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Trade Reform and Inflation Stabilization

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Abstract

This paper examines two important issues for a small high-inflation open economy with trade controls where the government implements an exchange-rate based stabilization program: first, the extent to which the degree of openness of the economy influences the probability of success of the program; and second, the conditions under which a trade reform, implemented in conjunction with the stabilization program, will increase the probability that stabilization will be successful. The paper shows that in an economy with high export and import price elasticities, structural reforms to increase openness can be important in determining the success of the program.

JEL Classification Numbers:

E63, F13, F31, F41

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Contents

Summary

In recent years, a large number of developing countries have undertaken inflation stabilization programs. In many instances, these programs have been accompanied by structural reforms in the external sector, in particular trade liberalization. It has been increasingly recognized that the degree of openness of an economy, and the efficiency gains brought about by trade liberalization, can influence the success of a program. Yet the analytical literature on inflation stabilization has largely ignored the potential role that can be played by greater openness--both structural and policy-induced--in supporting a stabilization effort. This paper examines the implications of structural reforms to increase openness in determining the likelihood that an inflation stabilization program will be successful.

The paper identifies conditions under which different policies with regard to openness are likely to improve the probability of success of a stabilization program. In several empirically realistic cases, policies that promote openness, including trade liberalization policies, have a positive effect on the ex ante probability that a program will succeed. An important conclusion is that in cases where the exchange rate elasticities of imports and exports are sufficiently large (that is, the Marshall-Lerner condition holds), a greater degree of openness increases the probability of success. This is because, with greater openness, the extent to which persistence in inflation in nontraded goods results in real exchange rate appreciation is dampened, thereby mitigating the adverse effect of this persistence on the trade balance.

The paper derives additional conclusions about the likely effects of trade liberalization on the probability of success of stabilization by explicitly considering the role of trade taxes in budgetary revenues and the role of imported intermediate goods in the production process. The model suggests that trade reform would most strongly support a stabilization effort when the productivity of imported inputs is high and the price elasticity of imports is low.

I. Introduction

In recent years, a number of analytical studies have examined the effectiveness of exchange-rate based stabilization programs in high inflation developing economies. 1/ There has also been a considerable literature on the benefits and costs of trade liberalization to developing economies. 2/ However, the interaction between stabilization programs and structural reforms aimed at trade liberalization has received relatively limited attention. This paper tries to explore this interaction, and in doing so it analyzes two main questions concerning the relationship between the degree of openness of an economy, removal of trade controls, and the outcome of a stabilization program: First, does the degree of openness of the economy affect the probability of success of the program? Second, under what conditions does a trade reform increase the probability that stabilization will succeed?

The factors affecting the likelihood that an exchange-rate based inflation stabilization program would be successful have been examined in a number of papers. 3/ The setting for this type of analysis has typically been that of a small open economy with a fixed exchange rate regime and perfect capital mobility. In such an economy, the government runs a budget deficit that is partially financed by seigniorage generated by nominal devaluation of the exchange rate. The rate of nominal devaluation, through its effect on the price of internationally traded goods, plays a key role in determining the rate of domestic inflation. An exchange rate based stabilization program involves a reduction in the rate at which the nominal exchange rate is devalued. This reduction can take the form either of a freezing of the exchange rate, so that the rate of devaluation is zero, or the implementation of a preannounced path of nominal devaluation.

An important conclusion of the literature in this area has been that fiscal consolidation is a necessary condition for inflation stabilization to be sustained, because by reducing the rate of devaluation, the government is no longer able to rely on seigniorage for financing the fiscal deficit. Moreover, the government's intertemporal budget constraint indicates that, in present value terms, the primary deficit is equal to the inflation tax plus the government's initial wealth. This implies that a stabilization program that does not entail adequate fiscal consolidation leads to future

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1/ See, for instance, Sachs (1987), Calvo (1986), Calvo and Vegh (1990), and Dornbusch (1982, 1991).

2/ See, for example, Dornbusch (1992), Edwards (1993), Khan and Zahler (1985), Krueger (1978), and Rodrik (1992).

3/ See, in addition to the theoretical literature, Khan and Knight (1981) for an empirical analysis of the effects on inflation and growth of programs involving fiscal consolidation and monetary restraint.

inflation being even higher than it was before stabilization. A program that involves exchange rate pegging not accompanied by fiscal adjustment may thus be worse than no program at all. 1/

Dornbusch (1991) provides a benchmark model that describes the main factors, including fiscal stabilization, that affect the probability of failure of a stabilization program. This probability provides a measure of the likelihood that the net foreign exchange expenditure of the government, assumed to be exogenous, will exceed the sum of the initial stock of foreign reserves and the additional foreign exchange generated by the stabilization. The latter is assumed to accrue from an improvement of the trade balance resulting from a depreciation of the real exchange rate.

The above type of analysis raises several theoretical issues with important policy implications. First, instead of having net foreign exchange expenditure being exogenous, the government may be able to influence it at least partially, by means of trade policy. 2/ A second issue concerns the behavior of the real exchange rate, and its effect on the trade balance. 3/ Since a change in the real exchange rate affects the trade balance, which in turn affects the level of foreign reserves, the time path of the real exchange rate and the resulting impact on the trade balance are important determinants of the probability of failure.

The rest of the paper focusses on the second set of issues and is organized as follows: Section II develops a basic model of the economy and links the probability of success of the program to the degree of openness. Section III extends the analysis by examining the impact of changes in trade controls on the real exchange rate, and on the probability of success. Section IV provides some concluding remarks.

1/ For further discussion, see Calvo (1986). Some observers, notably Sargent (1982), have argued that policies which use nominal anchors, such as exchange rate pegging or incomes policies, cannot lower inflation even in the short run unless they are accompanied by credible fiscal reform. The approach adopted in this paper--which is similar in spirit to Dornbusch (1982) and Sachs (1987)--is that the exchange rate can serve as a nominal anchor in the short run, although the sustainability of stabilization requires fiscal consolidation.

2/ For example, by regarding it as a regulated Brownian motion with one component that is a policy variable and another that is random--to reflect, for instance, terms of trade or productivity shocks, analogously to Bertola and Drazen (1993).

3/ See Khan and Lizondo (1987) for an analysis of the implications of demand management policies for real exchange rate behavior.

II. Degree of Openness and Stabilization

In the Dornbusch(1991) model, the probability (p) of failure of the stabilization program is defined as follows:

$$p = p(x > \alpha A + R) = \int_{\psi}^{\infty} f(x)\, dx \qquad (1)$$
$$\text{where} \quad \psi \equiv \alpha A + R$$

where net foreign exchange expenditure, x, is assumed to be an exogenous stochastic variable with density function f(x); R denotes the stock of initial reserves; 1/ and the additional foreign exchange generated by the stabilization is denoted by αA, where A stands for "adjustment effort", and includes costs that often accompany a stabilization effort, for instance, adjustments to real wages. The policy problem in the context of stabilization then revolves around minimizing the probability of failure as given by equation (1), and of determining whether this probability is affected by structural characteristics of the economy.

A number of studies have examined empirically the relationship between successful inflation stabilization and structural characteristics of an economy such as the tax system and income distribution. 2/ However, few of these studies have focussed on structural characteristics of the external sector. The key feature that we focus on in this paper is the degree of openness of the economy, which is described in more detail below. This section deals with the issue of how this feature affects the probability that an exchange rate based stabilization program will succeed.

A priori it is unclear how the degree of openness would affect the probability of success, although policy orientation (which may be a key element in openness) would, in general, have a bearing on the country's external balance. The implication of a given pattern of real exchange rate behavior for the trade balance, and hence for reserves, depends on the exchange rate-elasticities of exports and imports (that is the Marshall-Lerner condition), but the extent of the change in the real exchange rate itself depends on the degree of openness of the economy. The paper establishes general conditions linking the degree of openness and trade volume elasticities on the one hand, and the time path of reserves and the likelihood of successful stabilization on the other.

By equation (1), the behavior of foreign reserves is a major determinant of the likelihood that the stabilization program will succeed.

1/ R may also reflect foreign financial support at the inception of the program.

2/ See, for instance, Cukierman, Edwards and Tabellini (1992).

An important factor influencing foreign reserves is the time path of the real exchange rate. To model this time path, and its implications for the trade balance and hence for foreign reserves, we start with the price index of the home country, which is a composite of the prices of traded and non-traded goods. The home and world price levels are thus:

$$P = (P^T)^{\beta} (P^N)^{1-\beta} \quad and \quad P^* = (P^{T*})^{\beta} (P^{N*})^{1-\beta}. \tag{2}$$

This specification of price indices in the context of real exchange rates was originated by Balassa (1964), and is now widely used. 1/ In equation (2), the parameter β, which represents the relative weight of traded and nontraded goods in the price index and hence in the consumption bundle, may be interpreted as the degree of openness of the economy.

The real exchange rate, Q, is defined as the relative price of foreign goods in terms of home goods; that is:

$$Q \equiv \frac{EP^*}{P} \tag{3}$$

The nominal exchange rate--ie, the price of foreign currency in terms of domestic currency--is denoted by E. For the traded good it is assumed that:

$$P^T = E\, P^{T*}, \tag{4}$$

that is, effective international arbitrage results in the equalization of world prices of the traded good.

Equation (4) assumes that there are no transportation costs or tariff barriers. The assumption with regard to tariff barriers is relaxed in the next section which discusses the links between trade reform and successful stabilization.

1/ For use of this index, see Svensson (1992), and Razin and Svensson (1983), among others. In a utility maximizing framework, as is well known, equation (2) is just the exact price index when the utility function in terms of traded and non-traded goods is of the Cobb-Douglas form. An important assumption in this specification, made for analytic convenience, is that the shares of traded and non-traded goods in the price index are the same across countries.

Equations (3) and (4) together imply that:

$$Q = \left(\frac{E\,P^{N*}}{P^{N}}\right)^{1-\beta} \qquad (5)$$

That is, if non-traded goods cost more at home than they do abroad then the real exchange rate will appreciate (relative to purchasing power parity. One can postulate a number of theories concerning what drives the price differential of non-traded goods. 1/ However, for our purpose it is not the differential itself that is important but rather the implications for the time path of the real exchange rate.

Taking the logarithm of equation (5) and differentiating the resulting expression with respect to time, the rate of change of the real exchange rate is given by the following:

$$q'(t) = (1 - \beta)\,[e'(t) + \pi^{N*} - \pi^{N}] \qquad (6)$$

where π^{i} represents the inflation rate in the ith sector, q(e) represents the logarithm of the real (nominal) exchange rate, and a prime (') over a variable denotes a time derivative. Equation (6) captures the direct effect of e'(t) on q'(t)--that is, the implication for the real exchange rate of changes in the nominal exchange rate. The equation also shows how the degree of openness determines the extent to which inflation in the nontraded goods sector leads to real exchange rate appreciation. The more open the economy, the smaller is the real appreciation implied by a given rate of inflation in the nontraded sector. The reason is simply that the more open the economy, the smaller is the role played by the price of nontraded goods in determining overall prices. Thus inflation in the nontraded goods sector has less of an effect in determining foreign prices relative to home prices.

Before discussing the implications of the time path described by equation (6), first consider the role played by nominal devaluation in the determination of the inflation rate. This will yield the indirect effect of devaluation on the real exchange rate. (A change in the nominal exchange rate would, of course, affect the real exchange rate directly and, via the price level, indirectly.) Combining equations (2) and (4), taking logarithms, and differentiating with respect to time we have that:

1/ The classic reference is Balassa (1964).

$$\pi = \beta (e'(t) + \pi^{T*}) + (1 - \beta) \pi^{N}. \quad (7)$$

This is the effect of devaluation on the rate of inflation; and also the effect of inflation in traded and non-traded goods on the overall inflation rate. Notice that e' affects π via the price of traded goods: hence the weight β on the effect of e'.

In the case of an exchange-rate-based inflation stabilization the rate of nominal devaluation will be lowered (see, for example, Calvo 1986). As a benchmark we can consider the case in which the nominal exchange rate is used as an anchor: that is, e'(t) is set equal to zero. Without loss of generality we can assume that the rate of foreign inflation is zero. Then, using equations (6) and (7), the time paths of the real exchange rate and the rate of inflation will be, respectively,

$$q'(t) = - (1 - \beta) \pi^{N} \quad (8)$$

and

$$\pi = (1 - \beta) \pi^{N}. \quad (9)$$

Equation (8) states that if the inflation rate of non-traded goods is positive then the real exchange rate will appreciate. Equation (9) states that if foreign inflation is zero and the nominal exchange rate is frozen, then the rate of inflation of traded goods will be zero, so that the overall rate of inflation will depend only on the inflation rate of non-traded goods. A one percentage point increase in π^{N} would translate into a $(1-\beta)$ percentage point increase in the overall inflation rate--as we would expect from equation (2).

The determinants of π^{N} could be explained along the lines of Balassa (1964) who focuses on the role of the productivity differential between the home country and the rest of the world. Alternatively, it could be explained as in Calvo and Vegh(1990) who specify a supply side, a monetary sector, and then derive π^{N} as an endogenous variable. But in any event, the setting of e'(t)=0 does not affect π^{N}---so for now we just take π^{N} to be positive; that is, we consider an economy which has high inflation to begin with.

Once the sign of π^{N} is determined, then given β, the time path of Q will be determined. The implications of this time path for the trade balance can be spelt out as follows. The trade balance, expressed in terms of home goods, is:

$$TB(Q) = X(Q) - Q\,M(Q). \tag{10}$$

where X and M denote the volume of exports and imports respectively.

The behavior of the trade balance over time will then be given by:

$$TB'(t) = \frac{\partial TB}{\partial Q}\,\frac{\partial Q}{\partial t} = Q'(t)\,[X_Q - M - M_Q] \tag{11}$$

Equation (11) can be expressed in terms of the elasticities of exports and imports with respect to the real exchange rate, that is, in terms of the Marshall-Lerner-Hirschman condition. Note that equation (11) is just: $TB'(t)=TB_Q.Q'(t)$. The Marshall-Lerner-Hirschman condition refers to the first term: ie, the condition under which the trade balance will improve following a real depreciation. Formally, the dependence of the trade balance on the real exchange rate is given as:

$$TB_Q = \epsilon_X \frac{X}{Q} - M + \epsilon_m \frac{M}{Q} \tag{12}$$
$$\text{where: } \epsilon_X = X_Q \frac{Q}{X} \text{ and } \epsilon_m = -M_Q \frac{Q}{M}$$

(the ϵ's represent trade elasticities). Clearly,

$$TB_Q > 0 \text{ if: } \frac{X}{QM}\,\epsilon_X + \epsilon_m > 1 \tag{13}$$

Equation (13) is thus the basic Marshall-Lerner-Hirschman condition, which states simply that in order for the trade balance to improve following a real depreciation, the components of the trade balance must possess sufficiently large exchange rate elasticities.

However, our focus is not on condition (13) *per se* but on the conditions under which TB'(t) is positive. From equations (11), (12) and (13), it can be seen that:

$$TB'(t) > 0 \text{ if: } (a)\ Q'(t) > 0 \text{ and } TB_Q > 0 \tag{14}$$
$$\text{or } (b)\ Q'(t) < 0 \text{ and } TB_Q < 0$$

This simply formalizes two possibilities: (i) the real exchange rate depreciates and the Marshall-Lerner condition holds, and the trade balance improves; and (ii) the real exchange rate appreciates but the Marshall-Lerner condition does not hold, then once again the trade balance improves. 1/ We will show that the trade volume elasticities also play an important role in determining the effect of openness on the likelihood of success of the program.

The next step is to link the trade balance to the level of reserves and hence to the probability of program failure. As a simplification, the level of foreign reserves can be written as a positive fraction of the trade balance:

$$R = R_0 + \alpha\, TB = R_0 + \alpha\,(X - QM) \tag{15}$$

where R_0 represents the initial stock of reserves.

The time path of reserves is then given by:

$$R'(t) = \alpha\, TB'(t) = \alpha\, Q'(t)\,[X_Q - M - Q\, M_Q] \tag{16}$$

Thus, $R'(t) > 0$ if and only if $TB'(t) > 0$. Since at this stage we abstract from capital flows, the only way to improve the reserve position is by improving the trade balance. That is, the conditions given by equation (14) are also the conditions under which the level of reserves will increase. The implications for the failure probability then follow from equation (1).

Now consider the effects of the degree of openness on the time path of reserves, and hence on the failure probability. The issue is whether a higher β makes it more likely that conditions (14) will hold. Combining equations (16) and (8) yields:

1/ It is true that if a depreciation of the real exchange rate directly raises the level of consumption (the Harberger-Laursen-Metzler effect) then the holding of the Marshall-Lerner condition is not sufficient for the trade balance to improve. However, since our focus is not explicity on consumption but on trade aggregates, and given the varying empirical results on the exchange rate elasticity of consumption, we do not consider this possibility. The next section of the paper does, however, contain an analytical discussion of the effects of changes in tariffs on consumption.

$$R'(t) = -\alpha (1-\beta) \pi^N Q M \left[\frac{X}{QM}\epsilon_Q^X + \epsilon_Q^M - 1\right] \quad (17)$$

that is, R' is a positive function of β *provided* the Marshall-Lerner condition holds. In other words, even if β is small, reserves might rise as long as the trade volume elasticities are large.

The rationale for equations (16) and (17) is apparent from equations (6) and (14). If the Marshall-Lerner condition holds, then a real appreciation results in a deterioration of the trade balance. The real appreciation in turn is driven by the persistence of inflation in the non-traded goods sector. However, the extent to which π^N results in real appreciation depends on β; the more open the economy the smaller is the effect on the real exchange rate of non-traded goods inflation. The smaller the real appreciation, the less is the deterioration in the trade balance and hence the less the adverse effect on reserves and the lower the probability of failure.

More interestingly, even if the degree of openness is low, if the Marshall-Lerner condition does not hold, the reserve position might improve. Here, there is considerable empirical evidence regarding differences in price elasticities between exporters of primary commodities on the one hand, and exporters of manufactures on the other. 1/ For the former set of countries, the trade elasticities are, in general, low, but given the export diversification which some of these countries have undertaken in recent years, these elasticities may have increased substantially. For the exporters of manufactures, the elasticities remain high. With regard to imports, especially in the case of countries heavily dependent on food and fuel imports, the demand for imports is relatively price-inelastic.

This type of evidence suggests that structural reforms aimed at increasing the degree of openness may be a useful element in any stabilization program in countries with high trade elasticities. The degree of openness may be increased by, for instance, reducing trade barriers (discussed below) as part of an outward oriented strategy. In countries with low trade elasticities, there may be a case for structural reorientation, in some cases by emphasizing the production and export of manufactured goods, to increase the responsiveness of output of traded goods to market prices. This would have the additional advantage of increasing the economy's resilience to unfavorable external shocks that may affect a particular sector of the economy. 2/ In the case of fuel importers, the

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1/ See, for instance, Goldstein and Khan (1985) and Kumar et al (1993). See Khan and Montiel (1987) for a detailed analysis of real exchange rate dynamics in primary producing countries.

2/ For a more complete description of the effects of trade reform in a stochastic setting, see Khan and Zahler (1985).

low elasticity may simply reflect the fact that domestic consumption is subsidized and the consumer is often not confronted with the world price of fuel. Hence, in this case, a rationalization of domestic fuel prices to reflect world prices would be the main requirement.

For a country with low trade elasticities, there may also appear to be the option of lowering the degree of openness by, for instance, raising trade barriers. However, the imposition of tariffs can directly result in a deterioration of the current account if the production of exports is intensive in imported inputs, as is the case in many developing countries (see discussion in section III). 1/ Moreover, the possibility of further increases in tariffs results in a distortion of intertemporal relative prices that induces higher current consumption, reduces domestic saving and further worsens the current account. 2/ Finally, such a policy can have significant negative effects on the efficiency of resource allocation, which can aggravate the effects on domestic saving and the current account. 3/

III. Trade Liberalization and Stabilization

The above section has discussed the implications of openness in general for successful stabilization. This section discusses the particular issue of trade liberalization--which, for simplicity, is considered to entail a reduction in the prevailing import tariffs--in the context of inflation stabilization. Trade liberalization would directly influence the volume of imports, which in turn would have implications for the production of exports. These two factors would affect the trade balance which is an important determinant of reserves. However, trade liberalization will also affect the government budget constraint by influencing tariff revenues.

The trade balance and the budgetary effects may often be in opposite directions: for instance, there may be a worsening of the trade balance alongside an improvement in the fiscal position due to an increase in tariff revenues resulting from a surge in import volumes. In addition, there may be second-round effects through, for instance, the greater availability of imported inputs leading to greater output and exports. The higher level of real activity associated with greater output and exports, in addition to raising employment, could lead to higher fiscal revenues. Finally, the higher level of income is likely to result in higher imports. These interactions between the effects of trade liberalization on the budget and on the trade balance highlight the need to determine the conditions under which trade liberalization increases the likelihood for a stabilization program to be successful.

1/ See, for example, Lopez and Rodrik (1991).

2/ There is a large literature on this issue. See for instance Razin and Svensson (1983).

3/ See, for example, Ramaswami and Srinivasan (1971) for an early theoretical study, Krueger (1978) for the experience of developing countries, and IMF (1993) for more recent empirical evidence.

This section presents a stylized version of the above model with trade controls, in the form of a tariff τ, and discusses the effects of tariff liberalization on the government budget, the trade balance, and the level of reserves. The first sub-section analyzes the role of the trade balance in influencing reserves, and the role played by intermediate inputs. The second sub-section describes the relevance of fiscal policy for the sustainability of a stabilization, and examines how it affects the reserve position. This is followed by an examination of the interaction between the government budget and the trade balance, and the overall implications of tariff liberalization.

1. Tariffs and the Trade Balance

The discussion in Section II of the paper dealt only indirectly with the impact of trade policy as a factor influencing the likelihood of success of a stabilization program. Trade reform can, of course, take many forms, such as the easing or abolition of quotas on imports and their replacement by tariffs, lowering existing tariffs and making them more uniform, or abolishing all trade controls. We try to identify conditions under which lower tariffs increase the likelihood of the stabilization succeeding. 1/

This issue has been relatively neglected in the context of exchange rate based stabilization. Calvo (1988), for instance, examined the usefulness of capital controls in an open trading regime for countering the adverse effects of the imperfect credibility of a program, and showed their benefits to be limited. 2/ In addition, Dornbusch (1992) and Rodrik (1992) provide only general discussions of the relationship between trade liberalization and macroeconomic stability. Rodrik (op.cit) suggests that converting import quotas to tariffs can ease the government's fiscal constraint, by capturing quota rents that previously accrued to the private sector, and can hence help in attaining stabilization. But his study does not examine the implications of this policy for the country's stock of foreign exchange reserves. Dornbusch emphasizes the benefits of trade liberalization for improving efficiency, which in turn can play an important role in improving competitiveness and fostering stability.

There is a voluminous literature on the implications of trade liberalization for the current account (see Edwards (1993) for a recent survey). Both the timing, and credibility, of liberalization have been shown to play important roles in this regard. Recent attention on this

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1/ See Khan and Knight (1985) for an empirical analysis of how structural policies can offset the short run adverse effects (for example, on growth and prices) of demand-management policies.

2/ On the related issue of optimal sequencing of reforms, Frenkel and Khan (1990) argue that if asset markets are believed to clear faster than goods markets, capital account liberalization should follow, rather than precede, trade liberalization. The reverse sequence of reform would lead to destabilizing capital outflows.

issue began with Razin and Svensson (1983), who pointed out that, in theory, gradual tariff reduction should result in a distortion of intertemporal relative prices such that the price of future consumption falls relative to that of current consumption, leading to a rise in current saving and an improvement in the current account balance. However, in practice, in several cases, such a strategy has been seen to lead to a sharp worsening of the current account (see, for instance, Arrau and van Wijnbergen (1991), Dornbusch (1987)).

Van Wijnbergen (1992) attributes the current account deterioration to the imperfect credibility of the trade reform: if agents believe that the reform will be reversed in the future, then the price of future consumption is in fact higher than that of current consumption, leading to a decline in current saving, and a deterioration in the current account. However, the analysis in these papers is in the context of trade liberalization per se, while our objective is to examine specifically its implication for successful inflation stabilization.

The model below examines the implications of a reduction in tariffs for fiscal revenues, imports, the trade balance, and foreign exchange reserves. It examines the conditions under which the lowering of tariffs can improve the government's fiscal position, as well as the trade balance, thereby increasing the probability of success of the stabilization program. The intuition is that if the price elasticity of imports --with respect to both the real exchange rate and tariffs--is sufficiently high, then the increase in imports following from both tariff reduction and any real exchange rate appreciation is large enough to offset the effect on fiscal revenue of the tariff reduction itself. At the same time, the analysis incorporates the effect on exports of an increased availability, and lower cost, of imports using an intermediate goods model. This reflects the fact that intermediate and capital goods constitute an important part of developing countries' imports. It explores the conditions under which increased exports more than offset the increased imports, to improve the probability of success of stabilization. 1/

2. Public and Private Sectors

In order to analyze the implications of trade liberalization for the likelihood of success of a stabilization program, the discussion below places the behavior of the trade balance alongside the fiscal constraint in order that the potentially opposing effects of trade liberalization on them can be made explicit.

The flow constraint of the government may be written as:

1/ Lopez and Rodrik (1991) establish conditions under which tariff increases can lead to a deterioration in the trade balance.

$$B' - ER' + D'P = P(G-T) + iD^P - i^*ER \qquad (18)$$

where D^P is government debt issued to the private sector and B denotes the nominal stock of money. T denotes government revenues, and consists of tax and tariff revenues; thus, $T = tY + \tau(C_f+Z^f)$, where C_f is consumption of importable goods and Z^f is the quantity of imported inputs (discussed below). Tariff revenues are an important source of fiscal revenues in many developing countries (see, for example, Burgess and Stern (1993)) and equation (18) takes this into account.

The flow constraint of the representative household is specified as follows:

$$B' + D'P + ER'P = P(Y-C-T) + iD^P + i^*ER^P . \qquad (19)$$

Equation (19) describes household flow receipts and expenditures, where Y is gross income and C is private consumption. The left hand side represents the savings flow of the household, consisting of money, government bonds, and foreign assets (R^P). (Notice the inflation tax in the intertemporal budget constraints). Substituting equation (19) into equation (18), the equation describing the evolution of foreign reserves over time is obtained as:

$$R' = \frac{P}{E}(Y-C-G) + i^*(R^P+R) - R'P . \qquad (20)$$

Equation (20) shows that an improvement in the trade balance (i.e., Y-C-G) results in an improvement in the reserve position; the equation also shows how capital flight (or private sector accumulation of foreign assets in general--i.e., $R'P > 0$) can undermine a stabilization program by leading to a deterioration in the reserve position. 1/

In light of equation (20), an important question is how tariff liberalization affects the trade balance and the fiscal position. The answer, as elaborated below, depends on how consumption and production respond to lower tariffs.

1/ Equations (18), (19), and (20) show also that tariffs represent an internal transfer from the private sector to the public sector, and do not directly affect the budget constraint of the nation as a whole.

First taking consumption, let real private consumption be denoted by C, and postulate it to be a composite of two (tradable) goods, a home good, h, and a foreign good, f. The household's dynamic optimization problem is to maximize:

$$U = \int_0^{\infty} u(C_t, b_t)\, e^{-\delta t} dt \tag{21}$$

(where u is a standard instantaneous utility function), subject to equation (19). Letting u take the particular separable form: $u = \ln C_h^{\alpha} C_f^{1-\alpha} + \gamma b$, the optimality conditions imply the following relative consumption demand and money demand function:

$$\frac{C_h}{C_f} = \frac{\alpha}{1-\alpha} \frac{(1+\tau)}{p} \tag{22}$$

and

$$b_t = \frac{\gamma C_t}{i_t}, \tag{23}$$

where p denotes the reciprocal of the terms of trade. Other things equal, a decrease in τ implies an increase in the consumption of good f relative to good h, as does an improvement in the terms of trade. As τ falls and consumption of good f increases, imports increase, and to this extent there is a negative effect on the trade balance. However, as discussed before, tariff reduction, by increasing productive efficiency, also raises national income; if the income gains are large enough, the trade balance would improve. The trade balance would also be positively affected by a reduction in tariffs if there are imported inputs in production.

Assume that production is characterized by imported intermediate inputs. Let there be two sectors, h and f, and constant returns to scale production functions, F and G, such that:

$$Q_h = F(Z_h^h, Z_h^f), \quad \text{and} \quad Q_f = G(Z_f^h, Z_f^f), \tag{24}$$

where Z_i^j represents the amount of input j used in the production of good i. The total availability of Z^h is given by the natural endowment, and that of Z^f is given by the foreign exchange available for importing inputs (that is

the trade balance minus reserves used for defending the exchange rate). Note that the trade balance is now given as TB= Y-C-G-I, where I = total Z^f.

Profit maximization yields the following four conditions: 1/

$$w_h^h = p F_h , \tag{25}$$

$$W_h^f \ (=(1+\tau)W^{f*}) = p F_f ,$$

$$w_f^h = (1+\tau) G_h ,$$

and

$$w_f^f \ (=(1+\tau)w^{f*}) = (1+\tau) G_f ,$$

where w_i^j is the return to factor j in sector i, w^{f*} is the world price of the imported input, and F_i and G_i represent the marginal products of factor i in the two sectors. The second and fourth expressions in (25) show that with a reduction in τ there will be an upward effect on both F and G-that is a tariff reduction will, by lowering the price of the imported input, raise output in both productive sectors. The third expression, however, indicates that with tariff reduction there is a downward effect on production of good F. Whether d_f increases or decreases thus depends on the balance between this price effect and the importance of the imported input in production of Q_f.

Free mobility of factors between sectors implies that the return to a factor must be the same across sectors. From equations (25), this implies that:

$$p F_h = (1+\tau) G_h , \quad \textit{and} \quad p F_f = (1+\tau) G_f . \tag{26}$$

1/ For simplicity, and with no loss of generality, the price of the foreign good, P_f, is normalized to unity.

Note that national income at world prices is:\

$$Y = p\,Q_h + Q_f\,, \tag{27}$$

and that the trade balance is:

$$TB = p\,(Q_h - C_h) + (Q_f - C_f) - G - I\,, \tag{28}$$

where I is equal to Z^f, and where it is assumed that $Q_f < C_f$ and $Q_h > C_h$, so that f and h can be thought of as the importable and exportable good, respectively. As noted, tariff reduction would have a negative effect on the trade balance by raising C_f, but this effect would be mitigated, and perhaps even reversed, by the positive effect on Q_h and Q_f in the presence of imported intermediate goods.

Further, from equation (26), a marginal decrease in the tariff results in a migration of factors from sector f to sector h, where their productivity, measured in world prices, is higher. From equation (27), this implies that a reduction in tariffs increases national income by increasing efficiency. (The increase in income thus occurs even in the absence of imported inputs. The presence of imported inputs simply presents another channel by which exports would be positively influenced.) The increase in Y results in an increase in tax revenues. It also results in an increase in consumption, since $C_h = \alpha Y/p$ and $C_f = (1-\alpha)Y/(1+\tau)$. The increase in C_f, in turn, could lead to higher tariff revenues.

In sum, the effects of a decrease in τ are to lead to an increase in Y, C_h, C_f, Z^f, and Q_h, and possibly a decrease in Q_f. Thus, imports (i.e., $C_f + Z^f - Q_f$) increase, and exports ($Q_h - C_h$) *may* increase (depending on the elasticities of C_h with respect to Y, of C and Y with respect to τ, and of Q with respect to Z^f). From equation (21), the increase in Y improves the reserve position, while the increase in C worsens it. The increase in Z^f has two effects: its direct contribution is to worsen the trade balance, but by increasing output it indirectly strengthens the trade balance. Thus, the short run effect of trade reform on stabilization prospects depends on what happens to reserves (equation (21)), and the above elasticities determine whether the effect is positive or negative. Eventually, (in the sense of the fiscal constraint (19)) trade reform can raise tax revenues through the increase in Y, and can even raise tariff revenues if the price elasticity of C_f is large enough. (Notice that trade reform can have a beneficial effect on the fiscal constraint *even if* tariff revenues fall.)

Thus, while trade reform is likely eventually to improve the fiscal position, in the short run its effect on stabilization efforts depends on the elasticities mentioned above. The cases in which the effects on

reserves would be most beneficial are the following: (i) imports have low price elasticity and exports have high price elasticity with marginal product of imported inputs also high, and (ii) imports and exports both have low price elasticity, along with high productivity of imported inputs. In the case in which both price elasticities are high, and productivity of imported inputs is also high, the expansion in total trade will be the greatest, but it is not clear whether the trade balance itself will improve or worsen. 1/

IV. Concluding Remarks

Despite a considerable literature both on exchange-rate based stabilization programs, and on trade liberalization, an analysis of the interaction between these two policies has been relatively neglected. This paper has attempted to explore the simultaneous pursuit of macro-stabilization and trade reform and examine the conditions necessary for the policies to be successful. The main conclusions resulting from the analysis can be summed as follows:

During the inflation stabilization program, the more open the economy the smaller is the real exchange rate appreciation resulting from residual inflation in the nontraded goods sector. Provided that the Marshall-Lerner condition holds, the smaller will be the decline in the trade balance, and hence in reserves, and the lower will be the probability of the program failing. However, this raises the question of whether trade reform, which is crucial as a means of achieving greater openness of the economy, might not adversely affect a stabilization program through the separate channel of a deterioration in fiscal revenues.

The analysis first made the simple point that whether or not fiscal revenues are adversely affected depends on the tariff elasticity of consumption demand. Given a sufficiently high elasticity, trade liberalization would lead to higher tariff revenues. Moreover, when production is taken into account, the efficiency gains from trade liberalization can result in higher (non-tariff) tax revenues, positively influencing reserves and reducing the failure probability. This effect on reserves and on the failure probability is reinforced when imported intermediate inputs in the production of exports are considered.

The analysis in this paper could be extended in a number of directions. First, the model could be made stochastic to explicitly include exogenous shocks to government tax revenues as well as government spending. Second, the model could examine in more depth the general equilibrium implications of the stabilization and structural reforms. The production side of the model could allow for imperfect competition in both the goods and the labor

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1/ Note that in this model, the consumption of each good displays unitary income elasticity, and C_f has a tariff elasticity of $-\tau/(1+\tau)$.

markets. This would permit, for example, an analysis of the effects of real wage rigidity including its impact on unemployment, as well as the broader political-economy considerations concerning the timing of reforms.

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