61

Boston University

Center for Latin American Development Studies

A SHORT-RUN GENERAL EQUILIBRIUM MODEL FOR A SMALL, OPEN ECONOMY

by

Santiago Levy

Discussion Paper
Number 61
February 1984

A SHORT-RUN GENERAL EQUILIBRIUM MODEL FOR A SMALL, OPEN ECONOMY

Santiago Levy

Boston University

A B S T R A C T

This paper develops an input-output type model of prices and quantities for a small, open economy. The model has a Keynesian flavor taking some component of aggregate demand as exogenous. It is also of a short-run nature as it assumes installed capacity in each sector to be given. However, depending on the level and composition of effective demand, excess capacity might exist in some sectors. Prices result from the interaction of world prices for traded goods together with domestically determined prices for non-traded goods. Traded goods, however, are determined endogenously as result of effective demand that exceeds installed capacity. For non-traded goods, excess demands are cleared through price adjustments that reduce the size of some of the components of aggregate demand. The same is true of traded goods that are subject to import quotas, whenever the quotas are binding. The model is used to show how exogenous changes in government expenditure and the nominal exchange rate effect such macroeconomic aggregates like the price level, the real exchange rate, the trade deficit, the real wage as well as the level of output and employment.

A SHORT-RUN GENERAL EQUILIBRIUM MODEL FOR A SMALL, OPEN ECONOMY

I. Introduction[1]

In this paper we construct a short run computable general equilibrium (CGE) model for a small open economy. The short run nature of the model derives from the fact that the capital stock installed in each sector is taken as given, such that output levels face exogenously set upper bounds. Furthermore, no explicit consideration is given to investment.

In the design of a CGE model it is crucial to bear in mind the institutional arrangements of the economy under study. The case analyzed here is that of an economy subject to significant amounts of government intervention. In particular, the nominal wage and exchange rate are exogenously set and there is no presumption that full employment of labor will occur. Competitive imports are only allowed when demand for a particular product exceeds maximum capacity output. Moreover, some goods might be subject to quantitative restrictions which might, or might not, be binding.

If any good is imported a nominal tariff rate is paid and at that point the domestic price will be given by the interaction of the nominal exchange rate, the world price and the associated tariff rate. In the absence of imports, however, prices will be given by domestic conditions relating to wage, mark-up and tax rates, along with the technological

---

[1] This model was motivated by the experience of the Mexican economy during 1979-1981. Although no numerical results are presented, the assumptions concerning trade policy and government expenditure are derived from that country.

conditions of production. Other goods, of course, may not be imported at all due either to an import prohibition, or because the good simply cannot be traded.

As we are working with a short run model, it seems reasonable to ignore problems of choice of technique. The view taken here is that at a given point in time there is a vector of non-shiftable capital goods installed in each sector. Thus, the short run response to exogenous changes is mainly through variations in the rates of capacity utilization. Labor/output ratios are fixed, although the capital/output ratios in each sector will decline as full capacity is reached.

The model includes three types of agents: workers, capitalists and the government. Workers receive income from a given nominal wage rate times the level of employment. A fixed proportion of that income is taxed and the rest spent on domestically produced goods. Their consumption basket, however, also depends on relative prices. For capitalists the story about consumption and taxes is the same. Profit income is obtained from a mark-up over wage costs. Mark-up rates, nevertheless, are affected by trade conditions. Capitalists who produce non-tradeable goods enjoy some "natural" protection and when there is excess demand for their products mark-up rates, and hence prices, increase to clear markets. For tradeable goods, however, an upper bound on price is given by the world price plus the tariff and capitalists in these sectors simply adjust their mark-up rates to face this fact. If quotas are imposed, on the other hand, the net effect will depend on whether at the margin the quota is binding or not, as this will determine the mechanism for clearing excess demands, either through imports or through price increases similar to those of non-tradeable goods.[1] Thus, income levels for both groups are endogenous and the effects of trade or government expenditure policy on income distribution can be analyzed. An interesting outcome is the differential short run effects of various exogenous changes on profits in the tradeable vs. non-tradeable sectors of the economy.

The government receives some revenue both from direct taxes (on wages and profits) and indirect taxes (from tariffs and a value added tax). Its expenditure can be either endogenized such that the fiscal deficit is zero or, alternatively, can be taken as exogenous. From this second type of behavior we might observe a trade deficit, which is duly recorded below.

As the government expands effective demand, wages profits and taxes increase in a typical Keynesian fashion. In some sectors, however, full capacity will be reached and competitive imports will come in. This will change relative prices and the structure of consumption. If full capacity is reached in a non-tradeable sector or if a quota becomes binding, price will increase and consumption will decline. Of course, if there is a lot of slack in the economy one can in fact expand output without requiring competitive imports and increases in the prices of non-tradeable goods. But what is interesting about our paper is what happens when the economy operates with little slack, and we thus concentrate on these cases.

---

[1]Perfect competition in the holding of the quota is assumed. Note, however, that when quotas are binding rents will accrue to quota holders.

Evidently, if the country's trade policy was different the determinants of the price vector would change affecting, in turn, output, employment and income distribution. Our framework, however, can be extended to cover these cases as well, although for reasons of space only brief mention will be made of these situations.

The rest of the paper is organized as follows: Section II develops the model appropriate to the trade policy described above. Section III analyses the behaviour of the real exchange rate and the price level when changes in government expenditure are taken as exogenous. It then extends the model to endogenize government expenditures such that the trade deficit is zero. Lastly, it studies the reaction of prices and quantities to a change in the nominal exchange rate. Section IV concludes by indicating how our framework can be expanded to consider alternative trade policies, and mentions an important shortcoming of the model.

II. The Model

II.1 Prices

Consider first the behaviour of prices in an economy with mark-up pricing, a value added tax, non-competitive intermediate imports and only one type of labor.[1] The price vector is written as:

$$(1) \qquad p^d = p^d A + ep^{nc}V + wl + wl\hat{Y} + (wl + wl\hat{Y})\hat{\alpha}$$

---

[1] This follows closely the model of Levy (1982).

where:[1]

$p^d(1,n)$ = a vector of per unit domestic prices

$A(n,n)$ = matrix of technical input/output coefficients

$e(1,1)$ = nominal exchange rate (domestic currency/foreign currency)

$p^{nc}(1,s)$ = vector of world prices for non-competitive intermediate imports expressed in the foreign currency

$V(s,n)$ = matrix of non-competitive import coefficients, where v_{ij} is the requirement of non-competitive good i per unit of domestically produced good j

$w(1,1)$ = nominal wage rate

$l(1,n)$ = vector of labor/output coefficients

$\gamma(1,n)$ = vector of profit mark-up rates

$\alpha(1,n)$ = vector of value added tax rates

$\hat{}$ = operator that turns a vector into a diagonal matrix

Equation (1) constructs the vector of domestic prices as the sum of intermediate costs (domestic plus non-competitive imports), wages, profits and taxes. Profits are modelled as a mark-up over wage costs while taxes, on the other hand, are modelled as a value added tax.

Equation (1) could be solved for the equilibrium price vector as a function of tax and mark-up rates as well as the nominal wage and exchange rate. It is clear, however, that the behaviour depicted by equation (1) is a particular case where prices of all goods produced at home are in

---

[1]The dimensions of each variable are given in the parenthesis immediately after it.

fact determined by domestic conditions. Although world prices enter into the picture, they do so in a restrictive way, only affecting the costs of non-competitive intermediates. If a good is traded, however, it is reasonable to expect that its price is determined by the world price for that good, so that (1) really describes the case of an economy that only produces non-traded goods. Under more general conditions, therefore, one can take the price vector to be a linear combination of world determined prices for traded goods plus domestically determined prices for non-traded goods. We therefore introduce a sourcing matrix, S, which is a diagonal matrix with zeros and ones along the main diagonal. The convention adopted is that $s_{jj} = 1$ implies that good j is non-traded (and hence its price determined by domestic factors) while $s_{ii} = 0$ implies that good i is traded (with its price determined by the world market). The price vector can then be written as:

(2) $$p = p^d S + ep^c(I + \hat{t})(I - S) \text{ where}$$

$p(1,n)$ = the equilibrium price vector

$p^c(1,n)$ = vector of world prices for goods produced in the economy expressed in the foreign currency

$t(1,n)$ = vector of ad valorem tariff rates

$I(n,n)$ = identify matrix

Once we allow some prices to be determined by the world market, however, domestic prices will also be affected, as now the cost of some intermediate inputs will be given from outside. We thus re-write (1) as:

(3) $$p^d = p^d SA + ep^c(I + \hat{t})(I - S)A + wl + wl\hat{Y} + (wl + wl\hat{Y})\hat{\alpha} + ep^{nc}V$$

Substituting (3) in (2) and solving for p we obtain:

$$p = ep^c(I + \hat{t})(I - S)A(I - SA)^{-1}S + wl(I + \hat{\gamma} + \hat{\alpha} + \hat{\gamma}\hat{\alpha})(I - SA)^{-1}S + ep^{nc}V(I - SA)^{-1}S + ep^c(I + \hat{t})(I - S) \tag{4}$$

A few things are worth pointing out: (i) first, the price vector is homogeneous of degree one in w and e. Therefore, regardless of whether goods are traded or non-traded, equiproportional changes in the nominal wage and exchange rate will leave relative prices unaffected. (ii) second, note that (4) contains various price vectors as special cases. In particular by setting S = 0 we obtain

$$p = ep^c(I + \hat{t}) \tag{4'}$$

which simply says that when all goods are traded prices are fully determined by the world market. Alternatively, by setting S = I we obtain

$$p = wl(I + \hat{\gamma} + \hat{\alpha} + \hat{\gamma}\hat{\alpha})(I - A)^{-1} + ep^{nc}V(I - A)^{-1} \tag{4''}$$

which is, in fact, the solution to (1) and determines equilibrium prices when all goods are not traded. Note that in either (4') or (4") the property of homogeneity of first degree of p with respect to w and e still remains.

In sum, equation (4) is the equilibrium price vector for a small open economy. It is clear, however, that to find the exact solution for p we must determine which goods will be traded, i.e., we must determine the values of the sourcing matrix.

II.2 Quantities

Let final demand be made up of two qualitatively different components. On the one hand, workers and capitalists consumption which is a function, for each group, of its level of income and prices. On the other hand, exports and government expenditures whose size and composition are exogenously given. The output vector is thus written as:

(5) $$q = Aq + c_w + c_\pi + d + g - m$$ where,

$q(n,1)$ = vector of total output

$c_w(n,1)$ = vector of workers consumption

$c_\pi(n,1)$ = vector of capitalist consumption

$g(n,1)$ = vector of government expenditures

$d(n,1)$ = vector of exports

$m(n,1)$ = vector of competitive imports

To model consumption we use a modified version of a linear expenditure system whose coefficients, however, can differ between workers and capitalists, reflecting the different tastes of these two groups.[1] We thus have

(6) $$c_w = Y_w(1 - t_w)\hat{p}^{-1}\eta^w \quad ; \quad \sum_{i=1}^{n} \eta_i^w = 1$$

[1] The standard LES contains a "minimum" level of consumption of each good, which is independent of prices and income. In our context this would be another exogenous term, which can be subsumed under vector g. Note that in (5) private investment was not included. Thus, no private savings are considered either. We could, of course, introduce some savings propensities into (6) and (7), but nothing essential is gained by this.

(7) $$c_\pi = Y_\pi (1 - t_\pi)\hat{p}^{-1}\eta^\pi \quad ; \quad \sum_{i=1}^{n} \eta_i^\pi = 1$$

where:

$Y_{w,\pi}(1,1)$ = income level of workers and capitalists, respectively

$t_{w,\pi}(1,1)$ = tax rate on wage and profit income, respectively

$\eta^{w,\pi}(n,1)$ = vectors of marginal expenditure shares

While the tax rates and marginal expenditure shares can be taken as exogenous, the same is not true of income levels. These are endogenously determined and follow directly from the level of employment.[1] Thus,

(8) $$Y_w = wlq$$

(9) $$Y_\pi = wl\hat{\gamma}q$$

Competitive imports, on the other hand, are determined as the excess of domestic demand over maximum capacity output.[2] In symbols:

(10) $$m = \text{pos}\ [Aq + c_w + c_\pi + d + g - \bar{q}]$$ where

$\bar{q}(n,1)$ = vector of maximum capacity output given the capital stock installed in each sector

The "pos" in (10) indicates that if demand is less than full capacity in any sector no imports are allowed, setting then the respective elements of vector m equal to zero.

---

[1] The level of employment will be denoted by L(1,1). Clearly L = lq.

[2] The modelling of competitive imports as excess demands over installed capacity, and eq. (10) in particular, follows Schydlowsky (1978).

Substituting (6) - (10) in (5) and gathering terms we obtain the output vector of the economy as:

(11) $$q = [A + wC_w(p) + wC_\pi(p,\gamma)]q + d + g - \text{pos}\,[(A + wC_w(p) + wC_\pi(p,\gamma))q + d + g - \bar{q}]$$

where, to shorten notation, we have introduced the C matrices of workers and capitalists consumption which are equal to

(12) $$C_w(n,n) = (1 - t_w)\hat{p}^{-1}\eta^w 1$$

(13) $$C_\pi(n,n) = (1 - t_\pi)\hat{p}^{-1}\eta^\pi 1\hat{\gamma}$$

II.3 Traded and Non-Traded Goods

The endogenization of competitive imports depicted in (10) creates some difficulties if certain goods cannot be imported due either to their physical characteristics and/or some policy induced import prohibition. An additional problem is derived from the existence of quantitative restrictions, which imply that import quantities are not determined freely. To model these situations it is necessary to bound vector m from above, with the values of the upper bounds reflecting the specific conditions governing the importation of each particular good. If we let $\bar{m}$ be the vector of exogenously specified import restrictions the case of a tariff, a quota, and a non-tradeable good can be respectively modelled by setting $\bar{m}_i = \infty$, $0 < \bar{m}_i < \infty$ and $\bar{m}_i = 0$.

Although this approach is in fact quite general it is useful, for future reference, to divide the set of all goods into two mutually exclusive and exhaustive subsets. On the one hand, set I will contain those goods that can be imported, if demand conditions so require (i.e., those goods for which the respective elements of $\bar{m}$ are positive). On the other hand set J, will include those goods that regardless of demand conditions cannot be imported (with the respective elements of $\bar{m}$ equal to zero).

Sets I and J are, properly speaking, the sets of tradeable and nontradeable goods, respectively. These two sets are exogenously specified. In fact, however, out of all goods in set I only a subset - depending on demand conditions - will actually be traded. Let us define, therefore, set R as the set of endogenously determined traded goods. Clearly $R \subseteq I$. Finally, if N is the set of all goods then $H = N \backslash R$ will be the set of nontraded goods. Since $N = I \cup J$ it follows that $J \subseteq H$, as the number of nontraded goods can exceed the number of nontradeable goods.[1]

Permute all goods produced in the economy such that goods belonging to set I are listed first in the input-output matrix. We can then introduce the following partition of the sourcing matrix:

$$(14) \qquad S = \left[\begin{array}{c|c} S_I & 0 \\ \hline 0 & S_J \end{array}\right]$$

---

[1]Henceforth, the lower case letter used as subindex to identify a good will denote the set to which the good belongs. Thus, q_n, $n \varepsilon N$ is the output of any good, p_r, $r \varepsilon R$ is the price of a traded good, etc.

Clearly, matrix S_I can have either zeros or ones along the main diagonal, depending on whether goods are traded or not. Matrix S_J, however, must be equal to the identity matrix as sourcing of all non-tradeables must necessarily be domestic. This, in turn, requires that excess demands for non-tradeables be cleared through a mechanism other than the trade balance. The natural assumption to make, of course, is for non-tradeable prices to adjust upwards.[1] Since the consumption component of final demand is price sensitive and, in particular, since $\partial c_j^{w,\pi}/\partial p_j < 0$ for any $j \in J$ it follows that as prices of non-tradeables increase their consumption will fall, thus clearing the relevant market.

In considering increases in the prices of non-tradeable goods it seems that mark-up rates are the variables that will most likely do the adjustment. This, of course, will increase the profitability of non-tradeable vis-à-vis tradeable production. As the stock of capital is fixed in each sector, however, this seems an admissible and even likely short run event. In what follows, therefore, we will adjust mark-up rates in the non-tradeable sectors so as to clear the respective markets.

With regards to tradeable goods, on the other hand, the adjustment of mark-up rates will depend on whether goods are actually traded or not. For tradeable but non-traded goods, the situation is quite simple, as mark-up rates need not change since no competitive imports are coming in given the lack of excess demand for these products. For traded goods subject to tariffs or non-binding quotas, however, the situation is quite different

---

[1] No quantity rationing schemes are considered.

since in this case the mechanism of price determination will change dramatically. In particular, we know that prices of traded goods will be given by:

$$(15) \qquad p_r = ep_r^c(1 + t_r) \ \forall \ r \in R$$

On the other hand, costs of production will be given by the domestically determined prices for non-traded inputs along with the world determined prices for traded and non-competitive intermediate inputs plus taxes and wages. It follows that mark-up rates for traded goods are also determined endogenously although their behaviour will be quite different compared to that of non-traded goods. More concretely, traded good mark-up rates will be given by the need to equalize domestic costs to the given world price. Following (3) we know that the domestic price for the k^{th} traded good would be given by:

$$(16) \qquad p_k^d = \sum_{r \in R} a_{rk}\, ep_r^c(1 + t_r) + \sum_{h \in H} a_{hk}p_h + wl_k + \sum_{u=1}^{s} v_{uk}ep_u^{nc} + wl_k\gamma_k + (wl_k + wl_k\,\gamma_k)\alpha_k$$

Obviously, there is a value of γ_k that will equalize (15) and (16):

$$(17) \qquad \gamma_k = [\, ep_k^c(1 + t_k) - (e \sum_{r \in R} a_{rk}p_r^c(1 + t_r) + \sum_{h \in H} a_{hk}p_h + e\sum_{u=1}^{s} v_{uk}p_u^{nc} + wl_k + wl_k\alpha_k)]/[wl_k(1 + \alpha_k)]$$

That is to say, mark-up rates in the traded sector are a residual obtained from substracting the cost of intermediate inputs, wages and taxes from product price. It is worth pointing out, however, that we cannot rule out the possibility of negative mark-up rates. This, of course, is perfectly sensible: with output price fixed while input prices change as a result of adjustments to trade policy and excess demand for non-tradeables, profit margins are the only variables left to carry out the adjustment.[1]

It is useful to note two properties of (17): (i) first, note that $\partial\gamma_k/\partial t_k > 0$ while $\partial\gamma_k/\partial t_r < 0$ for $r \neq k$.[2] These results are standard and need no further comment. (ii) second, note that γ_k is homogeneous of degree zero in w and e (since vector p is homogeneous of degree one in the same parameters). Thus, equiproportional changes in the nominal wage and exchange rate will leave profitability in the traded goods sector unchanged.

For traded goods whose quota is binding, lastly, the situation is again modified. In this case price determination will be domestic and the behaviour of mark-up rates similar to that of non-tradeable goods, except that maximum capacity output is defined to include the size of the quota.

---

[1]The fact that negative profits are allowed is another reflection of the short run nature of the model. Of course, for "sufficiently" negative values of γ it might pay to shut down production. This could be introduced into our model by setting $q_i = 0$ if $\gamma_i < \underline{\gamma}_i$ where $\underline{\gamma}_i$ is the lower bound on the mark-up rate below which production of any tradeable good would cease. In this case imports would completely satisfy internal demand. To simplify matters, however, in what follows it will be assumed that in the short-run production will continue, even if $\gamma_i < \underline{\gamma}_i$.

[2]To establish these signs we assume $(1 - a_{kk}) > 0$ and $a_{rk} > 0$, as usual.

That is to say, after the quota has been fully utilized mark-up rates, and hence prices, will have to adjust to eliminate any excess demands.[1]

One further effect of import restrictions must be noted. It concerns the fact that when quotas are binding income not associated with production will flow to holders of import quotas. In particular, these flows of income - which are properly called rents - will accrue to capitalists in the respective sectors, assumed here to be the sole holders of the quotas. It follows that import quotas, when binding, affect income distribution not only by raising the relevant mark-up rates and thus profits on current production but, additionally, by the rents derived from the ability to sell some imports at a price that exceeds the world price. As a result of this it is necessary to re-write equation (9) as:

$$(9') \qquad Y_\pi = wl\hat{\gamma}q + [p - ep^c(I + \hat{t})]W\bar{m}$$

where W is a diagonal matrix of zeros and ones, with $w_{nn} = \{{0 \atop 1}\}$ as $m_n \{{< \atop =}\} \bar{m}_n$. We now substitute (9') for (9) in the solution for q and determine matrix W along with vector p so as to endogenously calculate the quota-derived rents.[2]

We can now specify the adjustment of the economy to excess demands in any sector. To do this, let γ^o be the vector of mark-up rates ruling when the economy is operating at less than full capacity, and note from (4)

---

[1]It follows that for goods with quotas, as long as $m_n \in (0, \bar{m}_n)$ they will belong to set R, but when $m_n = \bar{m}_n$ they will switch to set H.

[2]For reasons of space, the new solution for q will not be written down here although it is, of course, included in the appendix. Note that if imports of goods subject to quotas pay no import tax we simply set $t_i = 0$.

that $\partial p_j / \partial \gamma_j > 0$.[1] For any good $n \in N$:

$$(18)\ \begin{cases} \text{if } m_n \in (0, \bar{m}_n) \rightarrow s_{nn} = 0,\ w_{nn} = 0 \text{ and } \gamma_n = [e p_n^c (1+t_n) - (e \sum_{r \in R} a_{rn} p_r^c (1+t_r) + \\ \sum_{h \in H} a_{hn} p_h + e \sum_{u=1}^{s} v_{un} p_u^{nc} + w l_n + w l_n \alpha_n)] \,/\, [w l_n (1 + \alpha_n)] \quad \text{else} \\ s_{nn} = 1,\ \gamma_n = \gamma_n^o + \delta_n \left[\dfrac{z_n}{(\bar{q}_n + \bar{m}_n)} \right] \text{ and } w_{nn} = \{^0_1\} \text{ as } m_n = \{^0_{\bar{m}_n}\} \end{cases}$$

where s_{nn}, w_{nn} is the n^{th} element along the main diagonal of matrix S,W, the δ_n's are some positive constants and $z = pos[Aq + c_w + c_\pi + d + g - (\bar{q} + \bar{m})]$.

It follows that the sourcing matrix along with mark-up rates will be a function of the level of output in the economy. It will be noted from (4), on the other hand, that the price vector depends on the mark-up rates and sourcing matrix. The output vector, in turn, is a function of prices and mark-ups as shown in (11). Thus, prices and outputs along with income, employment and capacity utilization levels are all determined simultaneously in this economy.

---

[1] Alternatively, γ^o can be the vector of long run equilibrium mark-ups that yield a uniform profit rate in all sectors, as in Levy (1982).

II.4 Feasibility

So far very few restrictions have been placed on the parameters of the model.[1] Nevertheless, the introduction of non-tradeable goods and import quotas together with the fixed capital stock in each sector do impose certain limitations on output levels. In particular, even if there was no consumption of non-tradeables or goods subject to quotas, it is still necessary to satisfy the demand for these products derived from the exogenous components of final demand. If we take exports as given and concentrate on the behaviour of government expenditures we can make the output vector, $q(g)$, a function of vector g. Clearly, there exists a vector $\bar{g}$ such that $q_n(\bar{g}) = \bar{q}_n + \bar{m}_n$ for at least one $n \in N$. It follows that there is no price adjustment in the economy that could satisfy a vector of government expenditures greater than $\bar{g}$.[2,3] We must therefore define the set:

$$(19) \qquad G = \{ g \mid 0 \leqslant g < \bar{g} \}$$

which is the set of vectors of government expenditures that will allow feasible solutions for this economy. In what follows it will be assumed that any vector g exogenously chosen belongs to set G.

---

[1] As usual, it is assumed that matrix A is productive and vector l strictly positive. Similarly $\bar{q}$ is supposed to be strictly positive such that each sector can produce some positive output.

[2] Note from (6) and (7) that $\lim_{p_j \to \infty} c_j = 0$.

[3] To make the argument fully rigorous we assume matrix A to be irreducible. Otherwise a distinction between basic and non-basic goods would be required, although the argument would still hold.

II.5 Equilibrium

The core of the model developed so far consists of equations (4), (11) and (18) which simultaneously determine the vectors of prices, quantities, mark-up rates and sourcing matrix consistent with an exogenously specified vector g. An equilibrium for this economy has, in particular, two characteristics:[1,2]

$$(20) \qquad \begin{cases} \text{(i)} \; m^* \leq \bar{m} \\ \text{(ii)} \; q^* \to (S^*, \gamma^*) \to p^* \to q^* \end{cases}$$

that is to say, in equilibrium no import quota is violated. As $\bar{m}_j = 0$ $\forall_j \in J$ this implies, in turn, that no imports of non-tradeables occur. Furthermore, the equilibrium output vector generates a sourcing matrix and a vector of mark-up rates which yields a price vector which, in turn, generates the same output vector.

Inspection of (4), (11) and (18), however, will show that no analytical solution can be obtained, since in (11) only positive values for vector m are allowed and (18) is just a set of rules to adjust mark-up rates. Nevertheless, a solution algorithm - which is included as an appendix - was constructed to solve the model.

---

[1] Asterisks are used to define equilibrium values.

[2] This is, of course, a short run equilibrium defined by the equality of supply and demand for all goods. It is possible to have at these values labor unemployment, unequal profit rates and a trade deficit. In section III.4 however, government expenditures will be endogenized such that the balance of trade is also in equilibrium.

III. Behaviour of Macroeconomic Variables

III.1 The Real Exchange Rate

We turn to consider the effects of changes in some of the exogenous variables of the model. Of particular interest is to analyze the effects of variations in government expenditure. This can be done by inserting alternative values for vector g and comparing the equilibrium solutions for p, q as well as other macroeconomic variables to be defined below. Different g vectors would reflect changes both in the size as well as in the composition of government expenditure. This last point is important, as it is clear that additional demand for non-tradeable goods has quite different effects compared to further demand for tradeable goods.

Nevertheless, to concentrate on certain variables it is useful to consider only variations in the "size" of government expenditures. This could be defined as the inner product p.g. However, this is not satisfactory as prices themselves will react to changes in g, thus requiring to divide the changes in p.g into a "real" and a "price" component. As an alternative, we prefer to multiply vector g by the scalar $\lambda \geq 0$, which can be taken as an index of the real size of government expenditures.[1] Thus, the composition of government expenditures will now be taken as fixed.

[1] Note that λ is also bounded from above since any vector λg must belong to set G.

Let f be the vector of final demand which is given by $c_\pi + c_w + d + \lambda g$. The real exchange rate, ϕ, can now be defined as:[1]

$$(21) \qquad \phi = \sum_{i \varepsilon I} p_i f_i / \sum_{j \varepsilon J} p_j f_j$$

It is interesting to consider how ϕ varies with respect to the changes in exogenous variables, in particular λ. It is clear that there is some "low" value for λ where effective demand in the economy is such that excess capacity exists in all sectors. Let us call this value $\underline{\lambda}$. At this point no competitive imports come in and all prices are determined by domestic conditions, in particular, by (4"), as S = I. This also fixes a value for ϕ at, say, $\underline{\phi}$. As λ increases output, consumption and employment will increase, but as long as excess capacity persists in all sectors ϕ will remain unaffected. For larger values of λ, nevertheless, the economy will "hit" full capacity. A critical question at this point is whether this occurs in tradeable or non-tradeable sectors, as this will determine the evolution of ϕ, as well as the level of employment. Of course, full capacity can be reached in both types of sectors simultaneously, presenting a very large number of possibilities. We can, however, consider the three following "limiting" cases.

In the first one, let $\bar{m}_i = \infty \; \forall_i \; \varepsilon \; I$ such that tariffs rule everywhere and assume full capacity is reached first in the tradeable sectors, such that as λ increases no further employment is generated in these sectors.

---

[1] Of course, only the changes in ϕ associated with variations in the parameters of the model matter. The level of ϕ is inmaterial. (Note that ϕ was defined as the ratio of tradeable to non-tradeable prices, rather than the ratio of traded to non-traded prices).

Their prices, however, will now be given by (15). If we assume that $ep_i^c(1 + t_i) > p_i^d$ this change in λ will imply that prices of tradeable goods will rise and the same will happen to ϕ.[1] For even larger values of λ, however, full capacity will also be reached in the non-tradeable sectors. At this point their prices will rise. The same will not be true, though, for prices of tradeables since these are now fixed by the world market. Rather, mark-up rates in these sectors will decline to accommodate the increase in the prices of non-tradeables. As a result, ϕ will fall and, moreover, will continue to do so for ever larger values of λ as the numerator of (21) is (almost) fixed, while the denominator is increasing.[2]

In the second case assume no quotas are used either, but full capacity is first reached in the non-tradeable sectors, such that as λ increases the real exchange rate will immediately fall.[3] For larger values of λ full capacity will be reached in the tradeable sectors and again, if $ep_i^c(1 + t_i) > p_i^d$, tradeable goods prices will increase, leading to an increase in ϕ. It is possible, of course, for prices of tradeables to exceed world prices before full capacity was reached, particularly so if nominal tariff rates

---

[1]Prices of non-tradeables will also increase if tradeables are inputs into non-tradeable goods. However, it can be shown that their price increase will be proportionately smaller.

[2]Note that vector f is used to determine the weights in ϕ. However, consumption is part of f and its composition will be changing in response to the changes in relative prices. Thus, ϕ will also be sensitive to substitution effects, and not only to the price changes. To avoid this problem we will refer to a fixed vector f with its compostion determined at an arbitrarily chosen value of λ.

[3]As before, prices of tradeables will increase if non-tradeables are inputs into tradeables, but these increases will be proportionately smaller.

are not "too high" and costs have increased due to the higher prices of non-tradeable inputs. If this is so prices of tradeables could conceivably fall when full capacity is reached, leading to a further decline in ϕ. In any case, after full capacity is reached in the tradeable goods sectors their prices will no longer change, while the opposite will be true in the non-tradeable sectors. It will thus be true that for even larger values of λ, the real exchange rate will decline further.

In the third and last case, let $\bar{m}_i < \infty \; \forall_i \in I$, such that import restrictions are used throughout. We could again distinguish two situations, depending on whether full capacity is reached first in tradeables or non-tradeables sectors. Nevertheless, it is clear that with quotas it will not be possible to establish any definite connection between λ and ϕ, as there is no mechanism that will set an upper bound on the prices of tradeable goods. In fact, once quotas are binding the real exchange rate becomes the ratio of two sets of non-tradeable prices, making it infeasible to determine its qualitative evolution as λ changes.

To sum up, an association has been made between the real exchange rate and the size of government expenditures. When the economy is operating with significant amount of slack, λ can increase without affecting ϕ. As full capacity is reached, however, prices will react. For a certain range of λ the behaviour of ϕ can be quite erratic, increasing or decreasing depending on which sectors reach full capacity first and on the relationship between the world price plus tariff to the domestic price for tradeable goods at the moment in which they are traded. Nevertheless, as long as no import restrictions are in place and once the economy is operating at full capacity everywhere, ϕ will decline as λ increases further. On the other hand, when quotas are imposed it is not possible to establish a definite relationship between λ and ϕ, even when the economy is operating at full capacity. This last point indicates that in economies with large number of quantitative restrictions the real exchange rate does not appear as a very meaningful concept, as price determination in all sectors is similar to that of non-tradeable goods.

III.2 The Price Level

Rather than taking the ratio of prices of tradeables to non-tradeables as in (21) we can simply add them to define the level of prices:

$$\rho = p.f \tag{22}$$

Once again, we are interested in analyzing the response of ρ to changes in λ. The arguments are similar to those presented before. As long as $\lambda < \underline{\lambda}$ the economy can expand while prices are given by (4"). At this price vector a certain price level will be observed, say $\rho = \underline{\rho}$. As λ increases, however, full capacity will be reached in some sectors. As long as $ep_i^c(1 + t_i) > p_i^d$ it does not matter whether it happens in the tradeable or non-tradeable sectors, since prices will increase in either case. Of course, if $ep_i^c(1 + t_i) < p_i^d$ and full capacity is reached first in the tradeable goods sectors, prices would drop and the same would be true of ρ. Nevertheless, when full capacity is reached in the non-tradeables sectors, their prices will increase. As tradeable prices are now fixed, the price level will now be a positive function of λ, as prices of non-tradeables have to rise continuously to clear prices in these sectors. Thus, even in a "fully" open economy, excess demands cannot be absorbed completely by the trade balance. Capacity constraints in non-tradeables are, in this case, the key link between changes in λ and changes in ρ. Of course, if quotas are present a limit is imposed on the amount of excess demands that can be absorbed via imports, thus strengthening the relationship between changes in λ and changes in ρ.

It should be pointed out that by taking the ratio of w to ρ an index of the real wage could be constructed, and its behaviour analyzed as a function of λ. With w fixed, w/ρ would simply be the inverse of ρ, and thus it need not be discussed further. In any event, it is clear that when e and w are fixed and the economy is operating with little slack, the expansion of government expenditures is financed by a mixture of the trade balance, a lower real wage and reduced profitability in tradeable production. How the burden of adjustment is distributed will depend, in particular, on the composition of vector g, the levels of installed capacity in each sector, the "height" of the tariff rates and the "size" of the import quotas.

III.3 Effects of a Devaluation

Let w^o, e^o and λ^o be some original values for the nominal wage and exchange rate, as well as the size of government expenditures (whose composition, as before, is taken as given). For a given level of exports, these three parameters determine the values of p^o, q^o, ϕ^o and ρ^o, along with a certain sourcing matrix, levels of capacity utilization, employment, quota rents and mark-up rates. We are interested now in analyzing the effects of changing e from e^o to $e^1 > e^o$.

A glance at (4) will reveal that prices in the economy would go up for two sets of reasons: the prices of traded goods would increase by the full amount of the devaluation. Non-traded goods prices will also increase, since the cost of traded intermediate as well as non-competitive intermediate inputs has increased. As long as there are non-traded goods in the economy, however, the overall price increase will be smaller than the devaluation since p is homogeneous of degree one in w and e and at this point no change is assumed in the nominal wage rate. The scalar β can be defined to measure the "inflationary" effect of the devaluation.

(23) $$\beta = (\rho^1 - \rho^o)/\rho^o$$

It is worth pointing out that β itself will be a function of λ^o. This is so since λ^o determines the sourcing matrix S^o and thus the set of goods that are actually traded at the moment of the devaluation. Since traded good prices are affected more by the devaluation vis-a-vis non-traded good prices it follows that, ceteris paribus, the larger the value of λ^o the larger the value of β. Thus, the inflationary impact of a devaluation will be an inverse function of the amount of slack there is in the economy at the time of devaluation.

The devaluation will also affect the output side of the economy. Firstly, note from (6) and (8) how consumption out of wage income depends on prices. Given that the devaluation will increase some prices while not reducing any, and as the nominal wage rate is kept fixed, it follows that workers consumption will decline. The reduction in workers consumption will lower output demand which, in turn, will lower total output and the level of employment. Thus, from this angle, the devaluation will be recessionary. Consumption out of profit and rent income, however, is more troublesome as mark-up rates and quota-derived rents will also be affected by the devaluation. The particular way in which this happens will depend, in turn, on whether we look at the traded or non-traded sectors of the economy.

In the non-traded sectors, as output demand out of workers consumption has declined we would expect, at given λ^o, that aggregate demand would fall and thus mark-up rates in these sectors would either drop or remain constant. But two additional effects blur the picture. First, since the relative price of traded vs. non-traded goods has increased, substitution in consumption would indicate a switch towards greater demand for non-tradeables. Secondly, since mark-up rates in the traded goods sector might increase (see below), consumption out of profit income could also increase. This, together with the substitution effect just mentioned might reduce the drop in aggregate demand for non-traded goods. Conceivably, depending on the values of vectors η^π and η^w the devaluation could actually increase effective demand in some non-traded goods and, if these sectors are operating at full capacity, the relevant mark-up rates.

In the traded goods sector the situation is equally complicated, for three sets of reasons. First, the drop in demand for traded goods coming from the reduced workers consumption along with the switch towards consumption of non-tradeables could actually eliminate competitive imports in some sectors thus changing the mechanism of price determination and, therefore, the values of the mark-up rates.[1] Second, inspection of (17) shows that even for goods that remained traded after the devaluation, the direction of change in the mark-up rate is undetermined, as it will depend on whether previous to the devaluation $\dot{\gamma}_k$ was positive or negative. Third, and last, the devaluation will affect the magnitude of quota-derived rents. If after the devaluation a quota becomes non-binding the relevant rents will disappear reducing income of the respective quota holders. For quotas that remain binding one would expect a reduction in rents since the price of imports will increase by the full amount of the devaluation while the domestic price will not given that the nominal wage rate did not change. However, as effective demand is shifting as well, mark-up rates will be affected and this could, conceivably, widen the difference between p and ep^c for some sectors.

In sum, it seems infeasible to determine a priori the direction of change in profit and rent income for the whole economy as a result of a change in the nominal exchange rate. Although wage income, and hence consumption, will decline we cannot determine whether consumption out of profit and rent income will increase or not. Under some particular set of circumstances capitalist's consumption could actually expand and, moreover, offset the decline in workers consumption demand. Thus, even though it does not appear likely, one could actually observe an expansionary effect resulting from the devaluation.

---

[1] That is to say, for some good i we would have $s_{ii}(e^o) = 0$, while $s_{ii}(e') = 1$.

III.4 The Trade and Fiscal Balance

We conclude this section by writing down expressions for the trade and fiscal balance. Total government revenue, coming from the value added tax, tariff collection and direct taxes on wages profits and rents will be:

$$(24) \qquad T = wl(I + \hat{\gamma})\hat{\alpha}q + ep^c\hat{t}m + t_w wlq + t_\pi(wl\hat{\gamma}q + [p - ep^c(I + \hat{t})]W\bar{m})$$

As government expenditure, E, is simply $\lambda.p.g$ it follows that D = T - E is the fiscal surplus. On the other hand, the balance of trade (in domestic currency) is:

$$(25) \qquad B = e[p^c.d - (p^c m + p^{nc}Vq)]$$

Since no private savings or investment has been modelled, macroeconomic equilibrium will imply that D = B.[1]

Both D and B, clearly, are functions of λ. If, as we have done so far, λ is taken as exogenous then the short run equilibrium of the economy might be associated with some non-zero value for B*, implying that capital inflows - or outflows - are taking place. While this is a plausible situation, it is clear that one can also impose the condition that the equilibrium solution be attained when the balance of trade is also in equilibrium.

---

[1]This can be proved by writing down the identity between total income [$= wl(I + \hat{\alpha})(I + \hat{\gamma})q + (p - ep^c(I + \hat{t}))W\bar{m}$] and total expenditure [$= p.(c_w + c_\pi + \lambda g) + ep^c d - e(p^c(I + \hat{t})m + p^{nc}Vq)$], rewriting wage income as $t_w wlq + (1 - t_w)wlq$ and noting that $(1 - t_w)wlq = p.c_w$, etc.

In this situation, of course, λ becomes endogenous and to the equilibrium conditions stated in section II.5 we would add the requirement that $B^*(\lambda^*) = 0$.[1] This implies that total export revenues determine the balanced budget values of λ, as well as of output and employment.[2] Whether λ is taken as endogenous or exogenous, however, will depend on the particular situation one is trying to model.

A final point worth mentioning, nevertheless, is that λ^* will depend on whether quotas are used or not. As full capacity is reached in some sectors we know that competitive imports will come in, but as long as the quotas are not binding both the tariff and the quota situations will yield the same value of imports. When quotas become binding, however, $p^c.\bar{m}$ reaches an upper bound and for higher values of λ only non-competitive intermediates imports will be required. The same is not true in the case of tariffs. With $p^c.d$ constant it follows that λ^* can take a higher value when quotas are present compared to the case when they are not.

The extra government expenditure consistent with balanced trade in the quota case, however, has a domestic cost as prices will have to increase in all sectors where quotas were imposed to limit imports. In particular,

---

[1]The solution algorithm presented in the appendix is designed to satisfy this requirement as well, if so desired.

[2]An interesting case occurs when $p^c.d$ is "very large". As B is a negative function of λ, it might be necessary to have very large government expenditures to absorb all the export revenues. But as section II.4 pointed out, λ is bounded from above such that an equilibrium solution with $B^* = 0$ might not be obtained unless, of course, one allows the consumption basket to include non-competitive consumption goods. (While this might sound remote for most LDC's, it might not be so for some oil exporting economies of the Middle East).

since the nominal wage is constant it follows that the higher value of λ^* in the quota case is obtained from a reduction of consumption out of income from wages.

IV. Conclusions

We have developed a complete model of prices and outputs for a small open economy. The model incorporates tradeable and non-tradeable goods and determines the levels of income, employment, capacity utilization and other macroeconomic aggregates. Although no numerical results were presented, it is clear that the model is fully computable. The only difficulty in this regard is the usual one of finding appropriate data.

Rather than restating here the main findings of the paper, we prefer to conclude by mentioning briefly how the model could be modified to take into account trade policies that differ from the ones discussed in the text. One alternative would be that regardless of whether tradeable goods are actually imported or not, their prices are always determined by the world market. This actually simplifies the model, as it fixes exogenously the values of the sourcing matrix, with $S_I = O_I$, regardless of the values of the m_i's.[1] The model would still be simultaneous, as prices of non-tradeable goods would remain endogenous, along with outputs and mark-up rates.

A second possibility relates to an economy that is more "closed" on the price side, due to import permits and other institutional arrangements.

---

[1] Where O_I is the zero square matrix of appropriate dimensions. Note also that in this case, from the point of view of prices, the distinction between traded and tradeable goods becomes irrelevant.

Prices for all goods in this case would be determined domestically. If imports can still clear excess demands for tradeable goods equation (10) would remain, but the sourcing matrix would be $S = I$. If competitive imports are not allowed when there are excess demands, we simply set $\bar{m} = 0$ and the economy would be closed on the output side as well.

The most important shortcoming of our model is, evidently, the fact that export quantities have been taken as exogenous. We could modify the sourcing matrix such that when $d_i > 0 \rightarrow s_{ii} = 0$ even if there still remains excess capacity in the i^{th} sector. Thus, with little effort our model could be changed to allow exports to have an effect on the structure of relative prices.[1] Nevertheless, export quantities would still be fixed. This is unsatisfactory, since domestic demand for exportables as well as the real exchange rate and price level are all varying in response to changes in w, e or λ.

[1] The respective t_i in this case should be interpreted as an export tax or subsidy.

APPENDIX

Solution Algorithms

The solution to the model consists of three nested algorithms. Algorithm Nº 1 is the "outer" layer and determines the value of λ^*. Algorithm Nº 2 solves for all variables except vector q, which is determined in algorithm Nº 3. In algorithms Nº 2 and 3 the value of λ is taken as exogenous. Thus, one can "skip" algorithm Nº 1 if one does not require the equilibrium solution to yield equilibrium in the balance of trade.

When trade is required to be balanced, however, we need two further assumptions to guarantee the existence of a solution. Write $M(\lambda) = p^c.m(\lambda) + p^{nc}.V.q(\lambda)$ for the total value of imports, and let $\bar{\lambda}$ be the largest value of λ such that $\bar{\lambda}.g \in G$.

Assumption 1: $p^c.d - M(0) > 0$.

Assumption 2: $p^c.d - M(\bar{\lambda}) < 0$.

That is, we assume export revenues are "large" enough such that they can finance some positive government expenditures but "small" enough such that they can all be absorbed without violating quota and capacity constraints.

With λ exogenous, of course, these two assumptions will not be required, although it still shall be true that $\lambda \in [0, \bar{\lambda})$.

Algorithm Nº 1: Let j be a counter of iterations, postulate a value of $\lambda^j \varepsilon [0, \bar{\lambda})$ and use algorithms Nº 2 and Nº 3 to determine vectors $q^*(\lambda^j)$ and $m^*(\lambda^j)$. Given these, calculate B^j as:

$$B^j = [\ p^c.d - (p^c.m^*(\lambda^j) + p^{nc}Vq^*(\lambda^j))]\ /\ p^c.d$$

If $|B^j| \leqslant x$ then $\lambda^j = \lambda^*$ else $\lambda^{j+1} = \lambda^j + \delta B^j$ (where $\delta \varepsilon (0,1)$ and x is a margin of error which can be made as small as desired and is introduced to guarantee finite convergence).

Algorithm Nº 2: Let i be a counter of iterations. Postulate arbitrary values of zeros and ones for matrices S^i and W^i and let $\gamma^i = \gamma^o$. Then use Rules P to obtain vector p^i:

Rules P: $$p^i = ep^c(I + \hat{t})(I - S^i)A(I - S^iA)^{-1}S^i + wl(I + \gamma^i + \hat{\alpha} + \hat{\alpha}\hat{\gamma}^i)(I - S^iA)^{-1}S^i + ep^{nc}V(I - S^iA)^{-1}S^i + ep^c(I + \hat{t})(I - S^i)$$

Given p^i, γ^i, W^i and λ^j use algorithm Nº 3 to obtain q^i. When q^i is known, define m^i and z^i as:

$$m^i = \text{pos}\ [\ (A + wC_w(p^i) + wC_\pi(p^i,\gamma^i))q^i + b^i + d + \lambda^j g - \bar{q}\ ]$$

$$z^i = \text{pos}\ [\ (A + wC_w(p^i) + wC_\pi(p^i,\gamma^i))q^i + b^i + d + \lambda^j g - (\bar{q} + \bar{m})]$$ where

$$b^i = (1 - t_\pi)[\ p^i - ep^c(I + \hat{t})\ ]\ W^i\ \bar{m}\ [\ \hat{p}^i\ ]^{-1}\eta^\pi$$

Given m^i and z^i use Rules M to construct S^{i+1}, W^{i+1} and γ^{i+1}:

Rules M for $\forall n \in N$

$$\begin{cases} \text{if } m_n^i \varepsilon (0, \bar{m}_n) \rightarrow s_{nn}^{i+1} = 0 = w_{nn}^{i+1} \text{ and } \gamma_n^{i+1} = [e p_n^c (1 + t_n) - (e \sum_{r \varepsilon R} a_{rn} p_r^c (1 + t_r) + \sum_{h \varepsilon H} a_{hn} p_h^i + e \sum_{k=1}^{s} v_{kn} p_k^{nc} + w l_n + w l_n \alpha_n)] / w l_n (1 + \alpha_n) \text{ else} \\ s_{nn}^{i+1} = 1,\ \gamma_n^{i+1} = \gamma_n^i + \delta_n \left[\dfrac{z_n^i}{(\bar{q}_n + \bar{m}_n)} \right] \text{ and } w_{nn}^{i+1} = \{ {0 \atop 1} \} \text{ as } m_n^i = \{ {0 \atop \bar{m}_n} \} \end{cases}$$

If $S^{i+1} = S^i$, $W^{i+1} = W^i$ and $|\gamma_n^{i+1} - \gamma_n^i| \leqslant x\ \forall n \in N$ then $S^i = S^*(\lambda^j)$, $W^i = W^*(\lambda^j)$, $\gamma^i = \gamma^*(\lambda^j)$, $m^i = m^*(\lambda^j)$ and $q^i = q^*(\lambda^j)$. Else return to Rules P.

Define the matrix $X^i = A + wC_w(p^i) + wC_\pi(p^i, \gamma^i)$. Note that according to algorithm Nº 2, in solving for q^i both matrix X^i and vector b^i are fixed. Vector q^i, in turn, can be obtained with the following:

<u>Algorithm Nº 3:</u> Let r be a counter of iterations, postulate a vector $k \geqslant 0$ and use rules Q to obtain q^r:

Rules Q: $q^r = X^i k^r + b^i + d + \lambda^j g - \text{pos}\ [\ X^i k^r + b^i + d + \lambda^j g - \bar{q}\ ]$

If $|q_n^r - k_n^r| \leqslant x\ \forall n \in N$ then $q^r = q^i$. Else $k^{r+1} = k^r + \delta(q^r - k^r)$ for $\delta\ \varepsilon (0, 1)$ and return to Rules Q.

R E F E R E N C E S

Levy, S.: "Un Modelo de Simulación de Precios para la Economía Mexicana." Center for Latin American Development Studies, Boston University, Discussion Paper Nº 55, November 1982

Schydlowsky, D.: "Competitive Imports in Input-Output Analysis: An Endogenous Treatment," Mimeo, Boston University, March 1978

BOSTON UNIVERSITY

CENTER FOR LATIN AMERICAN DEVELOPMENT STUDIES

DISCUSSION PAPER SERIES

* 1. Project Evaluation in Economies in General Disequilibrium: An Application of Second Best Analysis
March 1973 (46) - Daniel M. Schydlowsky

* 2. Methodology for the Empirical Estimation of Shadow Prices
April 1973 (49) - Daniel M. Schydlowsky

* 3. A Note on Distributional Considerations in Social Benefit/Cost Analysis
April 1973 (17) - Daniel M. Schydlowsky

4. Chile under Allende
May 1973 (20) - Paul N. Rosenstein-Rodan

5. International Trade Policy in the Economic Growth of Latin America
May 1973 (38) - Daniel M. Schydlowsky
(Chapter III in Trade and Investment Policies in the Americas, S.E. Guisinger, ed. Southern Methodist University Press, Dallas, 1973)

6. Influencia del Mercado Financiero sobre la Utilización de Capacidad Instalada (out of print)
May 1973 (23) - Daniel M. Schydlowsky
(Desarrollo Económico, Buenos Aires, July/September 1974)

7. Discussion on Chile: Diagnosis and Prognosis
November 1973 (7) - Paul N. Rosenstein-Rodan

8. Consistency in Measuring Capacity Utilization
March 1974 (30) - Patricio Millan

9. Multiple Shifts in the Pure Investment Decision
December 1974 (95) - Patricio Millan

10. In Support of Democracy in Latin America
April 1975 (10) - Carlos Lleras Restrepo

11. Price and Scale Obstacles to Export Expansion in LDCs
April 1975 (31) - Daniel M. Schydlowsky
(abbreviated version in Economic Growth in Developing Countries--Material and Human Resources, Proceedings of the VII Rehovot Conference, T. Ramati, ed., 1975)

* available also in Spanish ( ) number of pages

12. La Ampliación de Turnos en la Industria Chilena: La Factibilidad de una Política de Empleo Productivo
April 1975 (69) - Joseph Ramos

13. Guidelines for Policies to Increase the Use of Capital Through Multiple Shifts in Industrial Plants
June 1975 (28) - Patricio Millan

14. The Theory of Capital Utilization: Some Extensions
October 1975 (31) - Christopher Clague

15. A Statistical Shift-Choice Model of Capital Utilization
November 1975 (64) - Roberto Abusada-Salah

16. The Theory of Capital Utilization and the Putty-Rubber Production Function
May 1975 (21) - Christopher Clague

17. Criterios Analíticos para la Formulación de una Política Económica Subregional Andina
March 1976 (49) - Daniel M. Schydlowsky
(Chapter 8 in Pacto Andino, Carácter y Perspectivas, E. Tironi, ed., IEP, Lima, 1978

18. The Determinants of Capital Utilization in Labor-Managed Enterprises
March 1976 (34) - Roger Betancourt
Christopher Clague
(Quarterly Journal of Economics, August 1977)

19. Accelerated Modernization and the Population Explosion
June 1976 (38) - Emilio Casetti

20. The Theory of the Costs and Benefits from Foreign Investment and Economic Integration
December 1976 (35) - Ernesto Tironi

21. Customs Union Theory and Foreign Direct Investment
December 1976 (48) - Ernesto Tironi

22. Capital Utilization, Growth, Employment, Balance of Payments and Price Stabilization
December 1976 (72) - Daniel M. Schydlowsky
(Planning and Short-Term Macroeconomic Policy in Latin America, Jere Behrman and James Hanson, eds., Ballinger, 1979)

23. The Andean Pact: A Model of Economic Integration for Developing Countries (out of print)
December 1976 (53) - Ricardo Ffrench-Davis
(World Development, Vol. 5, 1977)

24. Towards a Change in the Economic Paradigm Through the Experience of Developing Countries
February 1977 (58) - Marcelo Diamand
(Journal of Development Economics, No. 5, 1978)

25. Real Wages and Economic Growth in Peru, 1900-1940
March 1977 (53) - Shane Hunt

26. The Subsidy and Countervailing Duties Negotiations and the Developing Countries (out of print)
March 1977 (32) - Daniel M. Schydlowsky
(Chapter 5 in Trade Policies Toward Developing Countries, The Multinational Trade Negotiations, L. Pérez, ed., AID, Washington, 1978)

27. Monetary Aspects of the Black-Market Exchange Rate Determination
July 1977 (24) - Mario I. Blejer
(Economics of Exchange Rate, Selected Studies, Jacob A. Frankel and Harry G. Johnson, Addison Wesley, eds., 1978

28. From Pre-Keynes to Post-Keynes
September 1977 (35) - Abba P. Lerner

*29. Design of Benefit/Cost Analysis of Investment Projects in Peru: A Country-Specific View
October 1977 (118) - Daniel M. Schydlowsky
(Industrialization and Development, No. 2, 1978)

30. A Monetary Approach to the Crawling-Peg System: Theory and Evidence
January 1979 (33) - Mario I. Blejer, Leonardo Leiderman
(Journal of Political Economy, Feb. 1981)

31. Strike Activity and Wage Determination under Rapid Inflation: A Quantitative Study of the Chilean Case
January 1979 (22) - Mario I. Blejer
(Industrial and Labor Relations Review, April 1981)

32. The Anatomy of an Economic Failure: Peru 1968-1978
February 1979 (110) - Daniel M. Schydlowsky, Juan J. Wicht
(Anatomía de un Fracaso Económico: Perú 1968-1978, Centro de Investigación de la Universidad del Pacífico, Lima, 1st printing, 1979 - 5th printing, 1980; The Peruvian Experiment Reconsidered, C. McClintock, and A. Lowenthal, eds., Princeton, N.J.: Princeton University Press, 1983

33. The Effects of Unanticipated Money Growth on Prices, Output and Its Composition in a Fixed-Exchange-Rate Open Economy: The Mexican Experience
July 1979 (38) - Mario I. Blejer, Roque B. Fernández
(The Canadian Journal of Economics, February 1980)

34. Relationships Between Macroeconomic Time Series in a Fixed-Exchange-Rate Economy
July 1979 (52) - Leonardo Leiderman
(European Economic Review, Spring 1980)

35. Inflation and Relative Price Variability in the Open Economy
September 1979 (41) - Mario I. Blejer, Leonardo Leiderman
(European Economic Review, Vol. 18, Nº 3, July 1982)

36. Containing the Costs of Stabilization in Semi-Industrialized LDC's: A Marshallian Approach
December 1979 (102) - Daniel M. Schydlowsky

37. Why an Initial Increase in Exports of Labor Intensive Manufactured Goods May Not Create Much Additional Employment: A Hypothesis
June 1980 (25) *(out of print)* - David Morawetz

38. Production Efficiency and the Transferability of Input-Output Coefficients
June 1980 (39) - David Wheeler

39. Benefit-Cost Analysis Methodologies: Untangling Their Equivalences and Discrepancies
June 1980 (86) - Luis A. Ramírez

*40. A Policymaker's Guide to Comparative Advantage
June 1980 (34) - Daniel M. Schydlowsky
(World Development (forthcoming 1984)

41. The Vulnerability of Small Semi-Industrialized Economies to Export Shocks: A Simulation Analysis Based on Peruvian Data
June 1980 (27) - Daniel M. Schydlowsky
Martha Rodríguez
(Trade, Stability, Technology and Equity in Latin America, M. Syrquin and S. Teitel, eds., Academic Press. N.Y., pp. 125-141, 1982)

42. The Short Run Potential for Employment Generation on Installed Capacity in Latin America
June 1980 (73) - Daniel M. Schydlowsky
(International Economic Association Volume of Proceedings, forthcoming 1983)

43. Relative Price Variability and Output-Inflation Tradeoffs in the Mexican Economy
July 1980 (20) *(out of print)* - Leonardo Leiderman
Mario I. Blejer

44. The Demand for Money Under Rational Expectations of Inflation FIML Estimates for Brazil *(out of print)*
August 1980 (24) - Leonardo Leiderman
(International Economic Review, Vol. 22, Nº 3, October 1981)

45. A Money Demand Equation for Brazil
May 1981 (23) - Eliana A. Cardoso

46. U.S. Multinationals and Latin American Manufacturing Employment Absorption
May 1981 (30) - Patricio Meller
Alejandra Mizala

47. Segmented Labour Markets Without Policy-Induced Labour Market Distortions
May 1981 (13) - Jaime Mezzera
(World Development, 1981)

48. What If There Is No "World Price"?
October 1981 (10) - Jaime Mezzera

49. Indexation, Monetary Accommodation and Inflation in Brazil
November 1981 (18) - Eliana A. Cardoso

50. Alternative Approaches to Short-Term Economic Management
December 1981 (45) - Daniel M. Schydlowsky
(Adjustment and Financing in the Developing World: The Role of the IMF, Tony Killick, ed., International Monetary Fund and Overseas Development Institute, 1982)

51. Exchange Rates in XIXth Century Brazil: An Econometric Model
July 1982 (15) - Eliana A. Cardoso

52. Free Trade and Markets--But Only as Long as Wages Are Under Control: The Case of Uruguay in the 70s
July 1982 (27) - Jamime Mezzera

53. Brazilian Trade During the Last Century
July 1982 (32) - Eliana A. Cardoso

54. On the Monetary-Macro Dynamics of Colombia and México
September 1982 (30) - Leonardo Leiderman

55. Un Modelo de Simulación de Precios para la Economía Mexicana
November 1982 (45) - Santiago Levy

56. Stabilization in Latin America: Popular Models and Unhappy Experiences
January 1983 (25) - Eliana A. Cardoso

57. "Factor Demand Functions for Constant Returns to Scale Technologies"
April 1983 (21) - Santiago Levy

58. Problemas del Arancel Externo Común: El Caso del Grupo Andino
April 1983 (38) - Juan Antonio Morales

59. Cambio Tecnológico y Uso de Energía en México
April 1983 (38) - Santiago Levy

60. Exchange Rate Dynamics and the Stock Market
May 1983 (14) - Eliana A. Cardoso

61. A Short-Run General Equilibrium Model for a Small, Open Economy
February 1984 (35) - Santiago Levy

Institutional exchange may be arranged or single copies purchased as noted below. Send check or money order made out to: CLADS, Boston University, 745 Commonwealth Avenue, Boston, MA 02215.

10 - 30 pages	$1.00	61 - 100 pages	$3.50
31 - 60 "	2.25	101 - 200 "	4.50

Other publications available:

Books: Schydlowsky, D.M., Hunt, S., and Mezzera, J. La Promoción de Exportaciones No Tradicionales en el Perú. Lima, Perú: Asociación de Exportadores del Perú. 1983. $8.00

Wicht, J., Versión resumen de La Promoción de Exportaciones No Tradicionales en el Perú. Lima, Perú: Asociación de Exportadores del Perú, 1983. $2.00