma A} \left\{ -R + 1 - \frac{[1 + (1 - B)\gamma] \tau}{\psi} + \frac{\delta(\varepsilon_1) + (1 - \theta_1)g}{\psi e_N} + \gamma S_2^* \right\} \quad (26)$$

$$\underline{S}_{1T} = \frac{1}{1 + \gamma A} \left\{ R + 1 + \frac{[1 + (1 - B)\gamma] \tau}{1 - \psi} - \frac{\delta(\varepsilon_1) + \theta_1 g + c(h_1^*, K)}{(1 - \psi) e_T} + \gamma S_2^* \right\} \quad (27)$$

$$2R > - \frac{[1 + (1 - B)\gamma] \tau}{\psi(1 - \psi)} + \frac{\delta(\varepsilon_1) + (1 - \theta_1)g}{\psi e_N} + \frac{\delta(\varepsilon_1) + \theta_1 g + c(h_1^*, \bar{H})}{(1 - \psi) e_T} \quad (28)$$

To establish the proposition, compare the expressions (20) where  $B = 1$  and (28), recall that  $\alpha < 1 \Rightarrow \beta < 1$  so that  $B < 1$ , which implies that, conditional on a recession, the right hand side of (28) is lesser in magnitude. Alternatively, if  $\alpha = 1$  so that  $\beta = 1$ , then the value of  $B$  returns to 1 and the likelihood of delay is unchanged. ■

In sum, this subsection has established that, while foreign aid conditional on a recession expands the set of exchange rate values that allow for an agreement in Period 2, it also increases the chances of a delay in stabilization in Period 1. Intuitively, the expectation that things will be bad enough in Period 2 so as to necessitate foreign aid increases the temptation to delay an agreement. Once delayed, however, it also makes an agreement more likely in Period 2 since aid alleviates some of the pain of adjustment.

### 3.3 Exchange Rate Expectations and Pre-Announced Aid

Some countries have internal negotiations in conditions where it is already clear that the IMF will have to be approached in the near future for stabilization funds. Moreover, the broad contours of IMF conditionality, such as steps to change the fiscal outlook and to address balance of payments problems with the help of exchange rate changes are more or less known due to past history with the institution and ongoing negotiations.

Consider a situation of foreign exchange scarcity that forces the government to strictly limit foreign currency access at the official rate. A (possibly illegal) parallel open market exists where expectations of jump changes in the exchange rate can influence its current level. To keep things simple, suppose that  $N$ -agents are forced by regulations to purchase foreign currency to pay for imports from this market while  $T$ -agents can purchase currency at the official rate (which, at  $S = 1$ , is lower than the market rate in period 1). This could be either due to laws that allow privileged access to foreign currency for tradable producers – a not uncommon phenomenon – or because the  $T$ -agents can employ their foreign currency savings deposited in foreign banks (partly through misinvoicing). Suppose too that it is essentially certain that, unless there is stabilization in Period 1, the IMF will have to be approached in Period 2, and that the IMF will demand a devaluation to a level  $S_2^{IMF}$  (which could correspond to the level that eliminates the parallel market premium) and consequent unification of the dual currency market. Thus, there is now no bargaining over the exchange rate between  $T$ - and  $N$ -agents in Period 2, and there is no uncertainty about the future level of the exchange rate.

How will this affect the parallel market exchange rate and the chances of an agreement in Period 1? We first need to determine what the market exchange rate in Period 1 will be *given* expectations of devaluation in Period 2. Some version of interest parity would be a good candidate but hard to justify rigorously in the absence of domestic and foreign assets financial assets in our framework. As an approximation, suppose that the level of the exchange rate in the parallel market is  $1 + x$ , where  $x$  is the open market premium, and  $1 < 1 + x < S_2^{IMF}$ . Assume also, again plausibly, that this expected depreciation is a positive function of the exchange rate that the IMF is known to prefer for Period 2 if there is no stabilization in Period 1, i.e.,  $x = x(S_2^{IMF})$ ,  $x' > 0$ .

To summarize, the set-up now is different from the previous two subsections in two respects: (1) the uncertainty about  $S_2$  is now gone, and (2) the open market exchange rate in Period 1,  $S_1$ , is now a function of the exchange rate level that the IMF is known to recommend as part of stabilization in Period 2. In order to isolate the effects of the removal of exchange rate uncertainty, I set  $\beta$  and  $\alpha$  from section 3.2 back to 1 (as in section 3.1).

*Proposition 8: Given  $\gamma$ ,  $x > 0$ , the presence of a known, conditionality-required level of the exchange rate  $S_2^{IMF}$  that would remove exchange rate uncertainty in Period 2 has ambiguous effects on the likelihood of delay.*

Proof: Since there is now no negotiating over, or uncertainty about,  $S_2$ , the only interesting change is that Proposition 4 from Section 3.1 needs to be altered.<sup>9</sup> The expressions that define indifference for each set of agents now become:

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<sup>9</sup>That is, Propositions (1)-(3) are unaffected and continue to hold.

$$(1 + \gamma)U \{ [1 - \psi (\bar{S}_{1N} + R) - \tau] e_N \} = \\ U \{ [1 - \psi(1 + x(S_2^{IMF}))] e_N - \delta(\varepsilon_1) - (1 - \theta_1)g \} + \gamma U \{ [1 - \psi S_2^{IMF} - \tau] e_N \} \quad (29)$$

$$(1 + \gamma)U \{ [(1 - \psi)(\underline{S}_{1T} - R) - \tau] e_T \} = \\ U \{ (1 - \psi)e_T - \delta(\varepsilon_1) - \theta_1 g - c(h_1^*, \bar{H}_1) \} + \gamma U \{ [(1 - \psi)S_2^{IMF} - \tau] e_T \} \quad (30)$$

Again, linearizing and solving for the two exchange rates ( $\bar{S}_{1N}$  and  $\underline{S}_{1T}$ ) yields,

$$\bar{S}_{1N} = -R + \frac{1}{1 + \gamma} \left\{ (1 + x) - \frac{\tau}{\psi} + \frac{\delta(\varepsilon_1) + (1 - \theta_1)g}{\psi e_N} + \gamma S_2^{IMF} \right\} \quad (31)$$

$$\underline{S}_{1T} = R + \frac{1}{1 + \gamma} \left\{ 1 + \frac{\tau}{1 - \psi} - \frac{\delta(\varepsilon_1) + \theta_1 g + c(h_1^*, K)}{\psi e_N} + \gamma S_2^{IMF} \right\} \quad (32)$$

and recognizing that a delay in stabilization requires that  $\bar{S}_{1N} < \underline{S}_{1T}$ , yields the following condition:

$$2R > \frac{1}{1 + \gamma} \left\{ x (S_2^{IMF}) - \frac{\tau}{\psi(1 - \psi)} + \frac{\delta(\varepsilon_1) + (1 - \theta_1)g}{\psi e_N} + \frac{\delta(\varepsilon_1) + \theta_1 g + c(h_1^*, K)}{(1 - \psi)e_T} \right\} \quad (33)$$

As long as the discount rate  $\gamma$  and the premium  $x$  are positive, the right hand side of the expression above may be lesser, equal to, or greater than that from (20). ■

Comparing with the corresponding expressions in Section 3.1, i.e., (18) and (19), reveals that the removal of uncertainty about the exchange rate in Period 2 has ambiguous effects on  $\bar{S}_{1N}$  while increasing  $\underline{S}_{1T}$ .

The overall impact on the likelihood of delay is ambiguous. First recall that the uncertainty about the level of the exchange rate should stabilization occur in Period 1 still exists. Intuitively, now there are two opposing effects of removing uncertainty about  $S_2$  and, therefore, causing movements today in the parallel market. The presence of an open market premium in Period 1 on the exchange rate makes it less costly for  $N$ -agents to agree to a depreciation in Period 1. It makes less sense to desire a delay if part of the costs of an agreement have already been borne in Period 1. On the other hand, the removal of exchange rate uncertainty in Period 2 and the resulting higher open market exchange rate prevalent in Period 1 reduces the potential cost of delaying.<sup>10</sup> The net impact on

<sup>10</sup>That is, instrument uncertainty now only has an effect on the current period utility but not on the discounted second period utility.



the likelihood of delay will be the sum of these two forces. Perhaps surprisingly, the higher the exchange rate known to be required under the conditionalities of the program, the less likely a delay. Intuitively, if the parallel market rate available to  $N$ -agents already prices in the possibility of an agreement in Period 2, the cost of agreeing to stabilization today declines.

## 4 Concluding Remarks

Large sustained fiscal and balance of payments deficits culminating in home-grown or IMF-influenced stabilization programs are a common occurrence in developing countries. Often these programs seem to come at the last possible moment when the economy is on the verge of or in the middle of a crisis. This applies to fiscal crises as well as exchange rate crises. Interestingly enough, this happens even though almost everyone can see the crises approaching, and some of the participants opposed to changes in exchange rate regimes oppose reforms in spite of the recognition on their part that delay could make their position even worse when the much needed reforms are eventually carried out. Why then the push to delay?

This paper builds on existing literature by focusing on the political economy of changes in exchange rate levels and the resulting asymmetric effects on different groups of producers. Producers of tradables and non-tradables have varying preferences over this key price in the macroeconomy. I show that, exchange rate uncertainty, even when different risk-averse groups have perfect foresight otherwise, can dominate the costs of inflation to an extent where it causes delays in stabilization. If inflationary costs are high, fear of the devaluation that follows stabilization increases the likelihood of delay and shrinks the space for agreement in the presence of a high share of imported inputs. IMF aid that reduces the burden of adjustment makes it more appealing to delay an agreement to the date when the aid is dispersed even if that happens following an economic downturn. An IMF conditionality that unifies the official and parallel exchange rate markets at a widely expected level and takes uncertainty out of the picture for the future exchange rate, on the other hand, could have ambiguous effects on the likelihood of delay. That the devaluation is already partly priced into the current exchange rate increases the cost of delay for the group that does not have privileged access at the official exchange rate. That the discounted cost of exchange rate uncertainty in the future is zero encourages delay. Thus, the higher the premium already incorporated into today's parallel market exchange rate, the smaller the likelihood of delay. In sum, the form that foreign aid takes matters.

It would be useful to end by noting some limitations of the analysis here. An important impact of external support is that it can in and of itself increase the credibility of a program. I only take this into account in a limited sense in section 3.3 by postulating that the IMF program removes exchange rate uncertainty in the second period. Also, IMF programs could cause moral hazard problems (Dreher and Vaubel (2004)) that are beyond the scope of this paper.

Finally, an IMF program may make it easier to create a consensus since the country, by signing an agreement, has already committed to macroeconomic discipline under the terms of the program. These and related considerations provide useful avenues for future work.

## 5 Appendix:

This appendix provides the Section 3.2 equivalent of the proof of Proposition 3 from Section 3.1.

$N$ -agents will be willing to stabilize in Period 1 if:

$$(1 + \gamma)U \{[1 - \psi(S_{1N} + R)e_N - \tau]e_N\} \geq U \{[1 - \psi]e_N - \delta(\varepsilon_1) - (1 - \theta_1)g\} + \gamma U \{[1 - \psi(S_2^* + R)A - B\tau]e_N\} \quad (\text{A1})$$

Again,  $\bar{S}_{1N}$  to denote the maximum level acceptable yields the following equation:

$$(1 + \gamma)U \{[1 - \psi(\bar{S}_{1N} + R)e_N - \tau]e_N\} = U \{[1 - \psi]e_N - \delta(\varepsilon_1) - (1 - \theta_1)g\} + \gamma U \{[1 - \psi(S_2^* + R)A - B\tau]e_N\} \quad (\text{A2})$$

Now (23) can be re-written as:

$$\{[1 - \psi(\bar{S}_{2N} + R)A - B\tau]e_N\} = [1 - \psi]Ae_N - \delta(\varepsilon_2) - (1 - \theta_2)g \quad (\text{A3})$$

which, given that  $\varepsilon_2 > \varepsilon_1$ , and  $\theta_2 < \theta_1$  from Proposition 1, means that:

$$\{[1 - \psi(\bar{S}_{2N} + R)A - B\tau]e_N\} < [1 - \psi]Ae_N - \delta(\varepsilon_1) - (1 - \theta_1)g$$

Employing the inequality above to re-write (A2) is an inequality, canceling out terms, and re-arranging yields:

$$\psi(\bar{S}_{1N} + R)e_N + \tau < \psi(S_2^* + R)A + B\tau$$

and since,  $A, B < 1$ ,  $\bar{S}_{1N}$  has to be even lower than  $S_2^*$  compared to (15) of Section 3.1 where  $A = B = 1$ . ■

Since, barring an agreement in Period 1, IMF aid potentially becomes available in Period 2, the  $N$ -agents become even more reluctant to allow a large devaluation in the former period. As we see in the main text, this enhances the specter of delay.

## References

Agenor, P. Montiel, P. (2008). *Development Macroeconomics* (3rd ed.). New Jersey: Princeton University Press.

- Alesina, A. and A. Drazen (1991). Why are stabilizations delayed? *American Economic Review* 81(5), 1170–88.
- Alfaro, L. (2002). On the political economy of temporary stabilization programs. *Economics and Politics* 14(2), 133–161.
- Broz, L. J., J. Frieden, and S. Weymouth (2008, July). Exchange Rate Policy Attitudes: Direct Evidence from Survey Data. *IMF Staff Papers* 55(3), 417–444.
- Casella, A. and B. Eichengreen (1996, May). Can Foreign Aid Accelerate Stabilisation? *Economic Journal* 106(436), 605–619.
- Cooper, R. N. (1971). Devaluation and aggregate demand in aid-receiving countries. In N. Bhagwati, Jagdish, R. Jones, R. Mundell, and Vanek (Eds.), *Trade, Balance of Payments and Growth*. Amsterdam: North Holland.
- Cornia, G. A. (2020, 03). Macroeconomic Stabilization in Developing Countries. In *The Macroeconomics of Developing Countries: An Intermediate Textbook*. Oxford University Press.
- Drazen, A. (1996). The political economy of delayed reform. *The Journal of Policy Reform* 1(1), 25–46.
- Drazen, A. (2000). *Political Economy in Macroeconomics*. Princeton University Press.
- Dreher, A. and R. Vaubel (2004, January). Do IMF and IBRD Cause Moral Hazard and Political Business Cycles? Evidence from Panel Data. *Open Economies Review* 15(1), 5–22.
- Egan, P. J. (2017). The political economy of exchange rates in an era of global production chains. *International Interactions* 43(3), 507–536.
- Frieden, J. (1991). Invested interests: The politics of national economic policies in a world of global finance. *Industrial Organization* 45(4), 425–451.
- Gündüz, Y. B. and R. Darius (2021, June). Exchange rate adjustment and growth in IMF-supported programs. Background Paper BP/21-01/05, Independent Evaluation Office of the IMF, Washington, DC.
- Krueger, A. O., S. Fischer, and J. D. Sachs (2003, January). Imf stabilization programs. In *Economic and Financial Crises in Emerging Market Economies*, pp. 297–362. University of Chicago Press.
- Laban, R. and F. Sturzenegger (1994, November). Distributional Conflict, Financial Adaptation And Delayed Stabilizations. *Economics and Politics* 6(3), 257–276.

- McNamara, Kathleen, R. (2001). Structural indeterminacy and sectoral interests in european monetary integration. In J. Sinclair and P. Kenneth (Eds.), *Structure and Agency in International Capital Mobility*. London: Palgrave.
- Patnaik, I., S. Gupta, and A. Shah, Abhijit (2012). Determinants of trade misinvoicing. *Open Economies Review* 23, 891–910.
- Steinberg, D. A. (2015). *Demanding Devaluation: Exchange Rate Politics in the Developing World*. Ithaca, NY: Cornell University Press.
- Steinberg, D. A. and K. Malhotra (2014). The effect of authoritarian regime type on exchange rate policy. *World Politics* 66(3), 491–529.
- Tommasi, M. (1994). The consequences of price instability on search markets: Toward understanding the effects of inflation. *The American Economic Review*, 1385–1396.
- Ugurlu, E. N. and A. Razmi (2023). Political economy of real exchange rate levels. *Journal of Comparative Economics* 51(3), 918–940.
- Velasco, A. (1999). A model of endogenous fiscal deficits and delayed fiscal reforms. In J. M. Poterba and J. von Hagen (Eds.), *Fiscal Institutions and Fiscal Performance*, pp. 37–58. Chicago: University of Chicago Press.
- Weldzius, R. M. (2021, November). The end of currency manipulation? Global production networks and exchange rate outcomes. *Economics and Politics* 33(3), 514–532.