

# ON THE POLITICAL ECONOMY OF TEMPORARY STABILIZATION PROGRAMS

**Laura Alfaro\***

*Harvard Business School*

*October 2001*

*JEL classification code: E6, F31, F41.*

*Key words: temporary policies, exchange-rate-based stabilization programs, real exchange-rate appreciation.*

## **Abstract**

This paper provides a political economy explanation for temporary exchange-rate-based stabilization programs by focusing on the distributional effects of real exchange-rate appreciation. I propose an economy in which agents are endowed with either tradable or nontradable goods. Under a cash-in-advance assumption, a temporary reduction in the devaluation rate induces a consumption boom accompanied by real appreciation, which hurts the owners of tradable goods. The owners of nontradables have to weigh two opposing effects: an increase in the present value of nontradable goods wealth and a negative intertemporal substitution effect. For reasonable parameter values, owners of nontradables are better off.

---

Harvard Business School, Morgan Hall 263. Soldiers Field Road, Boston Massachusetts, 02163 Tel: 617-495-7981. Fax: 617-496-5985. E-mail [lalfaro@hbs.edu](mailto:lalfaro@hbs.edu).

\* I would like to thank Fabio Kanczuk, Luisa Lambertini, Carlos Vegh, and an anonymous referee for helpful comments and suggestions.

## 1. Introduction

This paper provides a political economy explanation for the implementation of temporary exchanged-rate-based stabilization programs (where the exchange rate is used as a nominal anchor) by focusing on the distributional effects across agents of a real exchange-rate appreciation.

Since the late 1950s, many Latin American countries have suffered from chronic inflation.<sup>1</sup> During the past 35 years, most of the 11 major exchange-rate-based stabilization programs in Argentina, Brazil, Chile, Mexico and Uruguay have failed and ended in balance of payment crises. These programs have been characterized by an initial expansion of economic activity and by large exchange-rate appreciations.<sup>2</sup> Programs where fiscal adjustment has been either partial or absent have failed. Indeed, the elimination of large public sector deficits has proven to be a necessary condition for their success.

Studied by Calvo (1986) and Calvo and Vegh (1993) of stabilization programs show that the initial boom in consumption can take place when agents believe the stabilization program to be temporary because government policies fail to be credible or sustainable.<sup>3</sup> Calvo and Drazen (1998) find similar dynamics in a setup with incomplete markets by modeling uncertainty in the duration of a program, which can reflect as well imperfect policy credibility that leads the public to expect a future policy reversal.<sup>4</sup> The sustained high differentials between domestic and international interest rates observed in most stabilization programs provide additional support for the lack of credibility assumption.

In general, governments often undertake temporary policies. However, from the representative agent's point of view, short-lived policies are not necessarily welfare improving because they distort intertemporal choices.<sup>5</sup> Note however, that certain models deviate from Calvo's (1986) analysis in which lack of credibility is always welfare reducing. In models that consider supply side effects (labor-leisure decisions and capital accumulation) or currency substitution, a temporary stabilization program can be welfare improving for some range of parameter restrictions.<sup>6</sup> From a policy point of view, the issue is not settled. In particular, the "lack of credibility" assumption that has dominated the literature raises a very interesting question: Why would a rational government carry out a stabilization policy that every one expects not to be sustainable in the long run? In order to understand the rationale behind temporary

policies, I depart from models in which policy making is viewed as the optimal outcome of a social planner who wishes to maximize the welfare of the representative agent. Heterogeneity in the population and the distributional consequences of policies are crucial to understanding why temporary policies are implemented. Drazen (2000) argues that heterogeneity of interests and the conflict this generates between agents in a society is central to the political economy field: “if there were no conflict of interests, whatsoever, the choice of economic policy would be that of the social planner maximizing the utility of the representative individual... .”<sup>7</sup>

In this paper, I propose that some groups within the economy benefit from these temporary policies and, consequently favor them. I model a small open economy with two types of agents with identical preferences but different endowments.<sup>8</sup> One type is endowed with tradable goods and the other one with nontradable goods. Following Calvo (1986), a temporary stabilization program is modeled as a temporary reduction in the devaluation rate. In a small open economy, a reduction in the devaluation rate leads to a reduction in the nominal interest rate. Under a cash-in-advance-constraint assumption, a lower nominal interest rate reduces the effective price of today’s consumption relative to the future price and induces a consumption boom accompanied by an appreciation of the real exchange rate (price of tradable goods in terms of nontradables).

Given the differences in the income distribution across agents, a real appreciation can have different welfare effects. The temporary stabilization program will hurt the tradable goods’ owners and, therefore, they will oppose the temporary plan. The owners of nontradables have to weigh two opposite effects: a positive wealth effect (a real appreciation increases the present value of nontradable goods wealth) and a negative intertemporal substitution effect. Overall, the owners of nontraded goods might be better off and favor the temporary stabilization policy.

*A real appreciation quickly raises real wages in terms of tradables and quickly reduces inflation.... The implication of these timing relationships is that a policy of real appreciation, conducted at the right time can make an administration look particularly successful at controlling inflation, while at the same time delivering increases in real disposable income... and hence it wins popularity contests.... No wonder that overvaluation is a very popular policy. It created broad short-term political support in Chile for Pinochet, in Argentina for the policies of Martinez de Hoz, for the Thatcher*

*government in the United Kingdom and the United States for Reagonomics....”*  
*Dornbusch (1988)*

Previous literature already has proposed that distributive issues are important factors for understanding stabilization policies. Alesina and Drazen (1991), describe the process leading to stabilization as a war of attrition between different socioeconomic groups. Each group waits for the other group to give in. The most anxious group will give in and adjustment takes place. The “wait and see” process lead to delays in stabilization. Fernandez and Rodrik (1991) explain how uncertainty about the consequences of policy changes can prevent a rational risk-neutral electorate from favoring a reform that, if implemented, would benefit a majority of voters. According to their model, the political system is biased towards the status quo.<sup>9</sup>

In contrast to these two contributions, this paper focuses on understanding the rationale behind short-lived stabilization programs: policies ex-ante known to be unfeasible in the long run, not optimal from a social planner’s point of view, but potentially beneficial to certain groups in the economy.

Section 2 of this paper reviews the main stylized facts that characterize exchange-rate stabilization programs. Section 3 describes the model using a representative agent setup. Section 4 extends the model to allow for two types of agents: one type endowed with tradable goods only, the other with nontradables. The last section analyzes the welfare effects of a temporary reduction in the devaluation rate on the owners of tradable goods and on the owner of nontradable goods for different values of the intertemporal and the intratemporal substitution elasticities. For reasonable parameter values, the owners of nontraded goods are better off when facing a transitory reduction in the devaluation rate.

## **2. Exchange-Rate-Based Stabilization Programs: Stylized Facts**

In the second half of the twentieth century, Argentina, Bolivia, Brazil, Chile, Ecuador, Mexico, Peru and Uruguay suffered from “chronic” inflation episodes (see Table 1). The literature tends to classify the approaches used to try to reduce inflation under money-based programs (those that rely on

restrictions on the monetary expansion) and exchange-rate-based plans (where exchange rate pegging provides a nominal anchor).

Table 2 summarizes the main features of 11 major exchange-rate-based stabilization programs observed in Latin America since the 1960s.<sup>10</sup> These programs are characterized by a slow convergence of inflation to the devaluation rate, due partially to an initial boom in consumption and an expansion of economic activity. The slow convergence in the inflation rate led to large exchange-rate appreciations and deterioration of the external accounts. Eight out of the eleven exchange-rate-based stabilization programs ended in balance of payment crises and large international reserve losses. Successful programs exhibited large fiscal adjustments. The Latin American experience provides evidence that governments often followed stabilization policies that, due to the lack of fiscal adjustment and credibility, are recognized to be unfeasible in the long run.

An interesting example that captures these stylized facts is the Argentinean experience. In the last 20 years, Argentina implemented three major exchange-rate-based stabilization programs.<sup>11</sup> All but the latest stabilization program (Convertibility) ended with high international reserve losses and failed to bring inflation down to sustainable levels. Graph 1 plots Argentina's real exchange rate since 1970 (the stabilization periods have been highlighted). In all exchange-rate-based programs, we can observe sharp real appreciations.<sup>12</sup> The appreciation of the real exchange rate was accompanied by a deterioration of the external accounts, as observed in graph 2. Both graph 3, which plots real product growth together with real consumption growth, and graph 4, which compares the real consumption series to its Hodrick-Prescott's trend, allow us to observe the consumption boom known to characterize most exchange-rate-based programs.

Argentina's experience with high inflation, however, goes back to the last century.<sup>13</sup> Its first inflationary episode occurred from the mid 1820s to the early 1860s, as seen in graph 5, which plots the price of one ounce of gold in Argentina from 1826-1852. The objective of this section is not to formally discuss the causes of Argentina's early experience with chronic inflation (or to understand why price stability was not restored through alternative financing methods); but to highlight that already, in this

early inflationary experience, the effects of inflation/depreciation on income distribution were noticeable. Burgin (1946) describes the distributive effects of this early inflationary experience as follows, capturing the notion that agents whose income derive primarily from tradable resources benefit (are hurt) by exchange-rate depreciation (appreciation):

*This process (currency depreciation)...in the final analysis involved changes in the distribution of the national income.... Commodity prices rose on the whole faster than wages and salaries, with the result that the real income of wage and salary earners decreased, both relatively and absolutely. The industrial and commercial classes bore the greater part of the burden of the currency depreciation. On the other hand, the cattle breeders were in a more favorable position. Therefore, far from having their real income diminished, this class was likely to benefit from the depreciation of the peso, ... not only as employers of labor but also as tax payers and exporters. Burgin (1946)*

The next section presents a model that captures the interplay among inflation, the real exchange rate, income distribution and the implementation of temporary stabilization policies

### **3. Model**

Consider a small open economy with perfect capital mobility. The economy is populated by two types of infinitely lived agents characterized by the same utility over the consumption of tradable and nontradable goods but different endowments. One agent is endowed with the tradable good ( $y_s^T$ ), the other with the nontradable good ( $y_s^N$ ). This is a reasonable assumption, if we consider that generally agents earn an income from working in one sector.<sup>14</sup> Given the heterogeneity in the population, instead of proposing a social function to aggregate preferences, we allow the median voter to implement her/his most preferred policy.<sup>15</sup>

We begin, though, by describing an economy with one representative agent who is endowed with both the tradable and the nontradable good. This serves not only as a comparison to the heterogeneous agent model but facilitates its analysis. Since preferences are assumed to be homothetic and identical for all agents, many properties of the representative agent model hold under all possible distributions of wealth.<sup>16</sup> Therefore, by using the representative agent model, we obtain the equilibrium prices relevant for the heterogeneous agent's economy as well.

### 3.1 Representative Agent's Problem

#### a. The Consumer

The representative consumer maximizes the lifetime utility function given by:

$$\sum_{s=t}^{\infty} \beta^{s-t} u(c_s^T, c_s^N) \quad (1)$$

where  $c_s^T$  denotes consumption of tradable goods and  $c_s^N$  consumption of nontradables goods;  $0 < \beta < 1$  is the rate of time preference; and  $u(\cdot)$  is an increasing, twice continuously differentiable and strictly concave function. We assume time separability, which greatly simplifies our analysis, however the period utility function,  $u(c_s^T, c_s^N)$ , generally will not be separable between traded and nontraded goods. Agents have perfect foresight.

The consumer's budget constraint is given by:

$$P_s^T B_{s+1} + M_s + P_s^T c_s^T + P_s^N c_s^N = P_s^T y_s^T + P_s^N y_s^N + P_s^T (1+r) B_s + M_{s-1} + TR_s \quad (2)$$

where  $B_s$  represents the stock of bonds issued by foreigners denominated in terms of tradable goods and held by the domestic agent;  $M_s$  is the nominal stock of money in terms of local currency held at the end of period  $s$  to be used at the beginning of period  $s+1$ ;  $TR_s$  are the nominal transfers received by the consumer from the government;  $1+r$  is the international real interest factor;  $P_s^T$  is as defined before, the money price of tradable goods at time  $s$  and  $P_s^N$  the money price of nontradable goods at time  $s$ .

Goods are non-storable. There are no barriers to free trade, therefore, purchasing power parity holds in terms of tradable goods:  $P_s^T = E_s P^{T*}$ , where  $P_s^T$  is the price of tradable goods at home,  $E_s$  is the nominal exchange-rate and  $P^{T*}$  is the price of tradable goods abroad. The world price of the tradable good in terms of foreign currency is assumed to be constant and equal to one,  $P_s^{T*} = P_{s+1}^{T*} = 1$ .

Money<sup>17</sup> is introduced through a cash-in-advance constraint:

$$P_s^T c_s^T + P_s^N c_s^N \leq M_{s-1} + TR_s \quad (3)$$

We assume that the government prints money, collects seignorage taxes and redistributes it back to the consumers ( $TR_s$ ). By assumption, each consumer will receive back the same amount she/he was

taxed.<sup>18</sup> If the nominal interest rate is positive, the cash-in-advance constraint will be binding.<sup>19</sup> We can rewrite the cash-in-advance constraint faced by consumers in period  $s+1$  as:

$$P_{s+1}^T c_{s+1}^T + P_{s+1}^N c_{s+1}^N = M_s + TR_{s+1} \quad (3')$$

substituting (3') into (2), we obtain the following simplified budget constraint:

$$P_{s+1}^T c_{s+1}^T = P_s^T y_s^T + P_s^N y_s^N + P_s^T [(1+r)B_s - B_{s+1}] - P_{s+1}^N c_{s+1}^N + TR_{s+1} \quad (2')$$

Using the utility function (1) and the simplified budget constraint (2'), we can maximize respect to  $B_{s+1}$  and  $c_s^N$  to obtain the following first order conditions for  $s > t$ :

$$\frac{u_{c^T}(c_s^T, c_s^N)}{u_{c^N}(c_s^T, c_s^N)} = \frac{P_s^T}{P_s^N} = \frac{1}{\rho_s} = e_s \quad (4)$$

where  $e_s$  is defined as the real exchange rate and  $\rho_s$  as the price of nontradable to tradable goods, i.e.  $\frac{P_s^N}{P_s^T}$ ;

and the Euler equation, for  $s > t$ :

$$\frac{u_{c^T}(c_s^T, c_s^N) P_{s-1}^T}{P_s^T} = \beta(1+r) \frac{u_{c^T}(c_{s+1}^T, c_{s+1}^N) P_s^T}{P_{s+1}^T} \quad (5)$$

Using the Fisher Equation,  $(1+i_s)P_s^T = P_{s+1}^T(1+r)$ , where  $i_s$  denotes the nominal interest rate, we can express the equation (5) as:

$$u_{c^T}(c_s^T, c_s^N)(1+i_s) = \beta(1+r)u_{c^T}(c_{s+1}^T, c_{s+1}^N)(1+i_{s-1}) \quad (5')$$

The nominal interest rate for dates  $s-1$  and  $s$  enters equation (5') because an agent can enjoy a unit of consumption on date  $s$  (as opposed to consuming on date  $s+1$ ) only if he/she had held money on date  $s-1$  and had foregone the interest payment on date  $s-1$ . From this equation, we observe that the nominal interest rate affects the path of consumption.

From the budget constraint (2') and imposing the transversality condition  $\lim_{T \rightarrow \infty} \frac{B_{t+T+1}}{(1+r)^T} = 0$ , we

obtain the consumer life-time budget constraint in terms of tradable goods:

$$\sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} \left( c_s^T + \rho_s c_s^N + \frac{M_s}{P_s^T} \right) = (1+r)B_t + \sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} \left( y_s^T + \rho_s y_s^N + \frac{M_{s-1}}{P_s^T} + TR_s \right) \quad (6)$$

### b. Government's Constraint

The government prints money, makes lump-sum transfers to private agents and holds interest-bearing foreign denominated assets. Let  $H_s$  be the government's net foreign assets; and  $E_s$  the nominal exchange rate; then the government's budget constraint is given by:

$$E_s(H_{s+1} - H_s) = M_s - M_{s-1} + r H_s R_s - TR_s; \quad (7)$$

Using the Fisher equation and imposing the transversality condition,  $\lim_{T \rightarrow \infty} \frac{H_{t+T+1}}{(1+r)^T} = 0$ , we obtain

the government's intertemporal budget constraint:

$$\sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} \left( \frac{TR_s}{P_s^T} \right) = \frac{(1+r)E_t H_t}{P_t^T} - \frac{M_{t-1}}{P_t^T} + \sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} \left( \frac{i_s}{1+i_s} \frac{M_s}{P_s^T} \right) \quad (8)$$

which simply states that the present value of government revenues from period  $t$  onward (in this case seignorage) must equal the real present value of governments debts outstanding at the start of period  $t$ , the initial monetary liability and the present value of government transfers.

### c. Resource Constraint

Adding the private agent's intertemporal budget constraint (6) to the government's one (8), we obtain the economy's resource constraint:

$$\sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} (c_s^T + \rho_s c_s^N) = (1+r)a_t + \sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} (y_s^T + \rho_s y_s^N) \quad (9)$$

where  $a_t = B_t - E_t H_t / P_t$  denotes net foreign assets.

### d. Equilibrium Conditions

An equilibrium consists of prices and quantities that satisfy two conditions: (i) given the equilibrium prices, agents maximize utility and (ii) markets for all goods clear.

In the nontradable sector, consumption has to be equal to production every period:

$$y_s^N = c_s^N. \quad (10)$$

In the tradable sector, the resource constraint and the transversality condition imply that the present value of tradable consumption has to be equal to the present value of tradable income plus the initial wealth:

$$\sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} (c_s^T) = (1+r)a_t + \sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} (y_s^T) \quad (11)$$

The current account for this economy is obtained by adding the consumer budget constraint (2) to that of the government's (7) and using the equilibrium condition in the nontradable sector (10),

$$a_{s+1} = (1+r)a_s + y_s^T - c_s^T \quad (12)$$

In the capital market, purchasing parity conditions in the tradable sector, the Fisher equation for both the domestic and foreign economy, together with interest parity conditions, imply that (one plus) the domestic interest rate is equal to (one plus) the international real interest rates times the devaluation factor:

$$(1+i_s) = (1+r) \varepsilon_{s+1} \quad (13)$$

where  $\varepsilon_{s+1}$  represents the devaluation factor between  $s$  and  $s+1$ ,  $\frac{E_{s+1}}{E_s}$ .

### 3.2 Stabilization policies

To further simplify the analysis, we assume the endowment of tradable and nontradable goods to be constant and equal in every period;  $y_s^N = y^N \forall s$ ,  $y_s^T = y^T \forall s$ . Additionally, we assume that  $\beta(1+r)=1$  and the initial stock of assets equal to zero,  $a_t = 0$ . We analyze the effects on consumption, real exchange rate and current account of a constant devaluation rate policy and a temporary change in the devaluation rate. From equation (13), we know that changes in the devaluation policies will affect domestic nominal interest rates.

#### a. Constant Devaluation Policy (Status Quo Scenario):

We first look at the case where there is a constant devaluation rate,  $\varepsilon_{s+1} = \varepsilon_s \forall s$ . From (13), this implies that the ratio of (one plus) the nominal interest rate in consecutive periods is constant,

$$(1+i_s) = \varepsilon_{s+1} = \varepsilon_s = (1+i_{s-1}) \forall s \quad (14)$$

Since we assumed the endowment of nontradable goods to be constant, from the equilibrium condition in the nontradable sector (equation (10)), we find that the consumption of nontradable goods is constant. From the Euler equation (5') and using  $\beta(1+r) = 1$ , we find that the tradable goods consumption is also constant:

$$u_{c^T}(c_s^T, y^N) \varepsilon_s = u_{c^T}(c_{s+1}^T, y^N) \varepsilon_s \quad \forall s \Rightarrow c_s^T = c_{s+1}^T \quad \forall s \quad (15)$$

Using the resource constraint for tradable goods (equation (11)), we find that the consumption of tradable goods each period is equal to the endowment of tradable goods and the return on initial assets (assumed to be zero,  $a_t=0$ ).

$$c_s^T = c_{s+1}^T = y^T \quad (16)$$

From the first order conditions for tradable/nontradable goods (equation (3)), we find that the price of tradable goods to non-tradables,  $\rho \equiv \frac{P_s^N}{P_s^T}$  in consequent periods is constant as well:

$$\rho_s = \frac{u_{c^N}(y^T, y^N)}{u_{c^T}(y^T, y^N)} = \rho_{s+1} \quad \forall s \Rightarrow \rho_s = \rho_{s+1} \quad \forall s \quad (17)$$

We will focus on this no-change or status quo scenario; but it is worth mentioning that under the cash-in-advance constraint assumption, the effect on the consumption path of no change in the devaluation rate is the same as that of a permanent change in the devaluation rate. From equation (5'), (13) and (15), we observe that consumption would remain the same if we permanently change the devaluation rate to  $\varepsilon'_{s+1} = \varepsilon'_s \quad \forall s$ . The intuition is simple. Since all goods need cash, agents cannot substitute away from taxed activities; therefore, there are no distortionary effects from a permanent devaluation or revaluation.

## **b. Temporary Policy**

A temporary stabilization program is modeled as a temporary reduction in the devaluation rate. At  $s = t$ , the government announces a reduction in the devaluation rate.<sup>20</sup> However, the public expects the program to be abandoned at  $s = S+1$ , with the devaluation rate increasing to a new level. The length of temporary policy is taken to be exogenous.<sup>21</sup>

$$\varepsilon_s = \varepsilon_1 \text{ for } t \leq s \leq S; \quad \varepsilon_s = \varepsilon_2 \text{ for } s > S; \quad \varepsilon_2 > \varepsilon_1. \quad (18)$$

In a small open economy, a reduction in the devaluation rate leads to a reduction in the nominal interest rate, as seen in equation (13). Under the cash-in-advance constraint assumption, lower nominal interest rates reduce the effective price of today's consumption relative to future consumption. Since money is needed to purchase goods and the opportunity cost of holding money is lower, agents will want to consume more of both goods now. The higher desire for tradable goods will be fulfilled through a current account deficit. Given the restrictions imposed by the local market in the nontradables sector, the only way in which agents can be satisfied with the amount of nontradable goods available in the economy is if their cost increased. The intertemporal consumption substitution induces a consumption boom accompanied by an appreciation of the real exchange rate. From equation (5')

$$c^T_s = c^T_1 \quad \forall t \leq s \leq S; \quad c^T_s = c^T_2 \quad \forall s > S; \quad c^T_1 > c^T_2 \quad (19)$$

Since  $c^T_1 > y^T$ , the current account will deteriorate on impact at  $s = t$  and will worsen throughout  $t \leq s \leq S$  (because of the interest payments on the accumulating debt).

From the equilibrium conditions in the nontradable sector, we know that the consumption of nontradable goods remains constant,  $c^N_s = y^N$ , therefore, from equation (4) higher consumption of tradable goods implies that the price of nontradable goods,  $\rho = P^N/P^T$ , will be higher for  $s \leq S$ ,

$$\rho_s = \rho_1 \quad \forall t \leq s \leq S; \quad \rho_s = \rho_2 \quad \forall s > S; \quad \rho_1 > \rho_2 \quad (20)$$

Figures 1 through 5 plot the dynamics of the nominal interest rate, the consumption of tradable and nontradable goods, the price of nontradable to tradable goods and the current account in the presence of a temporary stabilization policy and no stabilization policy. In general, if agents expect  $\varepsilon_s = \varepsilon_1$  for  $t \leq s \leq S^1$ ;  $\varepsilon_s = \varepsilon_2$  for  $S^1 < s \leq S^2$ ,  $\varepsilon_s = \varepsilon_2$  for  $S^2 < s \leq S^3 \dots$ ,  $\varepsilon_s = \varepsilon_N$  for  $s > S^N$ ; the consumption of tradable goods and the real exchange would change with each devaluation rate,  $c_1(\varepsilon_1)$ ,  $\rho_1(\varepsilon_1)$  for  $t \leq s \leq S^1$ ;  $c_2(\varepsilon_2)$ ,  $\rho_2(\varepsilon_2)$  for  $S^1 < s \leq S^2 \dots$ ,  $c_N(\varepsilon_N)$ ,  $\rho_N(\varepsilon_N)$  for  $s > S^N$ .

### 3.3 Political Decision

What will be the choice of a representative agent faced with the decision to vote in favor of a temporary program that attempts to lower the devaluation rate versus no stabilization plan (status quo)? Recall that under a temporary plan, the consumption profile is not smooth. Because of this “smoothing cost,” the representative agent would be worse under the temporary plan compared against the status quo.

**Proposition 1:** *When faced with the decision to vote in favor of a stabilization program that temporarily reduces the devaluation rate versus no stabilization plan, the representative agent will favor the permanent plan.*

**Proof:** Let  $\Delta$  be the ratio of (one plus) the nominal interest rates at dates  $S-1$  and  $\Delta = \frac{1+i_S}{1+i_{S-1}}$ .

Using the equilibrium conditions under a temporary plan in the nontradable sector and in the tradable sector (equations (10) and (19) respectively), we can rewrite the utility function (equation (1)) as:

$$\sum_{s=t}^S \beta^{s-t} u(c_1^T[\Delta], y^N) + \sum_{s=S+1}^{\infty} \beta^{s-t} u(c_2^T[\Delta], y^N) \quad (21)$$

Taking the first derivative of the utility function with respect to  $(\Delta)$ , we find the welfare effect of a temporary change in the devaluation rate:

$$\frac{\partial V}{\partial \Delta} = \left( \frac{1-\beta^{S+1}}{1-\beta} \right) \frac{\partial u(c_1^T, y^N)}{\partial c_1^T} \frac{\partial c_1^T}{\partial \Delta} + \frac{\beta^{S+1}}{1-\beta} \frac{\partial u(c_1^T, y^N)}{\partial c_2^T} \frac{\partial c_2^T}{\partial \Delta} \quad (22)$$

Rewriting the tradable-goods resource constraint (11),

$$\sum_{s=t}^S \left( \frac{1}{1+r} \right)^{s-t} c_1^T[\Delta] + \sum_{s=S+1}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} c_2^T[\Delta] = \frac{r}{1+r} y_s^T \quad (23)$$

and using the assumption that  $(1+r)B=I$ , we can derive the following condition from (23):

$$\left( \frac{1-\beta^{S+1}}{1-\beta} \right) \frac{\partial c_1^T}{\partial \Delta} = - \frac{\beta^{S+1}}{1-\beta} \frac{\partial c_2^T}{\partial \Delta} \quad (23')$$

substituting (23') into (22), we find:

$$\frac{\partial V}{\partial \Delta} = \left( \frac{1 - \beta^{s+1}}{1 - \beta} \right) \frac{\partial c_1^T}{\partial \Delta} \left[ \frac{\partial u(c_1^T, y^N)}{\partial c^T} - \frac{\partial u(c_2^T, y^N)}{\partial c^T} \right] \quad (24)$$

The first factor in equation (24) is positive since  $0 < \beta < 1$ . The second factor is positive (negative) for  $\Delta > 1$  ( $\Delta < 1$ ): if agents expect higher (lower) future nominal interest rates, they will increase (decrease) tradable goods consumption today. For a concave utility functions, the last term is negative (positive) for  $\Delta > 1$  ( $\Delta < 1$ ). Since the temporary devaluation policy distorts intertemporal consumption decisions, we refer to this last factor as the “smoothing cost.” ■

#### 4. Heterogeneous Agents Model

We now characterize an economy populated by infinitely lived agents who exhibit ex-ante heterogeneity as they belong to two possible types: consumers of type *A* are endowed with nontradable goods; consumers of type *B* are endowed with tradable goods.<sup>22</sup>

Each agent *i* maximizes

$$V^i = \sum_{s=t}^{\infty} \beta^{s-t} u(c_s^{i,T}, c_s^{i,N}) \quad (25)$$

subject to their own budget constraint:

$$P_s^T B_{s+1}^i + M_{s+1}^i + P_s^T c_s^{i,T} + P_s^N c_s^{i,N} \leq P_s^T y_s^{i,T} + P_s^N y_s^{i,N} + P_s^T (1+r) B_s^i + M_{s-1}^i + TR_s^i \quad (26)$$

and a cash-in-advance constraint:

$$P_s^T c_s^{i,T} + P_s^N c_s^{i,N} \leq M_{s-1}^i + TR_s^i \quad (27)$$

We assume that the government returns to each agent, as transfer payments, the same amount of seignorage revenues collected.<sup>23</sup> This is to abstract away from a political decision shaped by distributional considerations à la Meltzer-Richard (1981). Given this assumption, imposing transversality conditions and setting the initial stock of bonds equal to zero for both agents, the lifetime budget constraints for type *A* and type *B* are given by:

$$\text{Type A: } \sum_{s=t}^{\infty} (1+r)^{-(s-t)} (c_s^{A,T} + \rho_s c_s^{A,N}) = \sum_{s=t}^{\infty} (1+r)^{-(s-t)} \rho_s y_s^N \quad (28a)$$

$$\text{Type B: } \sum_{s=t}^{\infty} (1+r)^{-(s-t)} (c_s^{B,T} + \rho_s c_s^{B,N}) = \sum_{s=t}^{\infty} (1+r)^{-(s-t)} y_s^T \quad (28b)$$

Let  $(1-\lambda)$  represent the fraction of the present value of total resources that corresponds to nontraded goods, that is:

$$1-\lambda = \frac{\sum_{s=t}^{\infty} (1+r)^{-(s-t)} (\rho_s y_s^N)}{\sum_{s=t}^{\infty} (1+r)^{-(s-t)} (y_s^T + \rho_s y_s^N)} \quad (29a)$$

Similarly, we can define  $\lambda$  to be the proportion of the value of total wealth that corresponds to traded goods:

$$\lambda = \frac{\sum_{s=t}^{\infty} (1+r)^{-(s-t)} (y_s^T)}{\sum_{s=t}^{\infty} (1+r)^{-(s-t)} (y_s^T + \rho_s y_s^N)} \quad (29b)$$

using the definitions for  $(1-\lambda)$  and  $\lambda$ , we can rewrite type A and B's budget constraints as:

$$\text{Type A: } \sum_{s=t}^{\infty} (1+r)^{-(s-t)} (c_s^{A,T} + \rho_s c_s^{A,N}) = (1-\lambda) \sum_{s=t}^{\infty} (1+r)^{-(s-t)} (y_s^N + \rho_s y_s^N) \quad (28a')$$

$$\text{Type B: } \sum_{s=t}^{\infty} (1+r)^{-(s-t)} (c_s^{B,T} + \rho_s c_s^{B,N}) = \lambda \sum_{s=t}^{\infty} (1+r)^{-(s-t)} (y_s^N + \rho_s y_s^N) \quad (28b')$$

Under homothetic preferences, demand functions are a linear function of income. Therefore, each agent's consumption will be a fraction of that of the representative agent's. The proportion of the value of the resources each consumer owns to those of the total economy provides the weights. Thus, the period  $s$  consumptions for type A and type B as a function of the representative agent period consumption are given by:

$$\text{Type A: } \quad c_s^{A,T} = (1-\lambda) c_s^T; \quad c_s^{A,N} = (1-\lambda) c_s^N \quad (30a)$$

$$\text{Type B: } \quad c_s^{B,T} = \lambda c_s^T; \quad c_s^{B,N} = \lambda c_s^N \quad (30b)$$

These expressions imply that given the income distribution, if we solve for the representative agent's consumption profile, we can directly obtain the consumption for A and B.

## 4.1 Welfare Effects

From the representative agent problem, we know that a temporary decrease in the devaluation rate from  $s \leq t \leq S$  will increase consumption and the price of nontradable goods (real exchange rate appreciation). Since agents have different initial endowment, we need to consider in addition to the smoothing cost that will be faced by both types, a wealth or redistributing effect that occurs due to the real appreciation of the exchange rate. Substituting expressions (30a) and (30b) into the utilities for the owner of tradable goods and nontradables, we obtain,

$$V^A = \sum_{s=t}^{\infty} \beta^{s-t} u((1-\lambda)c_s^T, (1-\lambda)c_s^N) \quad (31a)$$

$$V^B = \sum_{s=t}^{\infty} \beta^{s-t} u(\lambda c_s^T, \lambda c_s^N) \quad (31b)$$

Imposing the equilibrium conditions from the representative-agent model, we can rewrite the utility for the owners of nontradables (equation (31a)) as,

$$\sum_{s=t}^s \beta^{s-t} u((1-\lambda)[\Delta]c_1^T[\Delta], (1-\lambda)[\Delta]y^N) + \sum_{s=S+1}^{\infty} \beta^{s-t} u((1-\lambda)[\Delta]c_2^T[\Delta], (1-\lambda)[\Delta]y^N) \quad (31a')$$

Taking the derivative of (31a') with respect to changes in the devaluation rate ( $\Delta$ ), and substituting condition (23') from the tradable good budget constraint, we find the welfare effect on the owner of nontradable goods from a temporary stabilization program:

$$\begin{aligned} \frac{\partial V^B}{\partial \Delta} = & \frac{\partial(1-\lambda)}{\partial \Delta} \left\{ \frac{(1-\beta^{S+1})c_1^T}{(1-\beta)} \frac{\partial u(\cdot)}{\partial(1-\lambda)c_1^T} + \frac{\beta^{S+1}c_2^T}{(1-\beta)} \frac{\partial u(\cdot)}{\partial(1-\lambda)c_2^T} + y^N \left( \frac{(1-\beta^{S+1})c_1^T}{(1-\beta)} \frac{\partial u(\cdot)}{\partial(1-\lambda)c_1^T} + \frac{\beta^{S+1}c_2^T}{(1-\beta)} \frac{\partial u(\cdot)}{\partial(1-\lambda)c_2^T} \right) \right\} \\ & + \frac{\partial c_1^T}{\partial \Delta} \frac{(1-\beta^{S+1})(1-\lambda)}{(1-\beta)} \left\{ \frac{\partial u(\cdot)}{\partial(1-\lambda)c_1^T} - \frac{\partial u(\cdot)}{\partial(1-\lambda)c_2^T} \right\} \end{aligned}$$

$$\partial V^i / \partial \Delta = \text{wealth effect} + \text{smoothing cost} \quad (32)$$

We can obtain a similar expression for the owners of tradable goods by replacing  $\lambda$  for  $(1-\lambda)$  in expression (32). The first term in equation (32) is the wealth effect. Its sign is given by how the stabilization policy affects the distribution of wealth between owners of tradable and nontradable goods.

Therefore, this term can be positive or negative. The second term is the “smoothing cost” and its value is negative, as shown in Proposition 1.

In order to analyze further expression (32) and the welfare effect of a temporary policy on both types of agents, we impose a general structure to the utility function. We propose an isoelastic period utility function and a constant elasticity of substitution between traded and nontraded goods.

$$V^i = \sum_{s=t}^{\infty} \beta^{s-t} \left\{ \frac{(C_s^i)^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} \right\} \quad (33)$$

$$C_s^i = u(c_s^{iT}, c_s^{iN}) = \left[ \gamma^{\frac{1}{\theta}} (c_s^{iT})^{\frac{\theta-1}{\theta}} + (1-\gamma)^{\frac{1}{\theta}} (c_s^{iN})^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}} = X_s^{\frac{\theta}{\theta-1}}$$

with  $\gamma \in (0,1)$ , where  $\sigma > 0$  is the elasticity of intertemporal substitution and  $\theta > 0$  is the elasticity of substitution between tradables and nontradables. This functional form is general enough to include most forms used in previous applied studies; for example, the Cobb-Douglas case is obtained when  $\theta = 1$ .

Using the first-order conditions for the representative agent (equation (3') and (4')), we obtain the price of nontradable goods and the Euler equation for the utility function (33):

$$\frac{(1-\gamma)c_s^{iT}}{\gamma c_s^{iN}} = \rho_s^{\theta} \quad (34)$$

$$P_s = \left[ \gamma + (1-\gamma)\rho_s^{1-\theta} \right]^{\frac{1}{1-\theta}} \quad (35)$$

$$c_{s+1}^{iT} = \left( \frac{P_s}{P_{s+1}} \right)^{\sigma-\theta} \left( \frac{1+i_{s-1}}{1+i_s} \right)^{\sigma} c_s^{iT}$$

Given this functional form, the welfare effect of a change in the devaluation rate for an agent endowed with nontradable good is given by:

$$\frac{\partial V^B}{\partial \Delta} = \left( \frac{\partial(1-\lambda)}{\partial \Delta} \right) \frac{(1-\lambda)^{\frac{1}{\theta}}}{(1-\beta)^{\frac{1}{\theta}}} \left\{ (1-\beta^S+1) \gamma^{\frac{1}{\theta}} X_1^{\frac{\sigma-\theta}{\sigma(\theta-1)}} (c_1^T)^{\frac{1}{\theta}} - \beta^S + 1 \gamma^{\frac{1}{\theta}} X_2^{\frac{\sigma-\theta}{\sigma(\theta-1)}} (c_2^T)^{\frac{1}{\theta}} + y^N (1-\gamma)^{\frac{1}{\theta}} \left( (1-\beta^S+1) \gamma^{\frac{1}{\theta}} X_1^{\frac{\sigma-\theta}{\sigma(\theta-1)}} - \beta^S + 1 \gamma^{\frac{1}{\theta}} X_2^{\frac{\sigma-\theta}{\sigma(\theta-1)}} \right) \right\}$$

$$+ \frac{\partial c_1^T}{\partial \Delta} \frac{(1-\beta^S+1) \gamma^{\frac{1}{\theta}} (1-\lambda)^{\frac{1}{\theta}}}{(1-\beta)} \left\{ X_1^{\frac{\sigma-\theta}{\sigma(\theta-1)}} (c_1^T)^{\frac{1}{\theta}} - X_2^{\frac{\sigma-\theta}{\sigma(\theta-1)}} (c_2^T)^{\frac{1}{\theta}} \right\} \quad (33')$$

Since the wealth effect (first term) can be positive or negative, while the smoothing cost (second term) is negative, in general, the sign of equation (33') depends on the parameter values of the intratemporal and the intertemporal substitution elasticities.

However, given the negative smoothing cost, if the wealth effect for an agent is negative, he or she will oppose a temporary program. Thus, a sufficient condition for someone to be against the temporary program is for the wealth effect to be negative. On the other hand, a necessary condition, though not sufficient, for an agent to be in favor of the temporary program is for the wealth effect to be positive. In particular if  $\theta < 1$ , the wealth effect is positive for the owners of nontradable goods and negative for the owners of tradable goods.

**Proposition 2:** *A necessary condition for the owners of nontradable goods to be in favor of a temporary program and a sufficient condition for the owners of tradable goods to be against it is for  $\theta < 1$ . In this case, the wealth effect is positive for the nontradable owners and negative for the owners of tradable goods.*

**Proof:** See Appendix 1

An interesting case occurs when we set  $\theta = 1$ . This implies that the intra-period preferences are given by a Cobb-Douglas utility.

$$C_s^i = u(c_s^{i,T}, c_s^{i,N}) = (c_s^{i,T})^\gamma (c_s^{i,N})^{1-\gamma} \quad (36)$$

In this case, a temporary devaluation policy does not affect the distribution of wealth.

**Proposition 3:** *If intra-period preferences are characterized by a Cobb-Douglas utility,  $\theta = 1$ , the ratio of the value of nontraded resources to traded-resources is independent of the real exchange rate, and thus a temporary program does not change the distribution of wealth.*

**Proof:** See Appendix 2.

This is a benchmark case since there are no redistributive wealth effects across owners of tradable and nontradable goods; both types of agents behave as the representative agent. In general, the overall

utility effect will depend on the parameter values of the utility function and the initial distribution of wealth.

## 4.2 Simulations

Estimates of the utility parameters vary widely across studies. Hansen and Singleton (1983) estimate the intertemporal elasticity of substitution to be in the range of [0.5,2.0]. Hall (1988) concludes that there is little evidence that the elasticity is positive. Eichenbaum, Hansen and Singleton (1988) find higher estimates when they consider leisure-consumption interactions. In studies that include durable goods, Fauvel and Samson (1991) and Ogaki and Reinhart (1998) also tend to find higher intertemporal elasticities measures. Tesar (1993) uses an estimate of intratemporal substitution elasticity of 0.44 obtained from a sample of 30 developing and industrialized countries; Ostry and Reinhart (1991) find a larger estimate in a sample of 13 developing countries.

Though empirical estimates of the utility parameters change across studies, we note that Tesar (1993) shows that the high correlation between savings and investment and the low cross-country correlation between consumption growth rates and the home bias in investment portfolios (all major puzzles in the international macroeconomics literature) are consistent with complete financial markets in a model with nontraded goods, if the intertemporal substitution elasticity is greater than the intratemporal substitution elasticity.<sup>24</sup>

Given the mixed evidence in terms of the estimates for the different elasticities parameters, figures 6.1-6.22 plot the uniform (compensating) percentage change in consumption across all dates required to make an agent indifferent between the constant devaluation rate scenario and that of a temporary increase in the devaluation rate for different values of the intertemporal and intratemporal substitution elasticities. We assume an expected increase in the devaluation of 50% ( $\Delta=1.5$ ) after  $s=S+I$ , which is consistent with the observed data in failed stabilization programs. Beta is calibrated so that half of the period is spent in the stabilization phase. We set the endowment level of tradables and nontradables equal to one in every period. At  $s=t$ , the proportion of the value of the endowment for the owners of

tradables and non-tradables is the same, that is  $\lambda = 0.5$ ; both  $\theta$  and  $\sigma$  vary between  $[0,2]$ .<sup>25</sup>  $NT\%$  is the compensating change for the owner of nontradables while  $T\%$  represents the change for the tradables' owners.  $RA\%$  is the compensating change for the representative agent (who owns both the tradable and the nontradable good).

For  $\theta < 1$ , figures 6.1-1.10, the owners of nontradables face a positive wealth effect. However this positive wealth effect is not always strong enough to compensate the smoothing cost. This depends on the intertemporal and intratemporal elasticities values.<sup>26</sup> Notice that as  $\sigma$  increases for values of  $\theta < 1$ , the wealth effect increases. As agents become more willing to substitute future consumption for today's consumption, the real exchange rate appreciates more and the "wealth effect" increases. The difference of the intertemporal and the intratemporal substitution elasticities plays an important role in the model. As the intertemporal elasticity rises, agents are more willing to accept fluctuations in their consumption over time, thus increasing the response in the real exchange rate. On the other hand, as the intratemporal substitution elasticity increases, agents are more willing to tolerate changes in the mix of traded and nontraded goods. Thus, the wealth effect and the overall utility effect decrease for the nontraded good's owners as lower real exchange rate appreciations are required.

In the plots, we can observe that the owners of the tradable goods are worse off for all reasonable values of  $\sigma$  (less than two). Figure 6.11 includes what we referred to before as the "benchmark" Cobb-Douglas utility case,  $\theta = 1$ . In this case, since there are no redistributive effects across agents, they both face the smoothing cost only, and therefore, both are hurt by the temporary program.

Finally, figure 6.22 shows in detail the welfare effects for the parameter estimated by Tesar (1993),  $\theta = 0.44$ . For this particular case, if  $\sigma > 0.31$ , the wealth effect dominates the smoothing cost for the owners of nontradables and their utility improves when facing a temporary stabilization program. However, as the length of the program decreases, the overall utility effect is positive for lower values of the intratemporal substitution elasticity. Consistent with Tesar findings, in general, the owners of nontradable goods will benefit from the temporary program for  $\sigma > \theta$  if  $\theta < 0.5$ .

### 4.3 Political Decision

Based on propositions 2 and 3 and the numerical simulations, we state the following:

*Conjecture 1:* When faced with the decision to vote for a temporary stabilization program versus no plan at all, agents endowed with tradable goods will oppose the temporary stabilization program for  $\theta < 1$ . Thus, in the particular case of  $\theta = 0.44$ , they will oppose the program. In general, for reasonable values of sigma  $\sigma$  (less than two) they will always oppose the temporary plan.

*Conjecture 2:* When faced with the decision to vote for a temporary stabilization program versus no plan at all, agents endowed with nontradable goods would favor a temporary stabilization program if  $\theta < 0.5$  and  $\sigma > \theta$ .

Since we have an unidimensional issue space and single peaked preferences, we can appeal to the median voter theorem. The policy chosen will depend on who is the median voter of the economy. The content of the previous conjectures gives a rationale for the observed temporary stabilization programs that were implemented. They show that for certain parameter values, one political group benefits from such programs. Under certain parameter restrictions, when, for example, political gridlock precludes authorities from favoring the constituency with fiscal/monetary expansion, the central authorities can increase the welfare of the owners of nontradable goods through a stabilization program that, due to the lack of fiscal adjustment, will not bring long-term reduction to inflation.

### 5. Conclusions

In the above analysis, we have only considered an endowment setup where wealth effects are solely related to changes in the real exchange rate due to intertemporal consumption substitution. In this simple framework, we found that, under certain parameter restrictions, the welfare of the owners of nontradable goods increases when a temporary stabilization program is implemented. This same policy has a negative welfare cost for the owners of tradable goods.

Additional wealth (and substitution effects) may be obtained from endogenous labor decisions, capital investment decisions, fiscal adjustments and other, which would change the conditions for which

nontradable owners would support the temporary program. In general, positive wealth effects will increase the support for the temporary program. Moreover, uncertainty in the duration of the program as shown by Calvo and Drazen (1998) generates similar consumption dynamics. In a setup with nontradable goods, this sort of uncertainty can lead to real exchange-rate appreciation and thus to wealth redistribution across agents, which can create support for the program as well.

Therefore, this paper should be viewed as a complement to models that capture the political economy rationale behind inflationary policies and stabilization programs where heterogeneity and wealth distribution play a crucial role.

### Appendix 1: Wealth Effect

Consider the following utility function:

$$V^i = \sum_{s=t}^{\infty} \beta^{s-t} \left\{ \frac{(C_s^i)^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} \right\} \quad (\text{A1.1})$$

$$C_s^i = u(c_s^{iT}, c_s^{iN}) = \left[ \gamma^{\frac{1}{\theta}} (c_s^{iT})^{\frac{\theta-1}{\theta}} + (1-\gamma)^{\frac{1}{\theta}} (c_s^{iN})^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$

with  $\gamma \in (0,1)$ , where  $\sigma > 0$  is the elasticity of intertemporal substitution and  $\theta > 0$  is the elasticity of substitution between tradables and nontradables.

The ratio of nontradable to tradable wealth is given by

$$\frac{1-\lambda}{\lambda} = \frac{\sum_{s=t}^S \left( \frac{1}{1+r} \right)^{s-t} \rho_1 y^N + \sum_{s=S+1}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} \rho_2 y^N}{\sum_{s=t}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} y^T} \quad (\text{A1.2})$$

Using the first order condition for the tradable-nontradable consumption choice (equation (4')), the price of nontradable goods under the utility function (A1.1) is given by:

$$\frac{(1-\gamma)c_s^{iT}}{\gamma c_s^{iN}} = \rho_s^{\theta} \quad (\text{A1.3})$$

Substituting the first order conditions (A1.3) into (A1.2) and imposing the equilibrium condition in the nontraded sector, we obtain:

$$\frac{1-\lambda}{\lambda} = \frac{\left(\frac{1-\gamma}{\gamma}\right)^{\frac{1}{\theta}} y^{N^{1-\frac{1}{\theta}}} \left[ (1-\beta^{S+1})(c_1^T(\Delta))^{\frac{1}{\theta}} + \beta^{S+1}(c_2^T(\Delta))^{\frac{1}{\theta}} \right]}{y^T} \quad (\text{A1.4})$$

where  $\Delta = \frac{1+i_s}{1+i_{s-1}}$ .

In order to calculate the effect on the ratio of nontradable to tradable wealth of change in the devaluation rate, we calculate the derivative of (A1.4) to  $\Delta$ :

$$\frac{\partial \left( \frac{1-\lambda}{\lambda} \right)}{\partial \Delta} = \frac{\left(\frac{1-\gamma}{\gamma}\right)^{\frac{1}{\theta}} y^{N^{1-\frac{1}{\theta}}}}{\theta y^T} \left[ (1-\beta^{S+1}) \frac{\partial c_1^T}{\partial \Delta} (c_1^T)^{\frac{1}{\theta}-1} + \beta^{S+1} \frac{\partial c_2^T}{\partial \Delta} (c_2^T)^{\frac{1}{\theta}-1} \right] \quad (\text{A1.5})$$

From the budget constraint,

$$\sum_{s=t}^S \left( \frac{1}{1+r} \right)^{s-t} c_1^T(\Delta) + \sum_{s=S+1}^{\infty} \left( \frac{1}{1+r} \right)^{s-t} c_2^T(\Delta) = \frac{r}{1+r} y_s^T \quad (\text{A1.6})$$

using (A1.6) and the assumption that  $(1+r)B=I$ , we can derive the following condition

$$\left( \frac{1-\beta^{S+1}}{1-\beta} \right) \frac{\partial c_1^T}{\partial \Delta} = -\frac{\beta^{S+1}}{1-\beta} \frac{\partial c_2^T}{\partial \Delta} \quad (\text{A1.7})$$

substituting (A1.7) in (A1.5), we find the following expression for the change in the distribution of wealth to changes in the devaluation rate:

$$\frac{\partial \left( \frac{1-\lambda}{\lambda} \right)}{\partial \Delta} = \left(\frac{1-\gamma}{\gamma}\right)^{\frac{1}{\theta}} \frac{(1-\beta^{S+1}) y^{N^{1-\frac{1}{\theta}}}}{\theta y^T} \frac{\partial c_1^T}{\partial \Delta} \left[ (c_1^T)^{\frac{1}{\theta}-1} - (c_2^T)^{\frac{1}{\theta}-1} \right] \quad (\text{A1.8})$$

If agents expect that the stabilization program is going to fail ( $i_s > i_{s-1}$ ), they will consume today (when interest rates are low), thus  $c_1^T > c_2^T$  and  $\frac{\partial c_1^T}{\partial \Delta} > 0$ . Therefore, the first part of expression (A1.8) is

positive. The second part of expression (A1.8) is positive for  $I > \theta$ . Under this condition,  $\frac{\partial \left( \frac{1-\lambda}{\lambda} \right)}{\partial \Delta} > 0$ ,

$$\frac{\partial \lambda}{\partial \Delta} < 0 \text{ and } \frac{\partial (1-\lambda)}{\partial \Delta} > 0. \blacksquare$$

## Appendix 2: Cobb-Douglas Case

Consider the following utility function:

$$V = \sum_{s=t}^{\infty} \beta^{s-t} \left( \frac{C_s^{1-\frac{1}{\sigma}}}{1-\frac{1}{\sigma}} \right) \quad (\text{A2.1})$$

$$C_s = u(c_s^{i,T}, c_s^{i,N}) = (c_s^{i,T})^\gamma (c_s^{i,N})^{1-\gamma}$$

obtained from setting  $\theta=1$  in (A1.1). The first order conditions for the representative agent are given by:

$$\frac{(1-\gamma)c_s^T}{\gamma c_s^N} = \rho_s \quad (\text{A2.2})$$

$$c_1^T = c_2^T \Delta^a, \text{ with } a = \frac{\sigma}{(\sigma-1)(1-\gamma)+1}; \quad (\text{A2.3})$$

Using the resource constraint and equations (A2.2) and (A2.3), we find that the ratio of nontradable to tradable wealth (equation (A1.2)) is given by:

$$\frac{1-\lambda}{\lambda} = \frac{\gamma}{(1-\gamma)} \quad (\text{A2.4})$$

which is independent of the price of nontradable to tradable goods. We obtain this same result by setting  $\theta=1$  in equation (A1.8), which corresponds to the Cobb-Douglas case; the distribution of wealth does not

change with change is the devaluation rate,  $\frac{\partial \left( \frac{1-\lambda}{\lambda} \right)}{\partial \Delta} = 0$  if  $\blacksquare$ .

## References

- Alesina, A. and A. Drazen, 1991, Why are stabilizations delayed? *American Economic Review* 81, 1170-1188.
- Backus D. and G. Smith, 1993, Consumption and real exchange rates in dynamic economies with nontraded good. *Journal of International Economics* 35, 297-316.
- Bordo M. and C. Vegh, 1998, What if Alexander Hamilton Had Been Argentinean? A Comparison of the Early Monetary Experiences of Argentina and the United States. UCLA Working Paper.
- Burgin, M, 1946, The Economic Aspects of Argentine Federalism 1820-1852 (Cambridge University Press).
- Calvo, G., 1986, Temporary stabilization: predetermined exchange rates. *Journal of Political Economy* 94, 1319-1329.
- Calvo, G., 1987, On the Cost of Temporary Policy. *Journal of Development Economics* 27, 245-261.
- Calvo, G. and A. Drazen, 1998, Uncertain Duration of Reform: Dynamic Implications. *Macroeconomic Dynamics* 2, 443-55.
- Calvo, G and C. Végh, 1993, Exchange Rate-Based Stabilization under imperfect credibility, in: H. Firsich and A. Worgotter, eds., *Open-Economy Macroeconomics* (London: MacMillan Press) 3-28.
- Calvo, G. and C. Vegh, 1999, Inflation Stabilization in Chronic Inflation Countries, in: Taylor, J.B. and M. Woodford, eds., *Handbook of Macroeconomics* 1C, (North-Holland, Amsterdam) 1531-1614.
- Drazen, A., 2000, *Political Economy in Macroeconomics* (Princeton University Press).
- Drazen A. and E. Helpman, 1987, Stabilization with Exchange Rate Management. *Quarterly Journal of Economics* 102, 835-856.
- Dornbusch, R., 1998, *Exchange Rates and Inflation* (MIT Press).
- Eichenbaum, M., L. Hansen and K. Singleton, 1988, A Time series analysis of representative agent models of consumption and leisure choice under uncertainty. *Quarterly Journal of Economics* 103, 51-79.

- Fauvel, Y. and L. Samson, 1991, "Intertemporal substitution and durable goods: an empirical analysis," *Canadian Journal of Economics* 24, 192-205.
- Fernandez R. and D. Rodrik, 1991, Resistance to Reform: Status Quo Bias in Presence of Individual-Specific Uncertainty. *American Economic Review* 81, 1146-1155.
- Hansen, L. P. and Singleton, K.J., 1983, Stochastic Consumption, Risk Aversion, and the Temporal Behavior of Asset Returns. *Journal of Political Economy* 91, 249-65.
- Ghezzi, P., 1998, Exiting a Peg: an optimal stopping problem approach. Working Paper, Johns Hopkins University.
- Hall, R.E., 1998, Intertemporal Substitution in Consumption. *Journal of Political Economy* 96, 330-357.
- Lahiri, A., 2001, Exchange Rate Based Stabilizations under Real Frictions: The Role of Endogenous Labor Supply. *Journal of Economic Dynamics & Control* 25, 1157-77.
- Meltzer A. and Richard S., 1991, A Rational Theory of the Size of Government. *Journal of Political Economy* 89, 914-27.
- Mendoza, E.G. and Uribe, M., Devaluation Risk and the Business-Cycle Implications of Exchange-Rate Management. *Carnegie-Rochester Conference Series on Public Policy* 53, 239-96.
- Ogaki M. and C.M. Reinhart, 1998, Measuring Intertemporal Substitution: The Role of Durable Goods. *Journal of Political Economy* 6, 1078-98.
- Ostry M. and C.M. Reihart, 1992, Private saving and terms of trade shocks: evidence from developing countries. *IMF Staff Papers* 39, 496-517.
- Roldos, J. E., 1995, Supply-Side Effects of Disinflation Programs. *International Monetary Fund Staff Papers* 42, 158-83.
- Tesar, L., 1993, International Risk-Sharing and Nontraded Goods. *Journal of International Economics* 35, 69-89.
- Uribe, M., 1997, Exchange-Rate-Based Inflation Stabilization: The Initial Real Effects of Credible Plans. *Journal of Monetary Economics* 39, 197-221.

Uribe, M., 1999, Comparing the Welfare Costs and Initial Dynamics of Alternative Inflation Stabilization Policies. *Journal of Development Economics* 59, 295-318.

## Endnotes

---

<sup>1</sup> Chronic inflation is defined by an annual inflation of 20% or more for at least five consecutive years.

<sup>2</sup> See Calvo and Vegh (1999) for a survey.

<sup>3</sup> Drazen and Helpman (1987) show that the consumption dynamics depend on whether agents expect future changes in government spending, taxes or money creation and the timing of the policy change.

<sup>4</sup> Drazen and Calvo (1998) show in a model with incomplete markets, that an uncertain duration of a policy generates consumption booms, although the same policy would generate a flat consumption path if the duration were known.

<sup>5</sup> See Calvo (1986, 1987).

<sup>6</sup> For models that include supply side effects from labor-leisure decisions or capital accumulation see Roldos (1995), Uribe (1997) and Lahiri (2001); Mendoza and Uribe (2000) consider both policy uncertainty and supply side effects; see Uribe (1999) for a currency substitution model with positive welfare effects.

<sup>7</sup> See Drazen (2000).

<sup>8</sup> Following Drazen (2000), the model exhibits ex-ante heterogeneity.

<sup>9</sup> See Drazen (2000) for a comprehensive review of the literature.

<sup>10</sup> See Calvo and Vegh (1999).

<sup>11</sup> The 1978 “Tablita” program, the “Heterodox” program in mid-eighties, and the 1991 “Convertibility” plan used the exchange rate to provide a nominal anchor to the economy. The 1989 stabilization program relied on restrictions to the rate of monetary creation

<sup>12</sup> In the “Tablita” program, at its peak, the real exchange rate appreciated about 60% from December’s 1977 level. In the “Heterodox” program, peak appreciation was 30% from the June 1985 level.

<sup>13</sup> See Bordo and Vegh (1995).

**Table 1: Percentage Change in Consumer Prices (Selected Countries)**

|      | Argentina     | Bolivia        | Chile        | Brazil        | Mexico       | Peru          | Uruguay      |
|------|---------------|----------------|--------------|---------------|--------------|---------------|--------------|
| 1960 | 27.3          | 11.5           | 11.6         | <b>29.5</b>   | 4.9          | 8.7           | 38.5         |
| 1961 | 13.4          | 7.6            | 7.7          | <b>33.4</b>   | 1.6          | 5.9           | 22.7         |
| 1962 | <b>28.3</b>   | 5.9            | 14.0         | <b>51.8</b>   | 1.2          | 6.6           | 10.9         |
| 1963 | <b>23.9</b>   | -0.7           | 44.1         | <b>70.1</b>   | 0.6          | 6.1           | 21.3         |
| 1964 | <b>22.2</b>   | 10.2           | 46.0         | <b>91.9</b>   | 2.3          | 9.8           | <b>42.4</b>  |
| 1965 | <b>28.6</b>   | 2.9            | 28.8         | <b>65.7</b>   | 3.6          | 16.4          | <b>56.6</b>  |
| 1966 | <b>31.9</b>   | 7.0            | 23.1         | <b>41.3</b>   | 4.2          | 8.8           | <b>73.5</b>  |
| 1967 | <b>29.2</b>   | 11.2           | 18.8         | <b>30.5</b>   | 3.0          | 9.8           | <b>89.3</b>  |
| 1968 | 16.2          | 5.5            | <b>26.3</b>  | <b>22.0</b>   | 2.3          | 19.1          | <b>125.3</b> |
| 1969 | 7.6           | 2.2            | <b>30.4</b>  | <b>22.7</b>   | 3.4          | 6.2           | 21.0         |
| 1970 | 13.6          | 4.0            | <b>32.5</b>  | <b>22.4</b>   | 5.2          | 5.0           | 16.3         |
| 1971 | <b>34.7</b>   | 3.7            | <b>20.0</b>  | <b>20.1</b>   | 5.3          | 6.8           | 24.0         |
| 1972 | <b>58.4</b>   | 6.5            | <b>74.8</b>  | 16.6          | 5.0          | 7.2           | <b>76.5</b>  |
| 1973 | <b>61.2</b>   | 31.5           | <b>361.5</b> | 12.7          | 12.0         | 9.5           | <b>97.0</b>  |
| 1974 | <b>23.5</b>   | 62.8           | <b>504.7</b> | <b>27.6</b>   | 23.8         | 16.9          | <b>77.2</b>  |
| 1975 | <b>182.9</b>  | 8.0            | <b>374.7</b> | <b>29.0</b>   | 15.2         | 23.6          | <b>81.4</b>  |
| 1976 | <b>444.0</b>  | 4.5            | <b>211.8</b> | <b>42.0</b>   | 15.8         | <b>33.5</b>   | <b>50.6</b>  |
| 1977 | <b>176.0</b>  | 8.1            | <b>91.9</b>  | <b>43.7</b>   | 29.0         | <b>38.1</b>   | <b>58.2</b>  |
| 1978 | <b>175.5</b>  | 10.4           | <b>40.1</b>  | <b>38.7</b>   | 17.5         | <b>57.8</b>   | <b>44.5</b>  |
| 1979 | <b>159.5</b>  | 19.7           | <b>33.4</b>  | <b>52.7</b>   | 18.2         | <b>66.7</b>   | <b>66.8</b>  |
| 1980 | <b>100.8</b>  | <b>47.2</b>    | <b>35.1</b>  | <b>82.8</b>   | <b>26.4</b>  | <b>59.1</b>   | <b>63.5</b>  |
| 1981 | <b>104.5</b>  | <b>32.1</b>    | 19.7         | <b>105.6</b>  | <b>27.9</b>  | <b>75.4</b>   | <b>34.0</b>  |
| 1982 | <b>164.8</b>  | <b>123.5</b>   | 9.9          | <b>97.8</b>   | <b>58.9</b>  | <b>64.4</b>   | 19.0         |
| 1983 | <b>343.8</b>  | <b>275.6</b>   | 27.3         | <b>133.2</b>  | <b>101.8</b> | <b>111.2</b>  | <b>49.2</b>  |
| 1984 | <b>626.7</b>  | <b>1281.3</b>  | 19.9         | <b>188.8</b>  | <b>65.5</b>  | <b>110.2</b>  | <b>55.3</b>  |
| 1985 | <b>672.2</b>  | <b>11749.6</b> | 30.7         | <b>224.6</b>  | <b>57.7</b>  | <b>163.4</b>  | <b>72.2</b>  |
| 1986 | <b>90.1</b>   | <b>276.3</b>   | 19.5         | <b>147.1</b>  | <b>86.2</b>  | <b>77.9</b>   | <b>76.4</b>  |
| 1987 | <b>131.3</b>  | 14.6           | 19.9         | <b>228.3</b>  | <b>131.8</b> | <b>85.8</b>   | <b>63.6</b>  |
| 1988 | <b>343.0</b>  | 16.0           | 14.7         | <b>629.1</b>  | <b>114.2</b> | <b>667.0</b>  | <b>62.2</b>  |
| 1989 | <b>3079.8</b> | 15.2           | 17.0         | <b>1430.7</b> | <b>20.0</b>  | <b>3398.7</b> | <b>80.4</b>  |
| 1990 | <b>2314.0</b> | 17.1           | 26.0         | <b>2947.7</b> | <b>26.7</b>  | <b>7481.7</b> | <b>112.5</b> |
| 1991 | <b>171.7</b>  | 21.4           | 21.8         | <b>432.8</b>  | <b>22.7</b>  | <b>409.5</b>  | <b>102.0</b> |
| 1992 | <b>24.9</b>   | 12.1           | 15.4         | <b>951.6</b>  | 15.5         | <b>73.5</b>   | <b>68.5</b>  |
| 1993 | 10.6          | 8.5            | 12.7         | <b>1928.0</b> | 9.8          | <b>48.6</b>   | <b>54.1</b>  |
| 1994 | 4.2           | 7.9            | 11.4         | <b>2037.8</b> | 7.0          | 23.7          | <b>44.7</b>  |
| 1995 | 3.4           | 10.2           | 8.2          | <b>66.0</b>   | 35.0         | 11.1          | <b>42.2</b>  |
| 1996 | 0.2           | 12.4           | 7.4          | 15.8          | 34.4         | 11.5          | <b>28.3</b>  |
| 1997 | 0.5           | 4.7            | 6.1          | 6.9           | 20.6         | 8.6           | 19.8         |

Chronic Inflation: Annual inflation of 20% or more for at least five consecutive years.

Source: IMF Financial Statistics

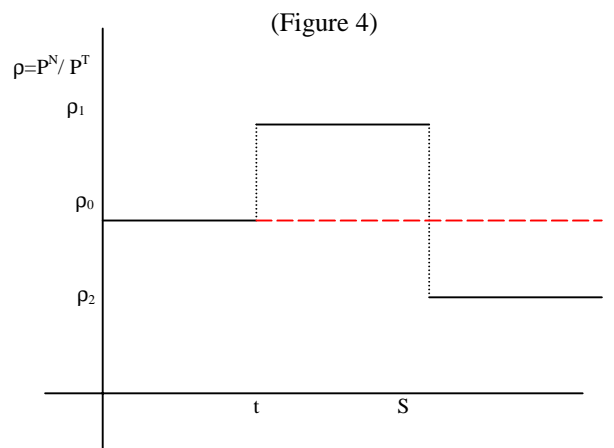
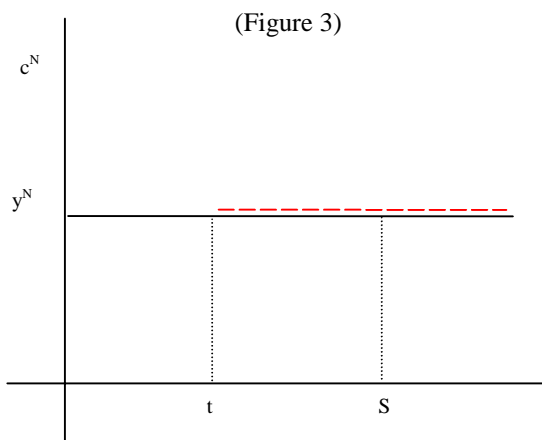
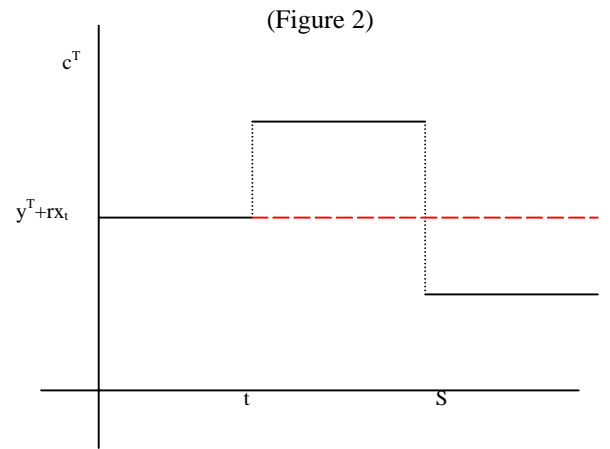
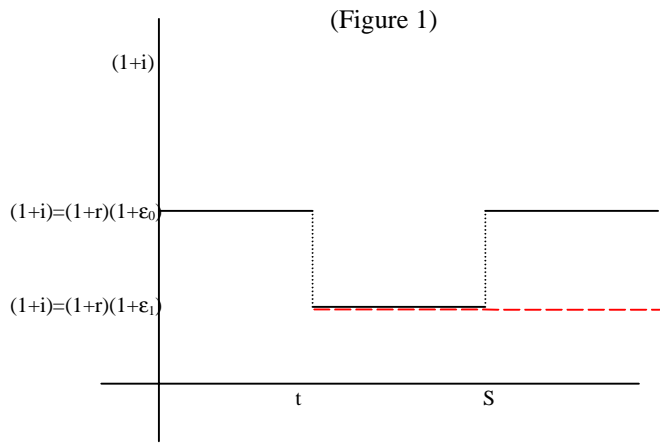
**Table 2: Exchange - Rate Stabilization Programs in Latin America**

| Program               | Beginning-Ending Dates | Exchange Rate Arrangement  | Did program end in crises? |
|-----------------------|------------------------|--|----------------------------|
| Brazil, 1964          | 03/1964 - 08/1968      | Fixed Exchange Rate with periodic devaluations   | No                         |
| Argentina, 1967       | 03/1967 - 05/1970      | Fixed Exchange Rate  | Yes                        |
| Uruguay, 1968         | 06/1968 - 12/1971      | Fixed Exchange Rate  | Yes                        |
| Chilean Tablita       | 02/1978 - 06/1982      | Pre-announced crawling peg (02/978-06/1979)<br>Fixed Exchange Rate   | Yes                        |
| Uruguayan Tablita     | 10/1978 - 11/1982      | Pre-announced crawling peg   | Yes                        |
| Argentine Tablita     | 12/1978 - 11/1981      | Pre-announced crawling peg   | Yes                        |
| Austral (Arg.)        | 06/1985 - 09/1986      | Fixed Exchange Rate (06/1985-03/1986)<br>Pre-announced crawling peg  | Yes                        |
| Cruzado (Brazil)      | 02/1986 - 11/1987      | Fixed Exchange Rate  | Yes                        |
| Mexico 1987           | 12/1987 - 12/1994      | Fixed Exchange Rate (02/1988-12/1988)<br>Pre-announced crawling peg (01/1989-11/191)<br>Exchange rate band | Yes                        |
| Uruguay 1990          | 12/1990-Present        | Exchange rate band with declining rate of devaluation  | No                         |
| Convertibility (Arg.) | 04/1991-Present        | Currency board 1-1 parity  | No                         |

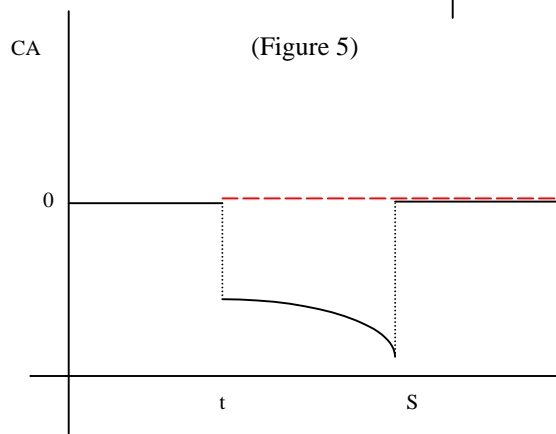
Calvo and Vegh (1999)

Additionally, there have been money-based stabilization programs in Chile (1975-1977), Argentina (1989-1991) and Brazil (1990-1991).

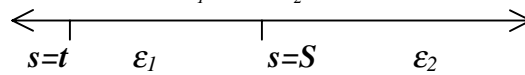
## Figures 1-5: Effects of Temporary vs. Permanent Stabilization Programs



——— Temporary Plan  
 - - - Permanent Program



$$\begin{aligned}
 \rho_1 &> \rho_2 \\
 c_1^T &> c_2^T \\
 c_1^N &= c_2^N
 \end{aligned}$$



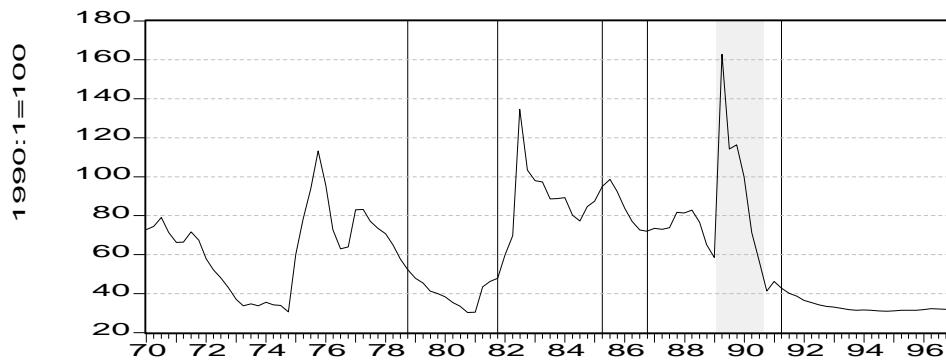
**Figure 6: Percentage change increase in consumption across all dates required to compensate the consumer between  $\Delta=1$  and an expected  $\Delta=1.5$  at  $s=S+1$ .**

| Parameters  | Benchmark |
|-------------|-----------|
| $\Delta$    | 1.000     |
| $C_1^T$     | 1.000     |
| $C_2^T$     | 1.000     |
| $\lambda$   | 0.500     |
| $1-\lambda$ | 0.500     |

$\sigma > 0$ : elasticity of intertemporal substitution;  $\theta > 0$  : elasticity of substitution between tradables and

nontradables;  $\Delta = \frac{1+i_s}{1+i_{s-1}}$

Argentina: Real Exchange Rate



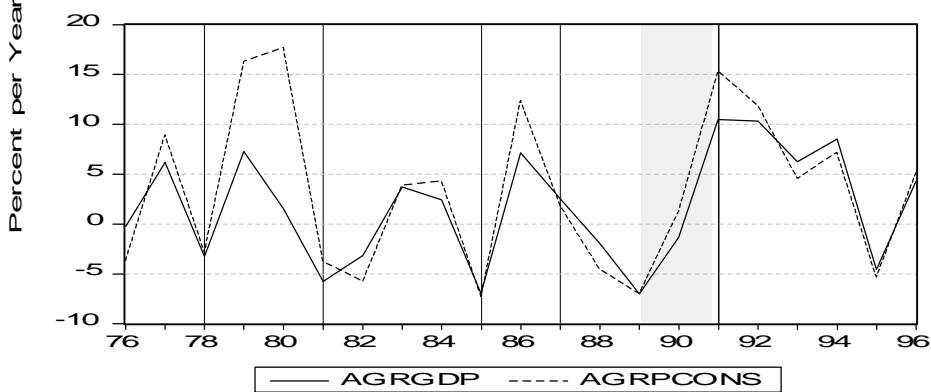
Graph #1

Argentina: Trade Balance



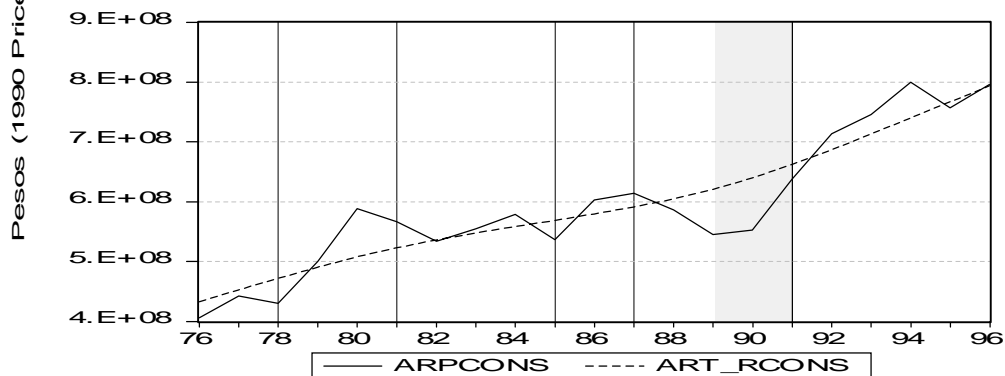
Graph #2

ARGENTINA: Growth Real GDP and Real Consumption



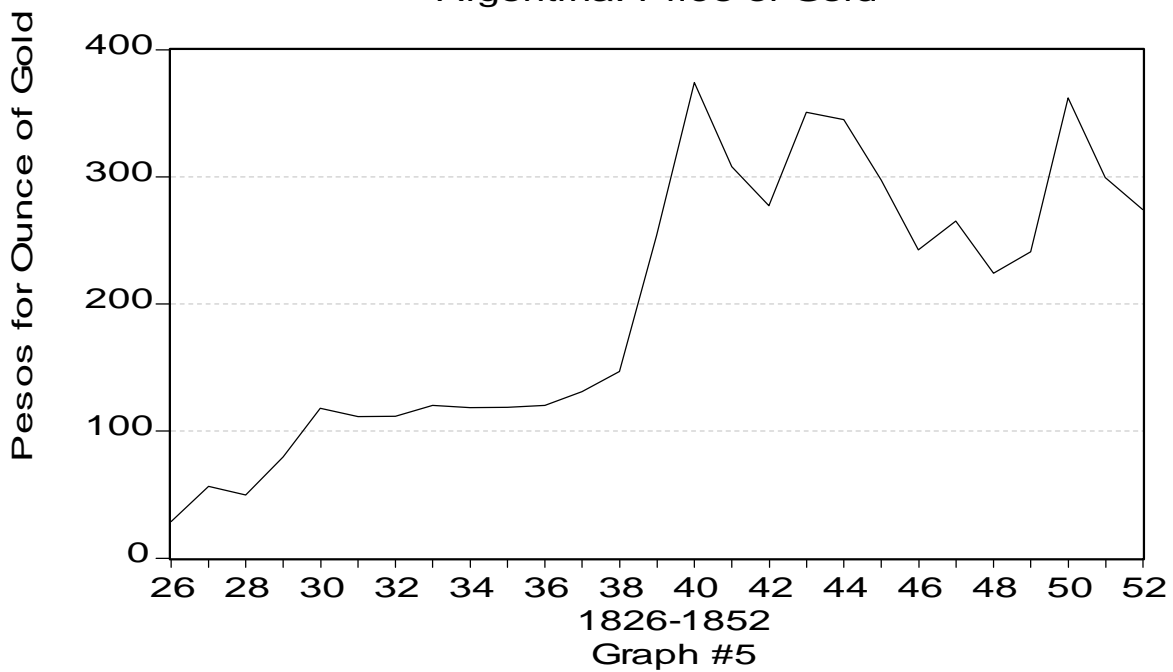
Graph #3

Argentina: Real Consumption (HP-trend)



Graph #4

Argentina: Price of Gold



---

<sup>14</sup> Reallocation across sectors is usually costly; diversification tends to be limited in developing countries due, partly, to development of the financial sector.

<sup>15</sup> We can appeal to the median voter theorem given an unidimensional issue space and single-peaked preferences.

<sup>16</sup> With homothetic preferences, the demand functions are a linear function of income:  $x_i(p,m) = x_i(p)m$ .

<sup>17</sup> In this setup, cash-in-advance constraints imply that there are no distortionary effects from a permanent reduction in inflation, and that velocity is constant. Alternative methods, money-in-the-utility function, cash goods-credit goods, transaction technology, have been used in the literature.

<sup>18</sup> We wish to abstract away from result driven by redistribution considerations where people of low endowment might favor inflation tax because of positive net transfer payments. We discuss further this point in section 4.

<sup>19</sup> If the nominal interest rate is positive, the consumer will not hold cash in excess of what he/she requires to consume.

<sup>20</sup> See Calvo (1986).

<sup>21</sup> However, since most stabilization programs that relied on pegged exchange rates have ended in crises and large reserve losses, we could think of endogenizing  $S$  using the balance of payment crisis literature. See Piero Ghezzi (1998) for this exercise.

<sup>22</sup> See Drazen (2000) for a classification and definition of the different types of heterogeneity relevant to the political economy field.

<sup>23</sup> Gilles Saint-Paul suggested to think of the following analogy: agents own parcels; some parcels have trees that produce tradable goods and others nontradable goods. The money transfer is accomplished through a helicopter drop, so that it will be lump-sum within groups but will not change the distribution of income across groups.

---

<sup>24</sup> Additionally, when the covariance between domestic output to traded and non-traded goods is greater than the covariance between domestic output of nontraded goods and foreign output of the traded goods, domestic agents will skew their portfolio towards domestic claims, thus explaining the home bias puzzle.

<sup>25</sup> Simulations were performed for different durations of the stabilization plan as well as for additional values of sigma and theta, obtaining similar results, available upon request.

<sup>26</sup> Though  $\theta < 1$  is a sufficient condition for the owners of nontradable goods to be hurt by the temporary program (see proposition 2) for reasonable values of  $\sigma$  - less than two – already we observe only negative utility effects for  $\theta < 0.6$ . However, positive utility effects are obtained for the owners of nontradable goods for  $\theta < 1$  for shorter programs and/or higher values of sigma beyond the usual estimates. Results available upon request.