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Trade Reform Under Partial Currency
Convertibility: Some Suggestive Results

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Abstract

This paper discusses the macroeconomic implications of trade reform in the presence of capital account restrictions. The latter is modelled by recognizing prior constraints on free currency convertibility that are imposed via the use of a multiple exchange rate system. The results of the analysis indicate that the preferred sequence of liberalization need not be of the commonly advocated "current account first" variety, and that real depreciation rather than real appreciation is in fact a more probable outcome following domestic tariff liberalization.

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I. Introduction

The experiences of a number of developing countries (more notably the Southern Cone countries such as Argentina, Chile, and Uruguay) with vigorous attempts at economic liberalization have raised the issue of the preferred order of liberalization. In an ideal frictionless world without externalities, distortions or other economic and political constraints, this question is very simply answered--all markets and sectors are optimally liberalized simultaneously. But in the less than perfect world of reality, simultaneous liberalization of all sectors is often infeasible for a variety of reasons, so that the question naturally arises as to which form of liberalization should first be pursued (from the point of view of the ensuing effects upon various domestic macro-economic variables, or upon an explicit welfare index). This question has not escaped the attention of economists and recently an extensive literature has grown up on this subject (see Edwards (1984) for a survey of this literature). A number of authors (McKinnon (1973, 1982), Frenkel (1982, 1983), Krueger (1983)) advocate a Chile-type "current account first" order of liberalization of the external accounts. 1/ Thus, these authors argue that the more prudent strategy is to liberalize the external capital account only after restrictions on the current account, as well as restrictions in the domestic financial sector, have been removed. An opposite and distinctly minority point of view however, is expressed by Lal (1984) who proposes that full currency convertibility be restored (i.e., that the external capital account be liberalized) prior to commercial reform. The latter sequence was pursued by Argentina and Uruguay during their liberalization efforts. 2/ Finally, Khan and Zahler (1983)

1/ Chile followed this order of liberalization. The Chilean experience resulted in failure due perhaps, not to an incorrect sequence of liberalization being pursued but to improper macroeconomic management during the reform period. See Edwards (1985) for a detailed discussion of the Chilean case.

2/ The Argentine and Uruguayan efforts also resulted in failure, although again extraneous reasons may have played a major contributory role in the failure (see Dornbusch (1983), Hanson and de Melo (1983) and Sjaastad (1983)). Khan and Zahler (1985) list in general terms the likely reasons for the failure of both types of liberalization strategies. A primary reason is the pursuit of "inconsistent" domestic policies during the reform effort. More specifically, the "inconsistency" is in the form of domestic real appreciation that was permitted to develop and thereby undermine the longer-term goals of liberalization (noted also in Edwards (1987)). Dornbusch (1986) appears to suggest that the intervening real appreciation may have been the result of a calculated political stance, rather than from unintentional mismanagement. The results of the present

report--based upon a small-scale simulation model--that the sequencing strategy is essentially irrelevant with respect to resulting domestic price/output behavior in the long run so that there is no a priori presumption preferring one strategy over another.

The purpose of this paper is to re-examine the desirability of the often-proposed "current account first" sequence of liberalization in the context of a simple macro-theoretic framework. To this end, we construct and analyze a model of an open economy characterized by both commercial restrictions in the form of nominal tariffs, as well as repression in the external financial sector. The latter is conveniently modelled by recognizing prior restraints on free currency convertibility that result from the use of a multiple-tier exchange rate system. Such a scenario is extremely common in developing countries. With the apparent exception of Aizenman (1985) however, the literature on liberalization appears to have neglected the type of capital controls implied by the use of such multi-tier exchange rate systems and has instead modelled external financial repression by means of explicit restraints on international capital flows (as for example, in Khan and Zahler (1983)). In the present framework, the policymaker restricts free convertibility according to the type of transaction for which foreign currency is demanded (earned) and in the typical case, a commercial exchange rate applies in respect of current account transactions while a (usually more depreciated) financial rate governs capital account items. 1/ In actual practice, however, the inconvertibility restrictions are substantially eroded by inter-market transactions (leakage) between the exchange markets on account of both legally compelled and fraudulent transactions. 2/ Thus, the actual degree of currency inconvertibility is often less severe than is immediately apparent, since at least some exchange regulations may be legally avoided or unlawfully circumvented. This aspect of external financial

2/ (Continued from page 1) analysis indicate that a domestic tariff reduction is more likely to lead to real depreciation rather than to appreciation. This in turn would suggest that to the extent that real appreciation did actually occur, it be attributed to factors other than domestic tariff reform. These extraneous overriding factors are styled as "inconsistent policies" in Khan and Zahler (1985).

1/ No less than eighteen countries were reported by the IMF to be employing legal dual exchange markets in 1985-86. In addition, at least two dozen other countries authorized the use of multiple rates for limited categories of various transactions over the same period.

2/ Illegal trade transactions have of course been recognized in the literature on smuggling, see for example, Pitt (1984) and Branson and de Macedo (1987). These authors do not however, deal with inter-market transactions that are the result of sovereign compulsion and are not concerned with the issues of reform and liberalization.

restrictions in general, or of multiple exchange rate regimes in particular, would seem to be an important one and is explicitly incorporated in the present paper. It is noteworthy that previous theoretical literature on the subject of economic reform has universally ignored this issue.

The model developed in the paper is utilized to examine the macro-economic effects of a reduction in tariff rates (both domestic and external) given the presence of external financial restrictions, as characterized by the use of imperfectly segmented dual exchange markets. In keeping with the fact that real world constraints most often limit policymakers to second-best adjustments, this paper evaluates the macroeconomic implications of commercial reform (tariff reduction) under alternative positive degrees of external financial repression.^{1/} Such a scenario would seem to more realistically characterize the liberalization attempts of many countries than one in which commercial reform under financial repression is compared with a situation of tariff liberalization when no financial restrictions remain (as considered, for example, by Aizenman (1985)).

While a detailed statement of the results of this paper is provided in the text, the following summary observations are in order here. First, when free currency convertibility is restricted by means of a dual exchange regime involving a pegged commercial rate and a floating financial rate, domestic tariff liberalization leads to financial nominal appreciation coupled with price deflation and an increase in output. Because the nominal commercial exchange rate is fixed, the price deflation necessarily implies commercial real depreciation. The effect upon the financial real exchange rate however, is far less clear and seems largely dependent upon the penalty costs associated with fraudulent cross-transactions between the two exchange markets, although the degree of legally compelled leakage also plays a contributory role. Specifically, financial real appreciation is a probable outcome in very limited circumstances. These results (with respect to the financial real exchange rate) are in sharp contrast to those obtained by other authors such as Aizenman (1985) and Khan and Montiel (1987). The present paper also indicates that tariff liberalization that occurs under more severe financial restrictions generates larger output increases as well as greater financial nominal appreciation; however, it may lead to sharper or reduced domestic price movements, depending again upon the penalty costs referred to above. Thus, if the policymakers' preference function is defined in terms of price, output and real commercial rate adjustments, it is clear that a general unqualified statement regarding the sequencing of commercial versus financial reform is not available.

^{1/} From a microeconomic welfare point of view such second-best comparison may well be treacherous. However, as Krueger (1983) and Edwards (1984) point out, on a macroeconomic level, there are indeed well-founded conjectures to the effect that partial liberalization (i.e. a second-best adjustment) will in fact lead to a determinate effect upon welfare.

Further elaboration as to specific circumstances in which the desirability of a particular sequencing scenario is clearly indicated is provided in the paper.

Finally, although the discussion in this present paper involves a dual rate system wherein the commercial exchange rate is fixed, the principal substantive results noted above carry over to the two-tier float variant as well. The latter variant is however, not discussed in this paper in view of its limited applicability to developing countries.

In what follows, Section II describes the analytical framework while the implications of tariff reform under varying degrees of external financial repression are discussed in Section III. The concluding section deals with some of the implications of the analysis, and areas of extension.

II. The Analytical Framework

Consider an economy characterized by the presence of both commercial and financial restrictions. Commercial repression takes the form of an ad valorem tariff imposed upon domestic imports. In addition, it is assumed that domestic exporters are also subject to a tariff imposed by the foreign country. Thus, domestic commercial reform consists of reducing the domestic tariff rate while worldwide commercial liberalization involves the simultaneous reduction of both domestic and foreign tariffs. Along with commercial repression, the domestic economy is also encumbered by financial restrictions in its external capital account. To model the latter we assume that the policymaker imposes restrictions on free convertibility of foreign assets via the use of an officially-sanctioned dual exchange rate system according to which current account items are subject to a commercial exchange rate, while capital account items are to be settled at a (depreciated) financial exchange rate. A key feature of the model to be presented is that the actual degree of currency inconvertibility in the economy is substantially less severe than its apparent degree, on account of both legal and fraudulent cross-transactions between the two exchange markets. This phenomenon of "leakage" between the two markets, has been analytically modelled in an earlier paper by Bhandari and Decaluwe (1987). ^{1/} The present paper represents a departure from the earlier work in that the framework is specifically amended to permit evaluation of competing economic reform sequences. There are also substantive differences between the earlier work and the present paper: for example, asset accumulation equations in the present context are specified

^{1/} The empirical importance of officially-sanctioned leakage as well as fraudulent cross-transactions is discussed in Bhandari and Decaluwe (1987) and in the references cited therein.

in terms of beginning-of-period ex-ante equilibrium rather than in end-of-period ex-post terms. This modification permits considerable simplification and avoids troublesome problems of non-linearities in the model that would otherwise be encountered.

The model involves a relatively uncomplicated structure. Domestic output is limited to a single final commodity. The price of domestic output (i.e., the exportable commodity) is endogenously determined. On the other hand, the country in question is small in the market for imports so that the foreign currency price of importables is exogenously given. It is assumed that domestic financial liberalization has already proceeded to such an extent that home residents have free access to a worldwide capital market dealing in internationally-issued, one-period, riskless government securities. The assumption that domestic financial reform has already been accomplished is a standard one that is made by most other authors writing in this area (see Khan and Zahler 1983). ^{1/} The menu of assets available to domestic residents is limited to domestically-issued money and the internationally-issued security. There is no "currency-substitution", no physical capital accumulation and no transactions or transport costs. All markets clear continuously and expectations are rationally formed. The central authorities intervene continuously in order to defend a specific commercial (official) exchange rate. Meanwhile, the financial (parallel) exchange rate is permitted to float freely. As indicated previously, the convertibility restraints that are imposed by the use of the two exchange markets are less onerous than is apparent in view of the presence of inter-market transactions.

The principal element in the description of such an economy is the specification of aggregate demand. In accordance with prevailing economic reality in the countries reported to be maintaining dual exchange rate arrangements, the analysis distinguishes commercially-settled export and import (as well as service account items) from those that occur in the parallel (financial) market. Examination of the data for relevant countries clearly reveals that specified proportions of both export and import items (as well as service account proceeds) are assigned de jure to the financial exchange market. ^{2/} This variety of leakage is thus, legally compelled. In addition, given a relatively depreciated financial (commercial) exchange rate, exporters (importers) find it profitable to circumvent exchange regulations by illegally surrendering (acquiring) export receipts (import

^{1/} The issue of reform in domestic financial markets is dealt with in McKinnon (1973) and Mathieson (1979, 1980), among others.

^{2/} See the Annual Report on Exchange Arrangements (IMF).

exchange) at the more favorable financial rate. ^{1/} For our purpose it is the separation of trade items into its commercially-settled and financially-settled components that is important, rather than the distinction between legal and illegal transactions.

Total exports comprise commercially-settled exports (X') and financially settled exports (X''), i.e.

$$X = X' + X''$$

Define $(1-\alpha)$ as the initial value of the ratio of financially-settled exports to total exports, i.e.

$$(1 - \alpha) \equiv (X''/X')^{\circ}$$

where " \circ " denotes an initial value. For expositional purposes, it is convenient to interpret the initial value $(1-\alpha)$ as the policy-controlled or legally compelled extent of export leakage. The actual extent of total leakage on the other hand, is an endogenous variable that is determined by the relevant factors affecting commercially-settled and financially-settled transactions. For example, an increase in the exchange rate spread induced by financial depreciation will lead to an increase in the volume (and proportion) of export transactions settled in the financial market. The degree of import leakage is defined as

$$(1 - \beta) \equiv (Q''M'')^{\circ}/[Q'M' + Q''M'']^{\circ}$$

where Q' and Q'' respectively denote the real tariff-ridden commercial and real tariff-ridden financial exchange rates, i.e.

$$Q' \equiv [\bar{E}P*(1+t)/P]; \quad Q'' \equiv [FP*(1+t)]/P$$

^{1/} There are virtually no reported cases wherein the commercial rate is relatively depreciated vis-a-vis the financial rate. Isolated instances of this have sometimes been noted during periods of exchange rate turbulence or substantial exchange rate re-alignments.

where \bar{E} and F denote the nominal commercial and financial rates respectively, t is the domestic ad valorem tariff rate levied upon imports while P and P^* refer to domestic and foreign price levels and M' , M'' indicate physical volumes of commercially- and financially-settled imports respectively. It can be shown that the aggregate demand function for the economy in question can be reduced to the following log-linear form:

$$(1) \quad y^d = \gamma_1 y + \gamma_2 (w - p) + \delta_1 (\bar{e} + p^* - p) + \delta_2 (f + p^* - p) \\ + \delta_3 t - \delta_4 t^* + \delta_5 (f - \bar{e})$$

where lower-case letters denote logarithmic values and all parameters are defined positively as follows:

$$\gamma_1 \equiv c_1 \left[\frac{C^0}{Y^U} - \beta e_m m_1' - (1 - \beta) e_m m_1'' \right]$$

$$\gamma_2 \equiv c_2 \left[\frac{C^0}{Y^U} - \beta e_m m_1' - (1 - \beta) e_m m_1'' \right]$$

$$\delta_1 \equiv [\alpha e_x x_1' - \beta e_m + \beta e_m m_2'']$$

$$\delta_2 \equiv [(1 - \alpha) e_x x_1' - (1 - \beta) e_m + (1 - \beta) e_m m_2'']$$

$$\delta_3 \equiv e_m [\beta m_2' + (1 - \beta) m_2'' - 1]$$

$$\delta_4 \equiv e_x [\alpha x_1' + (1 - \alpha) x_1'']$$

$$\delta_5 \equiv e_x [-\alpha x_2' + (1 - \alpha) x_2''] + e_m [-\beta m_3' + (1 - \beta) m_3''] = 0$$

In deriving this equation, use was made of the following (logarithmic) hypothesized functions: 1/ 2/

$$c = c_1 y + c_2 (w - p)$$

$$\ln X' \equiv x' = \bar{x}_1' (e + p^* - p) - x_1' t^* - x_2' (\bar{f} - e)$$

$$\ln X'' \equiv x'' = x_1'' (f + p^* - p) - x_1'' t^* + x_2'' (\bar{f} - e)$$

$$\ln M' \equiv m' = m_1' c - \bar{m}_2' (e + p^* - p) - m_2' t + m_3' (\bar{f} - e)$$

$$\ln M'' \equiv m'' = m_1'' c - m_2'' (f + p^* - p) - m_2'' t - m_3'' (\bar{f} - e)$$

As the above equations make clear, a depreciation of the tariff-adjusted real commercial exchange rate, i.e. $EP^*/P(1+t^*)$, increases commercially-settled exports in standard fashion (i.e. potential J-curve effects are ignored). For reasons of convenience, the effects of pure real depreciation are delineated from those of a pure increase in the applicable tariff rate; clearly, the same elasticities apply in respect of both. In addition, another margin of substitution is also operative. A depreciation of the nominal financial rate relative to the commercial rate leads to a decrease in commercially-settled exports as traders (illegally) divert export proceeds to the more favorable financial market. Similar considerations apply in respect of the import functions m' and m'' except that the effects of variations in the exchange rate spread are qualitatively opposite to those for exports. Thus, an increase in the exchange

1/ The following additional notation is involved in equation (1) and the accompanying unnumbered equations.

c : logarithm of domestic consumption; y : logarithm of domestic output, w : logarithm of domestic nominal wealth, C^0/Y^0 = average propensity to consume, e_x = initial ratio of total exports to income (i.e., X^0/Y^0), e_m = initial ratio of total imports to income (i.e. $(Q'M' + Q''M'')^0/Y^0$) while $c_1, c_2, x_1', x_1'', x_2', m_1', m_1'', m_2', m_2'', m_3', m_3''$ are parameters. It can also be shown that $x_2'' = [\alpha/(1 - \alpha)] x_2'$ and $m_3'' = [\beta/(1 - \beta)] m_3'$. Finally, it should be recognized that tariff revenue is properly included in gross income. Nevertheless, the discrepancy between income and output is disregarded in order to avoid additional problems of non-linearities that would otherwise be encountered.

2/ The export functions are to be viewed as being linearizations of the following functions:

$$X' = X' \left[\frac{P(1+t^*)}{EP^*}, \frac{F}{E} \right], \quad X'' = X'' \left[\frac{P(1+t^*)}{FP^*}, \frac{F}{E} \right]$$

Similar considerations apply to the import functions.

rate spread $(f - \bar{e})$ now encourages importers to utilize the more favorable commercial exchange market. ^{1/} It is also clear that the magnitudes of the elasticities x_2' , x_2'' , m_3' , and m_3'' are inversely related to the penalty costs attributable to such fraudulent transactions, high penalty costs resulting in low values of these elasticities and conversely. The concept of penalty costs is rather an amorphous one; at the very least, penalty costs subsume both the probability of detection and the severity of punitive sanctions. Nevertheless, it is assumed that whatever its underlying determinants, penalty costs (and hence the elasticities x_2' , x_2'' etc.) are properly identifiable. The next set of equations describe aggregate supply, the price index, money market equilibrium and a statement of international capital mobility.

The supply of domestic output is governed by the following supply function:

$$(2) \quad y^s = \bar{y} + b (p_t - E_{t-1} p_t, q_t)$$

where y is the trend level of output and q is the consumer price index (to be defined below). E is an expectations operator, with the subscript indicating the period in which the expectation is formed. It is straightforward to derive (2) on the basis of a firm's profit maximizing behavior assuming that nominal wages are fully indexed to the expected price index. The price index q is based upon domestic currency prices of domestic and foreign goods and is defined by:

$$(3) \quad q = gp + (1 - g)[\beta(\bar{e} + p^* + t) + (1 - \beta)(f + p^* + t)]$$

$$0 < g < 1$$

It can readily be shown that

$$(1 - g) = \frac{e_m}{(C/Y)}$$

^{1/} Recall that certain export and import transactions are assigned de jure to the financial market by the exchange authorities. Thus, financially-settled imports (M'') are non-zero despite the fact that the financial exchange rate may be relatively depreciated compared with the commercial rate.

The logarithm of the expected opportunity cost of holding domestic money as opposed to internationally-issued securities can be shown to be approximated by:

$$(4) \quad i_t = i_t^* + (E_t, f_{t+1} - f_t) + \bar{\omega} \bar{i}^* [\bar{e} - E_t, f_{t+1}]$$

where \bar{i}_t^* is the mean value of the foreign interest rate and ω measures the proportion of foreign interest receipts repatriated via the commercial market. Thus, $(1-\omega)$ measures the prevailing degree of service account leakage. In consonance with our earlier assumption regarding the degrees of merchandise trade leakage α and β , ω is also treated in what follows as a parameter that varies only with the policy-controlled extent of external financial repression. Domestic money market equilibrium is defined in logarithmic terms by:

$$(5) \quad m_t - p_t = -\lambda i_t + y_t$$

Next, domestic nominal wealth can be approximated in logarithmic form by:

$$(6) \quad w_t = d_1 m_t + (1 - d_1)(f_t + k_t)$$

where $d_1 \equiv (M/W)^\circ$ is an arbitrary linearization point and k is the logarithm of the domestically held stock of foreign assets. By assumption, the principal on foreign securities is acquired at the financial rate, but interest proceeds on these securities--a current account item--may be repatriated via either market depending upon the values of ω .

The final ingredient of the model is the specification of the accumulation processes governing the economy. Specifically, the model involves two distinct sources of accumulation, i.e. money (or reserve) accumulation and foreign asset accumulation. It is to be noted that the accumulation of foreign assets occurs despite the flexibility of the financial rate and is attributed solely to the presence of cross-market transactions. Hence, total wealth accumulation occurs via two components of saving in this model. One component of saving is the commercially-settled trade surplus ($X^1 - Q^1 M^1$) which results in money (reserve) accumulation. The other component of saving is the financially-settled trade balance ($X^2 - Q^2 M^2$) the counterpart of which is foreign asset accumulation. Thus, the accumulation equations

which express the equality of planned saving (of each type) with the appropriate component of real wealth accumulation can be shown to be given by the following equations: 1/

$$(7) \quad d_1[(E_t, m_{t+1} - m_t) - (E_t, p_{t+1} - p_t)] = \\ \psi' [h_1(\bar{e} + p^* - p) - h_2 y - h_3(w - p) - h_4 (f - \bar{e}) + h_5 t - h_6 t^*]$$

$$(8) \quad (1 - d_1) [(E_t, f_{t+1} - f_t) + (E_t, k_{t+1} - k_t) - (E_t, p_{t+1} - p_t)] = \\ \psi'' [g_1 (f + p^* - p) - g_2 y - g_3(w - p) + g_4 (f - \bar{e}) + g_5 t - g_6 t^*]$$

where ψ' and ψ'' are stock-flow conversion factors defined as

$$\psi' \equiv (X' - Q'M')^\circ / (W/P)^\circ; \quad \psi'' \equiv (X'' - Q''M'')^\circ / (W/P)^\circ$$

while the coefficients h_i are given by:

$$h_1 \equiv (x_1' + \eta' m_2' - \eta') / (1 - \eta'); \\ h_2 \equiv \eta' m_1' c_1 / (1 - \eta'); \\ h_3 \equiv \eta' m_1' c_2 / (1 - \eta'); \\ h_4 \equiv (x_2' + \eta' m_3') / (1 - \eta'); \\ h_5 \equiv \eta' (m_2' - 1) / (1 - \eta'); \\ h_6 \equiv x_1' / (1 - \eta') \text{ and } \eta' \equiv (\beta e_m / \alpha e_x)$$

The g_i coefficients meanwhile, are defined analogously to h_i with x_1'' , m_1'' , m_2'' , and η'' replacing x_1' , m_1' , m_2' and η' respectively, and where

$$\eta'' \equiv (1 - \beta) e_m / (1 - \alpha) e_x$$

1/ Details regarding the derivation of this equation are available upon request from the author. The procedure is similar to that described in Flood and Marion (1982).

As may be verified, these equations are consistent with the requirement that total planned saving equals aggregate expected real wealth accumulation.

The model is completed by specifying the nature of the processes governing variations in domestic and foreign tariffs. While a dichotomy between the possible transitory and permanent components of tariffs may be interesting in that it may involve issues of "credibility" of the reform, as, for example, considered by Calvo (1987), for present purposes it proves sufficient to hypothesize that all variations in tariffs (both domestic and foreign) are of the permanent variety and while changes in domestic tariffs are fully perceived, those relating to foreign tariffs are only imperfectly anticipated by domestic residents (due to higher costs of acquiring information on the actions of foreign governments). In this sense, the model incorporates the fact that domestic information sets contain spatially diverse information as relating to domestic versus foreign variables. ^{1/} Accordingly, the domestic and foreign tariff structures are given by:

$$(9) \quad t_t = \bar{t}$$

$$(10a) \quad t_t^* = \bar{t}^* + v_t^*$$

$$(10b) \quad v_t^* = v_{t-1}^* + \xi_t^*$$

where \bar{t}^* and ξ_t^* respectively denote the perceived and unanticipated components of foreign tariffs.

The next section discusses the implications of tariff reform under varying degrees of external financial repression.

III. Implications of Trade Reform Under Alternative Degrees of External Financial Repression

In order to isolate the effects of domestic and external tariff reform upon the domestic economy the model described above is solved by the use of the by now familiar rational expectations technique. Given the relatively complicated form of the model, however, the resulting expressions turned out to be analytically cumbersome. Thus, it proved

^{1/} Several recent models recognize the possibility of differentiated information, see for example, Flood and Hodrick (1985).

more useful to explore the properties of the model via numerical methods. Accordingly, the model was solved numerically for various hypothetical sets of scenarios corresponding to alternative values of the penalty cost parameters x_2' and m_3' . For each scenario, the effects of a 1% reduction in the domestic tariff rate and the effects of 1% reduction in both the perceived and unperceived components of foreign tariffs upon various domestic variables (such as the nominal financial rate, the price level, output level and both real exchange rates) were computed. The results were separately computed for alternative values of the leakage parameters α , β and ω ranging from $\alpha = \beta = \omega = .10$ to $\alpha = \beta = \omega = .90$ for each configuration of penalty costs. The results are presented in Tables 1-5.

Table 1 represents the result in the "benchmark" case which is designed to facilitate comparison. The benchmark case involves the following parameter values:

$$\begin{aligned} \lambda = 10, b=3, e_x=.25, e_m=.20, x_1'=.75, x_1''=.90, x_2'=1.0, m_1'=.80, \\ m_1''=.80, m_2'=.75, m_2''=.90, m_3'=1.0, c_1=.80, c_2=.10, d_1=.80, \\ \bar{i}^*=.04, (C/Y)^0=.90. \end{aligned}$$

Thus, the interest rate semi-elasticity of money demand (λ) is assumed to be 10. The latter number corresponds to an interest elasticity of .50 and a semi-annual nominal interest yield of 5 percent (the horizon of the model is assumed to extend over six months). The output supply curve parameter is given by $b=3$. It can be shown that $b=(1-\theta)/\theta$ where $(1-\theta)$ is the share of labor in the productive process; most empirical studies indicate that the latter share is approximately 0.75. The initial shares of exports and imports to income (i.e. e_x and e_m) are assumed to be .25 and .20 respectively. It should be noted that these values correspond to an arbitrary initial linearization point so that the implied assumption of an initial trade surplus is fairly innocuous (although necessary in order to proceed with the required log-linearization of the model). The elasticities of commercially-settled exports and imports with respect to the real exchange rate (x_1' and m_2') are assumed to be .75 each. These numbers are in broad conformity with the results typically reported; see for example, Goldstein (1980). No empirical evidence is available as to the real exchange rate elasticities of financially-settled exports and imports, i.e. x_1'' and m_2'' . The parameters here are assumed to be .90 each. The elasticity of imports with respect to consumption is fixed at .80 for both commercially- and financially-settled imports. Similarly, the income elasticity of consumption (c_1) is .80 while the wealth elasticity of consumption (c_2) is known to be much smaller and is assumed to be .10. The average propensity to consume i.e. (C/Y) is .90 while the initial ratio of money to wealth, i.e. d_1 is .80. Finally the mean value of the semi-annual foreign interest rate, \bar{i}^* is 4 percent.

Table 1: Effects of Domestic and Foreign Trade Reform Under Varying Degrees of Capital Controls: $x_2' = m_3' = 1.0$

Domestic Tariff Reduction (\bar{t})	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	-.1154	-.1761	.1761	.0607	.6185
$\alpha = .30$	-.0961	-.1785	.1785	.0824	.5925
$\alpha = .50$	-.0744	-.1882	.1882	.1138	.5660
$\alpha = .70$	-.0490	-.2073	.2073	.1584	.5382
$\alpha = .90$	-.0182	-.2395	.2395	.2213	.5082

Foreign Tariff Reduction (\bar{t}^*) <u>1/</u>	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	.0163	.7256	-.7256	-.7094	1.1407
$\alpha = .30$	.0132	.7218	-.7218	-.7086	1.1417
$\alpha = .50$	.0100	.7189	-.7189	-.7089	1.1426
$\alpha = .70$	.0064	.7171	-.7171	-.7107	1.1435
$\alpha = .90$	.0023	.7168	-.7168	-.7145	1.1444

Foreign Tariff Reduction (ξ_t^*) <u>2/</u>	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	.3122	.2911	-.2911	.0212	.6734
$\alpha = .30$	1.1788	.2568	-.2568	.9220	.2878
$\alpha = .50$	-.2726	.3100	-.3100	-.5827	.9642
$\alpha = .70$	-.0676	.3011	-.3011	-.3687	.8809
$\alpha = .90$	-.0137	.2982	-.2982	-.3119	.8664

1/ Anticipated.

2/ Unanticipated.

Table 2: Effects of Domestic and Foreign Trade Reform Under Varying Degrees of Capital Controls: $x_2' = m_3' = .01$

Domestic Tariff Reduction (\bar{t})	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	-.5009	-.5292	.5292	.0283	.6144
$\alpha = .30$	-.4749	-.4584	.4584	-.0165	.5827
$\alpha = .50$	-.4487	-.3933	.3933	-.0554	.5540
$\alpha = .70$	-.4181	-.3335	.3335	-.0846	.5279
$\alpha = .90$	-.3533	-.2793	.2793	-.0740	.5040

Foreign Tariff Reduction (\bar{t}^*) <u>1/</u>	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	.0707	.7755	-.7755	-.7048	1.1412
$\alpha = .30$	.0654	.7603	-.7603	-.6949	1.1430
$\alpha = .50$	.0602	.7464	-.7464	-.6862	1.1442
$\alpha = .70$	.0546	.7336	-.7336	-.6790	1.1448
$\alpha = .90$	.0449	.7219	-.7219	-.6770	1.1449

Foreign Tariff Reduction (ξ_t^*) <u>2/</u>	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	.2941	.4470	-.4470	-.1529	.7882
$\alpha = .30$	.2963	.4459	-.4459	-.1496	.8257
$\alpha = .50$	.3012	.4463	-.4463	-.1451	.8638
$\alpha = .70$	.3113	.4499	-.4499	-.1386	.9043
$\alpha = .90$	.3538	.4741	-.4741	-.1203	.9591

1/ Anticipated.

2/ Unanticipated.

Table 3: Effects of Domestic and Foreign Trade Reform Under Varying Degrees of Capital Controls: $x_2' = m_3' = .05$

Domestic Tariff Reduction (\bar{t})	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	-.4413	-.4747	.4747	.0333	.6150
$\alpha = .30$	-.4097	-.4102	.4102	.0005	.5844
$\alpha = .50$	-.3728	-.3518	.3518	-.0211	.5564
$\alpha = .70$	-.3205	-.3002	.3002	-.0203	.5307
$\alpha = .90$	-.2026	-.2614	.2614	.0588	.5059

Foreign Tariff Reduction (\bar{t}^*) <u>1/</u>	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	.0623	.7678	-.7678	-.7055	1.1411
$\alpha = .30$	.0564	.7537	-.7537	-.6973	1.1428
$\alpha = .50$	.0500	.7408	-.7408	-.6908	1.1439
$\alpha = .70$	.0419	.7292	-.7292	-.6874	1.1445
$\alpha = .90$	.0258	.7196	-.7196	-.6939	1.1447

Foreign Tariff Reduction ($\bar{\xi}_t^*$) <u>2/</u>	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	.2856	.4494	-.4394	-.1537	.7882
$\alpha = .30$	.2925	.4413	-.4413	-.1488	.8244
$\alpha = .50$	.3077	.4481	-.4481	-.1408	.8628
$\alpha = .70$	.3513	.4713	-.4713	-.1200	.9106
$\alpha = .90$	1.6597	1.1845	-1.1845	.4752	1.3457

1/ Anticipated.

2/ Unanticipated.

Table 4. Effects of Domestic and Foreign Trade Reform Under Varying Degrees of Capital Controls: $x_2' = m_3' = .10$

Domestic Tariff Reduction ($\bar{\tau}$)	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	-.3842	-.4224	.4224	.0381	.6156
$\alpha = .30$	-.3497	-.3658	.3658	.0162	.5860
$\alpha = .50$	-.3078	-.3161	.3161	.0083	.5585
$\alpha = .70$	-.2480	-.2754	.2754	.0274	.5327
$\alpha = .90$	-.1321	-.2530	.2530	.1209	.5068

Foreign Tariff Reduction ($\bar{\tau}^*$) <u>1/</u>	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	.0542	.7604	-.7604	-.7062	1.1411
$\alpha = .30$	.0481	.7476	-.7476	-.6994	1.1426
$\alpha = .50$	.0413	.7360	-.7360	-.6947	1.1436
$\alpha = .70$	.0324	.7260	-.7260	-.6936	1.1442
$\alpha = .90$	.0168	.7185	-.7185	-.7018	1.1446

Foreign Tariff Reduction (ξ_t^*) <u>2/</u>	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	.2784	.4308	-.4308	-.1524	.7868
$\alpha = .30$	.2923	.4365	-.4365	-.1442	.8213
$\alpha = .50$	.3249	.4524	-.4524	-.1275	.8599
$\alpha = .70$	.4529	.5184	-.5184	-.0655	.9217
$\alpha = .90$	-.3549	.1079	-.1079	-.4627	.7622

1/ Anticipated.

2/ Unanticipated.

Table 5. Effects of Domestic and Foreign Trade Reform Under Varying Degrees of Capital Controls: $x_2' = m_3' = 10.0$

Domestic Tariff Reduction (\bar{t})	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	-.0144	-.0836	.0836	.0692	.6196
$\alpha = .30$	-.0117	-.1161	.1161	.1045	.5947
$\alpha = .50$	-.0087	-.1522	.1522	.1435	.5681
$\alpha = .70$	-.0054	-.1924	.1924	.1870	.5395
$\alpha = .90$	-.0019	-.2375	.2375	.2356	.5084

Foreign Tariff Reduction (\bar{t}^*) <u>1/</u>	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	.0020	.7126	-.7126	-.7106	1.1405
$\alpha = .30$	.0016	.7132	-.7132	-.7116	1.1414
$\alpha = .50$	.0012	.7141	-.7141	-.7129	1.1423
$\alpha = .70$	.0007	.7152	-.7152	-.7145	1.1433
$\alpha = .90$	.0002	.7166	-.7166	-.7163	1.1444

Foreign Tariff Reduction (ξ_t^*) <u>2/</u>	Nominal Financial Rate (& Spread)	Price Level	Real Commercial Rate	Real Financial Rate	Output Level
$\alpha = .10$	-.0941	.8520	-.8520	-.9461	1.2911
$\alpha = .30$	-.0279	.4667	-.4667	-.4946	.9908
$\alpha = .50$	-.0120	.3725	-.3725	-.3845	.9190
$\alpha = .70$	-.0051	.3300	-.3300	-.3351	.8877
$\alpha = .90$	-.0013	.3059	-.3059	-.3072	.8707

1/ Anticipated.

2/ Unanticipated.

In the benchmark case, i.e. Table 1, the penalty cost parameters (x_2' and m_3') are fixed at unity. ^{1/} Other scenarios involve low values of these elasticities (and consequently, higher penalty costs) in Tables 2-4 while in Table 5, x_2' and m_3' are each fixed at 10 (implying low penalty costs associated with fraudulent transactions). For each scenario, the effects upon certain domestic variables of interest are computed and presented for several alternative values of the leakage parameters α , β , and ω .

An increased degree of financial repression in the external sector of the domestic country involves a more regimented and more effectively administered dual exchange rate system wherein, as a result, the degree of currency inconvertibility is increased. Thus, such circumstances involve higher penalty costs (lower values of x_2' and m_3') so that the separate exchange markets are more effectively policed and in addition, larger fractions of current account transactions are assigned de jure to the financial market. Accordingly, such a regime could be described by the first row in the first part of Table 2. By contrast a liberalized external financial section means that the regime in question functions more closely as a unified rate system. Thus, penalty costs associated with private cross-transactions are low and at the same time, official segmentation of the two markets is also limited. Thus, this scenario could be represented by last row in the first part of Table 5. Other comparisons within each table are also of interest and we shall make use of these as well.

First, consider the results stated in Table 1 for the benchmark case. Inspection of these results reveals that domestic tariff reform--as re-

presented by a decrease in the domestic tariff rate \bar{t} --leads to nominal financial appreciation coupled with price deflation, which in turn stimulates output. ^{2/} Because the commercial exchange rate is pegged, the price deflation leads a fortiori to commercial real depreciation. At the same time the financial real exchange rate also undergoes depreciation with the extent of the financial real rate generally exceeding that of the commercial real rate. These qualitative properties obtain regardless of the values of the leakage parameters (See Table 1, various rows) and may be reconciled with the structural model as follows. ^{3/} A decline in

^{1/} Note that once x_2' and m_3' are chosen, values for x_2'' and m_3'' are implied via the relations defined earlier.

^{2/} It also can be shown that the yield on domestic currency-denominated securities increases following domestic tariff reform.

^{3/} These results also obtain irrespective of the value of penalty cost parameters x_2' , m_3' etc., with the exception of the financial real exchange rate which may either depreciate or appreciate depending upon the values of these penalty costs.

the domestic tariff rate ($\bar{\tau}$) stimulates domestic aggregate demand via equation (1), since $\delta_3 > 0$. At the same time, the expected domestic price index (E_{t-1}, q_t) declines (see equation (3)) so that aggregate supply is also stimulated (equation (2)). In net terms however, excess supply is created in the goods market and is consequently eliminated via a combination of price deflation along with real commercial and real financial depreciation. ^{1/} In the final equilibrium, real output is higher after the reduction in tariffs. Because output is stimulated, the money market is characterized by excess demand following tariff reform (notwithstanding the price deflation) and as result, the yield on domestic currency-denominated assets increases in order to ensure the continued maintenance of money market equilibrium. The increase in the domestic asset yields is consistent with the nominal financial appreciation that is observed in every case. Finally, since the nominal commercial rate is fixed, a decline in the nominal financial rate must lead to a decline in the exchange rate spread ($f-\bar{e}$).

When the domestic economy is characterized by increasing de jure repression (in the sense of lower values of α , β and ω which, it will be recalled, are the officially sanctioned degrees of leakage), then for fixed levels of penalty costs, domestic tariff reform is accompanied by exacerbated effects upon the nominal financial rate and output levels, but the responses of the price level and both real exchange rates are qualitatively muted, i.e. a tradeoff is apparent. A decrease in the value of α leads to a decline in δ_3 (for the hypothesized values of m_2' and m_3'') so that a given reduction in the tariff rate now stimulates aggregate demand less than previously. Since there is no change in the degree of the supply-expansive effect of a decline in α (equations (2) and (3)),

^{1/} It should be noted that some of these results, in particular, the observed real financial depreciation, stand in sharp contrast to those obtained by various previous authors such as Khan and Montiel (1987) and Aizenman (1985), in both of which, commercial reform results in real financial appreciation. The former authors however, obtain that result in the context of a unified fixed rate regime while in Aizenman (1985), dual exchange markets are indeed incorporated but are assumed to be perfectly segmented. As will be seen below, the present analysis indicates that the response of the real financial rate following domestic tariff reform is fairly complex and is in fact non-linear in α for specified low values of x_2' and m_3' (i.e., the penalty costs) and when in fact real appreciation is observed, it occurs for intermediate values of α only (see Table 3). However, for higher values of the parameters x_2' , m_3' , financial real depreciation is observed for all values of α . (See Tables 1, 4 and 5).

it is clear that the resulting excess supply in the goods market is reduced with lower values of the de jure leakage parameters α , β and ω . Not surprisingly then, the extents of the observed price deflation and commercial and financial real depreciation are reduced. Finally, since the extent of price deflation is reduced, the net excess demand created in the money market is greater, thus calling forth a sharper increase in the domestic asset yield and hence a sharper nominal financial appreciation in order to ensure continued money market equilibrium.

Table 5 states the results for much higher values of the elasticities x_2' and m_3' , i.e. for much lower values of penalty costs associated with fraudulent cross-transactions. A glance at Tables 1-5 clearly reveals that there is no qualitative difference between the responses listed in Tables 1-5. In particular, we note that the nature of the various trade-offs associated with alternative values of α remains unchanged across Tables 1 and 5.

When penalty costs are substantially higher (i.e. lower values of x_2' and m_3') than in the benchmark case, then in the case of the financial real exchange rate these results are qualitatively affected while for other variables the responses associated with changing values of α are altered. Specifically, Tables 2 and 3 reveal that real financial depreciation occurs as a result of a tariff reduction for values of α that are low or high. For intermediate values of α however, financial real appreciation is observed (See Table 3). These Tables also reveal that increasing de jure leakage (as characterized by lower values of α) is now accompanied by larger absolute price declines whereas it will be recalled that in Table 1, lower values of α led to reduced price re-alignments. The effect upon the nominal financial rate is similar in all the results reported, i.e. lower values of α are associated with sharper nominal financial appreciation in every case (Tables 1-5).

The complex nature of these results indicate that the issue of the preferred order of liberalization is not one such that a simple unambiguous statement is possible. For example, if an increased degree of financial repression is characterized by low values of x_2' and m_3' (i.e. high penalty costs) along with low values of α (i.e. high de jure leakage) then a comparison of the first row in Table 2 with the last row in the relevant portion of Table 5 reveals that the "current account first" sequence is preferable only if the policymakers' preference function were defined exclusively in terms of domestic price-output movements. ^{1/} Alternative welfare criteria clearly affect this property however. For

^{1/} Thus, sharper price declines and output increases are observed in the first row of Table 2 (the financially repressed economy) than in the last row of the relevant portion of Table 5 (the liberalized case).

example, if the policymaker were to regard real commercial depreciation as a substantially favorable development (perhaps because of underlying trade balance difficulties), then it is clear from the same comparison that trade reform is best initiated after some measure of external financial liberalization has already been achieved (See Table 5, last row in first section).

Thus, the general point that emerges is that a "current account first" sequence is preferable if the policymakers' objective function is limited to domestic price-output targets. By contrast, if the policymakers' sole concern were with external competitiveness, then the "capital account first" scenario should be chosen. In the general case wherein both domestic and external targets matter, the choice between competing reform sequences is dependent upon the relative weights attached by the policy maker to the various targets. This is in contrast to the Khan and Zahler (1985) results where the sequencing strategy is apparently irrelevant (in the stationary state).

The implications of external tariff reform, as represented by \bar{t}^* and ξ_t^* , are also shown in Tables 1-5. A (domestically) anticipated

decrease in the foreign tariff rate (\bar{t}^*) stimulates domestic aggregate demand per equation (1) (where $\delta_4 > 0$) while leaving domestic aggregate supply unaffected. Maintenance of goods market equilibrium thus necessitates domestic price inflation along with an output increase. The domestic price inflation leads a fortiori to commercial real appreciation. These properties obtain for all values of penalty costs and for all degrees of de jure leakage, irrespective of whether or not the external reform is domestically anticipated. It is also noted from Table 1 that the price, output and commercial real exchange rate effects of a domestically anti- than those corresponding to an unanticipated (from the domestic viewpoint) reduction in foreign tariffs. Beyond these general observations, the effect upon the nominal and real financial exchange rate is apparently dependent upon the nature of the external tariff reduction (i.e. whether domestically anticipated or unanticipated). When the external tariff reform is fully anticipated, the nominal financial rate depreciates while the financial real rate undergoes appreciation for all value of the degree of de jure leakage and irrespective of the penalty cost parameters. 1/

Finally, variations in the de jure leakage parameter α again imply tradeoffs: specifically, increasing values of α are associated in Tables 1-5 with reduced nominal financial rate and price level re-alignments coupled with sharper adjustments in real exchange rate and output

1/ These qualitative properties may be altered however, for a domestically unanticipated reduction in foreign tariffs. See for example, Table 1.

levels. In view of the tradeoffs involved and because foreign tariff reform results in domestic price inflation coupled with an output increase, it is not apparent if the domestic authorities should prefer foreign tariff reform before or after domestic financial reform has occurred, even if the welfare criterion were defined solely in terms domestic price-output adjustments.

IV. Conclusion

This paper has discussed the implications of domestic and external tariff reductions in the presence of financial restrictions modelled as imperfectly segmented dual exchange markets. The principal results of the paper indicate that the commonly-proposed "current account first" sequence of liberalization is in fact not a preferred strategy if any attention is to be paid by the policymaker to external competitiveness, and that financial real depreciation rather than real appreciation is in fact a more probable outcome following domestic tariff liberalization. The results suggest therefore, the need for caution on the part of countries embarking upon liberalization programs, in the sense that the appropriate reform sequence can only be ascertained upon careful assessment of domestic versus external targets in the member country.

Finally, several caveats to the analysis should be noted. First, it is apparent that the focus of this paper is solely on external (trade and financial) reform. In reality of course, the domestic financial sector is also repressed in addition to the external sectors, so that the choice of an appropriate reform sequence is a more complex one, involving liberalization in three sectors of the economy, i.e. the domestic financial sector, the external financial sector and the external trade sector. The development of a model wherein these issues can be examined rate high on the agenda for future work. Second, the present paper has chosen to characterize external financial repression as an imperfectly-segmented dual exchange rate system (with its attendant implications for currency inconvertibility). However, it is also possible to view external financial repression as the result of the imposition of specific capital controls (as for example, in Khan and Zahler (1985)). Third, this paper has excluded considerations of both physical growth and external debt accumulation. A framework that is properly applicable to a longer horizon would clearly need to recognize these considerations as well. The need to develop such medium-term models is especially important in view of the Fund's recent emphasis on structural adjustment in its lending programs.

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