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This paper contains preliminary findings from research work still in progress and should not be quoted without prior approval of the authors.

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I. Introduction

A common situation in many developing countries is that foreign exchange shortages are accompanied by rationing of foreign exchange. This outcome reflects the combination of a fixed exchange rate and the lack of an accommodative domestic monetary policy. Given the stance of the monetary authorities, at the fixed exchange rate excess supply of domestic currency and excess domestic demand for foreign currency occurs. Foreign exchange generated by exports and surrendered to the central bank at the fixed rate is insufficient to meet domestic demand and must be rationed. Domestic trading of foreign exchange (on either white or parallel markets) occurs, creating a premium value on foreign exchange which must be paid by importers. A tightening of monetary policy in such circumstances will reduce the premium value on foreign exchange and will typically liberalize trade.

While earlier work on foreign exchange shortages in developing countries has stressed their crucial role as part of the protective trade policy regime, the formal links to the monetary sector have not been analyzed.[1] In this paper we present a simple monetized extension of a traditional small-country real-side general equilibrium trade model in which premia on foreign exchange occur and have real effects. Monetary policy is non-neutral in the model, and a premium value associated with rights of access to foreign exchange is endogenously determined in equilibrium.

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[1] See Dervis, de Melo, and Robinson (1981), Dervis, de Melo, and Robinson (1982) (Ch. 9), and Manne and Preckel (1984). Also see the comments by Srinivasan, T.N. (1982) on the treatment of exchange rates in Dervis, de Melo, and Robinson.

A series of modifications to our basic analysis also allow us to analyze how foreign exchange premia interact with real-side trade policies, including commodity-specific tariffs and quotas. We show that a reduction in a general tariff (one at the same rate on all importables) will have no real effects on trade flows when a foreign exchange premium occurs, since it will be exactly offset by an increase in the foreign exchange premium value. The implication in this case is that a restrictive monetary policy, a devaluation, or both, may be much more important trade-liberalizing measures than reductions in tariffs. However, where binding quotas apply for all imports and a positive foreign exchange premium value occurs, a tightening of domestic monetary policy will reduce the foreign exchange premium value but generate offsetting increases in quota premium values with no real effects on trade flows. In this case a restrictive monetary policy or a devaluation will have no real effects. We also analyze the role of parallel black markets that arise when trading of foreign exchange in legal white markets is disallowed.

We illustrate our approach with some counterfactual equilibrium calculations using a small open economy general equilibrium model of the Philippines due to Clarete (1984), which is modified here to include foreign exchange premia. The importance of incorporating domestic monetary policy, fixed exchange rates and associated foreign exchange premia as part of the trade policy regime in such a country emerges strongly from these results.

II. Foreign Exchange Premia in a Small-Open Economy Exchange Model

To illustrate the interaction of foreign exchange premia and trade, we first consider the case of a small-open price-taking economy in which, for simplicity, there is no production and all goods are traded. The world prices for the N goods are given as $\bar{\pi}_i^{w}$, i=1,...,N . The economy has market demand functions $\xi_i(\pi^d)$ and non-negative endowments ω_i for each of the N goods. π^d denotes the N-dimensional vector of domestic commodity prices. These demand functions are non-negative, continuous, homogeneous of degree zero in π^d, and satisfy Walras Law; i.e. at all price vectors π^d

(1) $\sum_{i=1}^{N} \pi_i^d(\xi_i(\pi^d) - \omega_i) = 0.$

Without foreign exchange premium, $\pi_i^d = \bar{\pi}_i^w$ for all i, and thus trade balance holds. Equilibrium in the domestic economy follows trivially; net trades are given by $(\xi_i(\pi^D) - \omega_i)$ which, in turn, are fully accommodated by the larger rest of the world.

This model changes, however, once foreign exchange premia enter. In this case, we assume that the government fixes the exchange rate at $\bar{e}$, implementing the policy by requiring all foreign exchange earned from exports to be surrendered to the Central Bank at the rate $\bar{e}$, and allocating rights to importers to purchase available foreign exchange at the same rate $\bar{e}$. There are obvious incentives for exporters to conceal foreign exchange and attempt to sell it on parallel (black) markets rather than surrender it at the lower fixed rate. We assume for now, however, that exporters comply with this policy and fully meet the surrender requirement.

A simple modelling of the allocation process of foreign exchange among importers is to assume that the government auctions or sells it. If desired imports require more foreign exchange than the government offers for sale, the price of foreign exchange paid by importers will be bid up. This price will thus include a foreign exchange premium above the fixed rate $\bar{e}$, which we designate as λ. This premium acts as a surcharge on foreign exchange bought by importers and adjusts so as to clear the foreign exchange. market. The net effect is akin to a general tariff on all imports, since the exchange rate received by exporters differs from the gross of premium exchange rate paid by importers. As modelled above, the foreign exchange premium accrues to the government, but if rights to purchase foreign exchange at the rate $\bar{e}$ are allocated by the government without charge, the premium would go instead directly to importers.

This treatment of foreign exchange premia introduces money into our small-open-economy trade model by requiring that domestic transactions be conducted in local currency, the "peso", and international trade be transacted using foreign exchange, the "dollar". Local exporters sell their dollar earnings to acquire pesos, while importers buy dollars with pesos to purchase imports. A dual price system occurs since exporters surrender foreign exchange at a net of premium exchange rate, but sales of foreign exchange to importers occur at a gross of premium rate. This is clearly the case where the government sells foreign exchange to importers. Where rights to foreign exchange are freely distributed to qualifying importers at the rate $\bar{e}$, and if legal foreign exchange resale markets occur, the effect is similar except that importers rather than the government receive the proceeds of the premia. If legal sale is prohibited, the premium value can be realized instead by importing goods and reselling the goods at the domestic price which reflects the foreign exchange premium, or by selling foreign exchange on black (or parallel) markets.

Our treatment of money is deliberately simplified to keep our model tractible. We assume that real balances are held purely for transactions purposes and the velocity of circulation is fixed, i.e. money demand is of simple Cambridge form. If we choose units such that the velocity is unity, the total demand for pesos, M^d, is given by the value of domestic final transactions divided by the price of pesos in terms of goods π_M^d i.e.

$$(2) \quad M^d = \frac{\sum \pi_i^d \xi_i(\pi^d)}{\pi_M^d}$$

The domestic supply of money in the model is assumed set by the monetary authorities, and given by $\bar{M}^s$.

Because of the foreign exchange premium, relative domestic prices of the N traded goods will now differ from world prices, depending upon whether they are imported or exported. Domestic prices π_i^D are given by:

$$(3) \quad \pi_i^d = \begin{cases} \bar{e}\,\bar{\pi}_i^w & \text{if } \xi_i - \omega_i < 0 \\ \bar{e}(1+\lambda)\bar{\pi}_i^w & \text{if } \xi_i - \omega_i \geq 0. \end{cases}$$

where $\xi_i-\omega_i$ denotes the net imports of good i, and λ is the premium value on foreign exchange paid by purchasers of imports.

The total revenues accruing to receipients of the foreign exchange premium (i.e. the value of rights to purchase dollars at the rate $\bar{e}$) are

$$(4) \quad R = \lambda\bar{e}\sum_{i=1}^{N} \bar{\pi}_i^w \max[0,\ \xi_i - \omega_i].$$

These rents accrue either directly to the household sector as additional revenues of importers who receive allocations of foreign exchange freely from the government, or indirectly as recycled government revenues.

The market demand functions for this model have to be rewritten to reflect the fact that anticipated revenues, L, from rights of access to foreign exchange and the price of money in terms of goods, π_M^d, affect both commodity and money demands. Commodity demands are therefore written as $\xi_i(\pi^d, L, \pi_M^d)$, although as in the case without foreign exchange premium they are homogeneous of degree zero in π^d, L, and π_M^d.

The budget constraint of the household sector, including initial holdings of money balances, is given by:

$$(5) \quad I = \sum_{i=1}^{N} \pi_i^d \omega_i + \pi_M^d \bar{M}^s + L.$$

L, the anticipated revenues from rights to buy foreign exchange at $\bar{e}$, is introduced into the model because of the simultaneity of demands and revenues, R, which actually accrue to holders of foreign exchange. This treatment is similar to that of tax revenues in general equilibrium tax models where a comparable simultaneity between revenues redistributed by the government and revenues actually collected occurs (see Shoven and Whalley, 1973). $\bar{M}^s$ appears as part of the budget constraint since initial period money balances used for transactions purposes are assumed held by the household sector; similarly M^d appears on the expenditure side since they are demanded for transactions purposes.

Walras' Law for this version of the model states that at any set of domestic prices, whether or not they are equilibrium prices, the total value of expenditures satisfies the household sector budget contraint i.e.

$$(6)\quad \sum_{i=1}^{N} \pi_i^d \xi_i + \pi_M^d M^d = \sum_{i=1}^{N} \pi_i^d \omega_i + \pi_M^d \bar{M}^s + L.$$

(6) implies that

$$(7)\quad \bar{e} \sum_{i=1}^{N} \bar{\pi}_i^w (\xi_i - \omega_i) + \pi_M^d (M^d - \bar{M}^s) + (R-L) = 0.$$

Based on (7), money is non-neutral when the exchange rate is fixed and domestic monetary policy is non-accommodative. A contractionary monetary policy can restore equilibrium in such circumstances and remove the need for either rationing or auctioning of foreign exchange by the central bank. Monetary policy can thus have real effects on trade flows in such a model.

A general equilibrium for this model is given by values of $[\lambda^*, L^*, \pi_M^{d*}]$ which satisfy the following conditions:

$$(8)\quad \sum_{i=1}^{N} \bar{\pi}_i^w (\xi_i - \omega_i) = 0$$

$$(R-L) = 0; \text{ and}$$

$$(M^d - \bar{M}^s) = 0.$$

In such an equilibrium the trade deficit is zero, the public sector's budget is balanced, and the peso market clears. Since there are three unknowns and three excess demand functions, we can apply a fixed point algorithm to determine an equilibrium for the model, such as Vander Laan and Talman (1979) or Broadie (1983). The only complication relative to the standard general equilibrium model is that the direction of trade needs to be assumed before computation begins, and the equilibrium solution may not yield trade flows which match these assumptions. While there are ways to accomodate this difficulty by introducing additional dimensions to the equilibrium problem which allow for the endogenous determination of the direction of trade, in practice a simpler scheme is repeated recomputation under modified assumptions on the direction of trade until consistency between assumption and solution is obtained.

III. Introducing Trade Policies and Other Features of Developing Countries External Sector Regimes

While the model described in the preceding section serves to illustrate how the basic equilibrium structure works in the presence of foreign exchange premia, it is not particularly useful for the analysis of policy options for economies under such a regime. This is because the interaction between tariffs and quantitative trade restrictions and any foreign exchange premium is missing from the model. In addition, such features as production, the presence of non-traded goods, and parallel (black) markets in foreign exchange need to be added to the model.

Tariffs

Tariffs are relatively easy to incorporate in the model described above. As already noted, their inclusion leads to the proposition that a reduction in a general tariff on all imports will have no real effects on trade, since an adjustment in the foreign exchange premium value will occur so as to leave both real trade flows and household incomes unchanged.

We represent tariffs by the ad valorem tariff rates t_i (i=1,...,N) on the N traded goods; $t_i=0$ where good i is exported. The two major adjustments to the model structure outlined above occur with the determination of domestic prices, which now include tariffs on imports, and with the determination of household incomes which now include tariff revenues (assumed redistributed by the government to the household sector).

Domestic prices are given by

$$(9)\qquad \pi_i^d = \begin{cases} \bar{e}\,\bar{\pi}_i^w & \text{if } \xi_i - \omega_i < 0 \\ \bar{e}(1+\lambda)(1+t_i)\bar{\pi}_i^w & \text{if } \xi_i - \omega_i \geq 0 \end{cases}$$

The household sector budget constraint is given by (5) except that where L now includes not only anticipated revenue from foreign exchange premia, but also anticipated tariff revenues.

In this case, actual revenues collected, R, include both tariff revenues and those from foreign exchange premia, i.e.

$$(10)\qquad R = \bar{e} \sum_{i=1}^{N} (\lambda + t_i + \lambda t_i)\bar{\pi}_i^w \max[0,\ \xi_i - \omega_i]$$

An equilibrium in the presence of both tariffs and a foreign exchange premium is again given by values of $[\lambda^*, L^*, \pi_M^{d*}]$ such that the same conditions as in (8) hold.

The neutrality proposition that a general reduction in tariffs will have no real effects on trade flows and will be exactly offset by an increase in the premium value for foreign exchange follows from equations (9) and (11).

For instance, in the case where $t_i = t$ for all import i, an elimination of tariffs results in a new premium value $\hat{\lambda} = \lambda + t + \lambda t$. At this new premium value domestic prices are unchanged; combined revenues from tariffs and premia, R, are unchanged in equation (10); household sector incomes are unchanged; and the value of domestic transactions, and hence, M^d is unchanged. In short, all the real characteristics of the equilibrium will be preserved since there are no relative price changes, and in this one-household case there are no income effects between households from the reduction in tariffs and the increase in premium values.

In the case of sector-specific tariffs, the neutrality of tariff policy occurs where changes in tariff rates are equiproportional, i.e. $\Delta t_i/(1+t_i)$ is equal for all t_i. Otherwise as in removing sector-specific tariffs, real effects will result. A change in tariffs can thus be decomposed into an average change which has no real effects, and a change in the dispersion of tariffs from which real effects result. For this reason the liberalizing effect of lowering tariffs will typically be smaller under a trade regime in which foreign exchange premia occur than otherwise, and reductions in tariffs on a subset of goods which increase the dispersion of tariff rates can be trade restricting.

Quantitative Restrictions (Quotas)

Quantitative restrictions (QRs) are slightly more complicated than tariffs to introduce into this, or any other equilibrium trade model, since each QR will have a separate quota premium value associated with it, all of which will be endogenously determined in equilibrium. We designate quota restrictions by $\bar{q}_i$, and the per unit value of the quota premium associated with each restriction as p_i^q. Where commodity i is exported, $\bar{q}_i = p_i^q = 0$.

The adjustments to the model structure in this case are much the same as occur with tariffs; domestic prices are gross of the premium value associated with the quota restrictions, and household incomes include the quota premium values. The major difference relative to the tariff case is that quota premium values are endogenously determined as part of the equilibrium process.

Domestic prices are given by

$$\text{(11)} \qquad \pi_i^d = \begin{cases} \bar{e}\,\pi_i^{-w} & \text{if } \xi_i - \omega_i < 0 \\ \bar{e}(1+\lambda)(1+p_i^q)\pi_i^{-w} & \text{if } \xi_i - \omega_i \geq 0. \end{cases}$$

The household sector budget constraint is given by equation (10), but revenues collected, R, include both revenues from foreign exchange premia and those accruing to holders of quota for imports

$$\text{(12)} \quad R = \bar{e} \sum_{i=1}^{N} (\lambda + p_i^q + \lambda p_i^q)\pi_i^{-w} \max[0, \xi_i - \omega_i]$$

An equilibrium in the presence of quantitative restrictions is given by values of $[p_i^{q*}, \lambda^*, L^*, \pi_M^{D*}]$ such that the same conditions as in (8) hold, except that an additional set of market clearing conditions are required for each quota i, i.e.

$$(13) \quad \xi_i - \omega_i - \bar{q}_i \leq 0 \qquad (= 0 \text{ if } p_i^q > 0).$$

In this version of the model, however, the foreign exchange premium only affects the domestic prices of imports for which there is either no quota or the quota is not binding. Where all imports are quota constrained, the foreign exchange premium, if positive, only has a redistributive role and has no real impacts in the model. In such a case, a devaluation or a contractionary monetary policy will be neutral and have no real effects on trade flows. Also reduction in quotas such that all quota premium values change proportionally, i.e. $\Delta p_i^q/(1+p_i^q)$ is equal for all import quota i, will be neutral, provided all quotas again continue to bind.

Where some imports have no quotas or have redundant quotas, a devaluation or a contractionary monetary policy will again have real effects, although of a smaller magnitude relative to a model without quotas. In this case, these policies act to transfer the rationing process from the foreign exchange market to the goods markets.

Priority Allocation of Foreign Exchange and Parallel Markets

Thus far, we have assumed that either foreign exchange received by the government from surrender by exporters is sold by the government on a free market, or rights to purchase foreign exchange at the rate $\bar{e}$ are allocated to importers without charge. In practice, more complex allocation procedures are used, and we briefly illustrate how these can also be incorporated into our approach.

We consider the case where certain imports are classified as "essential" or "high priority", and others are classified as "non-essential". Under such a scheme foreign exchange earnings are allocated to importers to be used only for essential imports, a procedure commonly followed in many developing countries, where essential imports include foodstuffs, raw materials, and capital equipment, and non-essential imports include consumer goods.

For essential imports, we assume that importers receive allocations of foreign exchange at the rate $\bar{e}$ which they then use for one of two purposes. Either they can import essentials which they sell at the going domestic price (in the process implicitly receiving a foreign exchange premium at rate λ), or they sell their foreign exchange on black (or parallel) foreign exchange markets. Buyers of foreign exchange on black markets use their dollars to finance non-essential imports, either through legal importation or through smuggling.

The presence of black markets for foreign exchange can be incorporated into this model using a similar approach to that employed in an equilibrium formulation for coexistence of equilibria on black and white markets due to Nguyen and Whalley (1985). In this case the effective foreign exchange premia applying to imports of essential and non-essential imports are given by the two different values λ_1 and λ_2, where the difference between the two reflects the probability of sellers of foreign exchange on black markets being detected and fined.[2] Under risk neutral behaviour by sellers of foreign exchange

(14) $\lambda_2 = \lambda_1 + \gamma \cdot K$

where γ is the probability of detection, and K is the fine per dollar sold on black markets.

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[2] We assume, for simplicity, that all penalties are incurred on the selling side of the black market for foreign exchange.

With this structure, the model is essentially the same as in the preceding section, with the difference that different premia apply to essential and non essential imports. Thus domestic prices are given by

$$\text{(15)} \quad \text{Essential Imports} \quad \pi_i^d = \bar{e}(1+\lambda_1)\bar{\pi}_i^w \quad \text{if } \xi_i - \omega_i > 0 \quad i=1\ldots N_E$$

$$\text{Non Essential Imports} \quad \pi_i^d = \bar{e}(1+\lambda_2)\bar{\pi}_i^w \quad \text{if } \xi_i - \omega_i > 0 \quad i=1\ldots N_{NE}$$

$$\text{Exports} \quad \pi_i^d = \bar{e}\,\bar{\pi}_i^w \quad \text{if } \xi_i - \omega_i < 0,$$

where N_E and N_{NE} define the number of essential and non-essential imports; $N_E + N_{NE} = N_M$ (N_M being the number of imports).

Revenues collected from foreign exchange premia also need to take into account the separate premium rates on essential and non essential imports, i.e.

$$\text{(16)} \quad R = \bar{e}\sum_{i=1}^{N_E} \lambda_1 \bar{\pi}_i^w \max[0, \xi_i - \omega_i] + \bar{e}\sum_{i=1}^{N_{NE}} \lambda_2 \bar{\pi}_i^w \max[0, \xi_i - \omega_i]$$

Otherwise the model is as above with equilibrium being given by $[\lambda_1^*, L^*, \pi_M^{D*}]$ such that the conditions in (8) hold. From equation (14), λ_2 can be calculated from λ_1. The added distortion introduced into this model variant is the difference in the distortion rate relative to world prices between essential and non-essential imports. This typically raises the welfare cost of any given fixed exchange rate and non-accomodative monetary policy mix.

Production and Non Traded Goods

Extending the approach outlined above to incorporate production and other features such as non-traded goods is also relatively straightforward.

Since we later apply our approach to modelling equilibrium with foreign exchange premia to a numerical general equilibrium model of the Philippines due to Clarete (1984) which uses production functions with both industry-specific factors and industry mobile factors, we describe a similar approach here.

In this model variant, there are T tradable goods, NT nontraded (home) goods, (T+NT) sector-specific factors and K industry-mobile factors of production. π^d and π^{-w} are respectively T-dimensional vectors of domestic and world prices of the tradable goods; π^h is a NT-dimensional vector of domestic prices of homegoods; and w a K-dimensional vector of factor prices. We again consider a single consumer on the demand side.

From profit maximization, the economy's aggregate profit function is $p(\pi^d,\pi^h,w,\bar{z})$, where $\bar{z}$ is a (T+NT) dimensional vector of industry-specific factors. We also assume this profit function to be linear homogeneous in π^d, π^h, and w. The derivatives of the profit function with respect to its price arguments, $p_\pi d$, $p_\pi h$, and pw give the net-outputs of the (N+NT) commodities and the K factor demands by firms. It follows from the homogeneity property of the profit function that $p(\pi^d,\pi^h,w,\bar{z}) = \pi^{d'}p_\pi d + \pi^{h'}p_\pi h + w'p_w \geq 0$. The inequality allows for rents which accrue to the sector-specific factors.

From utility maximization, the consumer's expenditure function is $e(\pi^d,\pi^h,\pi^d_M)$, which we assume to be linear homogenous in π^d, π^h, and π^d_M. The vectors of derivatives of the expenditure function with respect to its price arguments give the compensated consumer demand functions for (T+NT) goods and real balances. The homogeneity property of the expenditure function implies that $e(\pi^d_M,\pi^h,\pi^d)=\pi^{d'}e_{\pi^d}+\pi^{h'}e_{\pi^h}+\pi^d_M\ e_{\pi^d_M}$. We assume that consumer's factors (e.g. demand for leisure) are zero. Since all factor endowments in the model are exogenous, the vectors of sectorally-mobile and industry specific factor supplies, F and z, are respectively $\bar{F}$ and $\bar{z}$.

The income of the economy consists of the value of factors, the money endowment, and public income transfers (including the value of rights of access to foreign exchange). Household expenditures include both traded and nontraded goods plus money demands.

Using the homogeneity property of $p(\pi^d,\pi^h,w,\bar{z})$, and $e(\pi^d,\pi^h,\pi^d_M)$, the general equilibrium conditions for this version of the model are:

i). $(-p_w - \bar{F}) = 0$

for the sectorally-mobile factors (note that $p_w < 0$);

ii). $(e_{\pi^h} - e_{\pi^h}) = 0$

for homegoods;

iii). $\bar{\pi}^{w'}(e_{\pi^d}-p_{\pi^d}) = 0$

as the trade balance condition;

iv). $(R - L) = 0$

for the government budget; and

$$v). \quad (M^{d} - \bar{M}^{s}) = 0$$

for domestic currency. The above system of equations can again be solved for $w^*, \pi^{h*}, \lambda^*, L^*$, and π_M^{d*}, using a fixed point algorithm.

IV Analyzing Foreign Exchange Rationing in a Small Open Economy Model of the Philipines

In order to give some indication of how the approach outlined above can be used to analyze policy options in the presence of foreign exchange premia, we have also made some calculations using a small open economy numerical general equilibrium model of the Philippines due to Clarete (1984) which captures the interacting effects of foreign exchange premia and trade distortions. This model is presented in detail in Clarete (1984), and is also described in Clarete and Roumasset (1985) and Clarete and Whalley (1985), and so we only briefly summarize it here, and discuss the modifications made to accommodate the presence of foreign exchange premia.

In the basic version of the model, the government collects both tariffs and export taxes and redistributes the revenues to the consumer in a lump-sum fashion. In the version used here a fixed exchange rate, an exogenous domestic money supply and a foreign exchange premium are introduced as modelled above. We also consider an alternative case with all these distortions plus import quotas. For simplicity we ignore the case where parallel markets for foreign exchange arise due to the designation of priority and non-priority imports.

This small-economy model of the Philippines has been calibrated to a 1978 Philipine benchmark equilibrium data set using the procedures described in Mansur and Whalley (1984). Seven sectors are included in the model:

three exportables, two importables, and two homegoods. Exportables are commercial crops, agricultural food industries, and industrial exportables. Importables include industrial importables (consisting mainly of producer goods), and import substitutes. The homegoods sectors are other agricultural products and services. Two variable factors are specified, labour and capital, with the aggregate supply of each assumed to be fixed.

Tariff and export tax rates used in the model are trade-weighted averages of respective industry average rates using commodity-specific data listed in the Philippine Tariff Code for 1978. In the 1978 base year data, industrial importables have an ad valorem tariff rate equal to 23 percent, and import substitutes face a rate of 62 percent. Export tax rates for commercial crops, agricultural food industries, and industrial exportables are set at 5, 3, and 3 percent, respectively. As in Clarete and Whalley (1985), we also construct an alternative micro-consistent economic data with import quotas as well as tariff rates. Quotas are set equal to the observed benchmark imports, and the respective quota premium values are assumed equal to 0% and 20%, (i.e., one of the quotas is redundant). Finally, we assume the benchmark value of the foreign exchange premium to be 20%, and the money supply is set equal to real expenditures on all commodities in this benchmark data.

These policy parameters are combined with other data from Clarete (1984) to assemble the complete benchmark equilibrium data sets used in the model. Calibration procedures determine the parameters for the production and demand functions, which, in turn, are used in the counterfactual analyses reported on here.

We have performed two sets of calculations using this model. In the first we consider the version of the model in which quotas do not appear. The sector-specific tariffs in the 1978 data set are first reduced equiproportionately and then are completely removed, holding the exchange rate and money supply fixed at their benchmark values. We then reduce the money supply holding tariffs and exchange rates constant, by an amount sufficient to eliminate the foreign exchange premium, demonstrating the non-neutral effects of monetary policy. Furthermore, we allow the exchange rate to vary with other policy parameters constant, demonstrating the real effects of a devaluation in such a model. In each case we have calculated the welfare effect of the change as the Hicksian equivalent variation implied by the comparison to the original equilibrium.

These results are reported in the first column of Table 1 and clearly show the neutrality of a general tariff reduction, and the real effects of either contractionary domestic monetary policy or a devaluation. Reducing tariff rates equiproportionately has no real impact; the equivalent variation associated with this change is zero. The implication is that tariff reforms will typically have smaller liberalizing impacts where foreign exchange is rationed than otherwise. This is evident in the equivalent variation associated with removing all sector-specific tariffs, which is 0.91% of income. In an earlier paper, Clarete and Whalley (1985) which also analyzes trade policies in the Philipines, removing the same set of tariffs but without including foreign exchange premia in this model yields a welfare gain of 3.3% of income.

The equivalent variation implied by reducing the money supply so as to eliminate the foreign exchange premium value, holding the other policy parameters constant, is 2.11% of income. This result confirms the proposition that monetary policy is non-neutral under a regime of a fixed exchange rate and a foreign exchange premium. Interestingly, it has more effect than tariff removal. Lastly, devaluation of the peso is equally effective. These results clearly have major implications for the relative importance of monetary and trade policies in developing countries with fixed exchange rates and foreign exchange premia contemplating tariff reform.

In the other set of calculations using model version II which incorporates import quotas, we first consider an equiproportional reduction in sector-specific tariff rates, and then remove all tariffs in the model. This is followed by a case which computes the money supply which eliminate the foreign exchange premium. Finally, all sector-specific tariffs and quotas are removed. In each policy change, other policy parameters are again held constant.

The results of these policy changes are reported in column II. There is no real impact from changes in tariffs in this case, because these policies have no marginal effects on imports. This result is independent of the policy stance with respect to a fixed exchange rate and non-accommodative monetary policies. Perhaps the more interesting result is that monetary policy and devaluation are also neutral in this case. In the benchmark equilibrium under model version II, one of the import quotas is redundant, and the foreign exchange premium is 20%. In the counterfactual equilibria which allow either the money stock or the exchange rate to vary so as to eliminate the foreign exchange premium, the premium value of the redundant quota increases from zero to 20% and the other quota premium also increases by 20%. As mentioned above, the rationing process is transferred from the foreign exchange to the goods markets, leaving relative domestic goods prices unchanged. The equilibrium money stock or exchange rate is still equal to its benchmark value. Only when import quotas are changed (in this case reported, together with tariffs) do we observe any real effects. In this case an improvement in economic welfare of 1.86% of national income occurs.

The implication we draw from this analysis is the importance of considering foreign exchange premia as an integral part of the foreign trade regime in those countries where positive foreign exchange premium values occur. In analyzing tariff reforms the interaction of the premia with tariffs can negate any real effects of tariff changes; in analyzing changes in QR's the neutrality of exchange rate changes can be restored but only where binding quotas apply to all imports. In general, when evaluating the impacts of trade policy changes in such countries monetary policy or devaluations will have real effects in the type of model presented here, and such policy interactions need to be carefully considered.

IV Summary and Concluding Remarks

In this paper we present a small-open economy trade model in which the government pursues a fixed exchange rate policy and a non-accomodative domestic monetary policy (typical of many developing countries). An associated foreign exchange premium results generating a dual price system under which exporters surrender foreign exchange at a net of premium exchange rate but importers have to pay a gross of premium rate to acquire foreign exchange. We first describe our formulation in the pure exchange case with a transactions demand for money. We then indicate how trade taxes, quotas, parallel black markets for foreign exchange, production and homegoods can all be incorporated into the basic approach. We suggest that this analysis is especially important for policy evaluation in those developing countries which ration foreign exchange, stressing how a monetary policy or a devaluation can be a more important trade liberalizing change in such countries than a tariff reduction. Some general equilibrium calculations using a model for the Philippines incorporating rationed foreign exchange are presented in a final section.

TABLE 1

WELFARE IMPACTS FROM CHANGES IN TRADE AND MONETARY POLICIES IN A PHILIPINE TRADE MODEL[1]

(Welfare impacts measured as percent of national income)

Policy Change	Model Version[2] I (no quotas)	II (with quotas)
Equiproportional Reduction in tariff rates[3]	0.00	0.00
Sector-Specific Tariffs Removed	0.91	0.00
Money Supply Reduced so as to Eliminate the Foreign Exchange Premium	2.11	0.00
Devaluation of 10% in the peso	2.11	0.00
Sector-Specific Tariffs and Quotas Removed	--	1.86

Notes:

1. See description in text

2. Model version I includes sector-specific tariffs, a fixed exchange rate, an exogenous money supply, but no quotas are considered. Model version II incorporates sector-specific quotas as described in the text.

3. Equiproportional reduction in tariffs means lowering the rates on the two importables from 23% to 10.7% and 45.8% respectively. These reductions are such that $\Delta t_1/(1+t_1) = \Delta t_2/(1+t_2)$, and these equal (somewhat arbitrarily) 10 percent.

4. Holding other policies constant, the money stock is computed which eliminates the foreign exchange premium. In I, the amount is 91% of benchmark money stock; in II, it is 100%.

5. Holding other policies constant, the exchange rate is varied to eliminate the foreign exchange premium. In I, the exchange rate is 110% of the benchmark fixed exchange rate; in II, it is 100%.

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