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A NOTE ON THE DIRECT AND TOTAL REQUIREMENTS FOR IMPORT SUBSTITUTION

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I

The simple criterion for import substitution states that whenever the domestic production of a good requires imported raw materials costing less than the import of the finished good, there is a foreign exchange saving. Thus production of such a good can be considered import substitution.

This criterion has been faulted on two grounds:

a) The foreign exchange required for domestic production exceeds the cost of the imported inputs since the domestic inputs also require imported inputs in their own manufacture. Thus total imported inputs are relevant and these consist of direct and indirect imported inputs;

b) the new domestic production will create new domestic income and hence new demand for imports. This increase in imports is over and above the total requirement for production.

The implication then derived is that either of these factors alone or both together may cause what appears to be an exchange saving under the simple criterion to be an exchange loss or waste instead.

In the following sections these implications will be taken up and the conditions will be derived under which the simple criterion is an unequivocal

indicator of the existence of a foreign exchange saving. Section II will analyze direct and total import requirements in production and Section III will discuss the consumption effect.

II

In this section we wish to derive the total production effect of an import substituting activity and relate it to the simple import-substitution criterion.

Let us adopt the following definitions:

A = input-output matrix pre-substitution.

M' = row of direct input requirements pre-substitution. Let this be the total foreign input required per unit, i.e., the sum of raw material, intermediate goods, interest and depreciation.

M'_s = row of direct import requirements of commodity to be import substituted (commodity s).

$M'_{ns} = M' - M's$.

F = column vector of domestic material inputs required to produce one unit of s.

$\emptyset$ = direct import requirement to produce one unit of s domestically (a scalar).

$X_{(t)}$ = column vector of gross outputs at time t.

$M_{(t)}$ = value of imports at time t. (a scalar)

We can now derive the production effect of import substitution as follows:

$$M_{(1)} = M'_{(1)} X_{(1)} \tag{1}$$

$$M_{(2)} = M'_{(2)} X_{(2)} \tag{2}$$

$$M_{(2)} - M_{(1)} = M_{(2)}' (X_{(1)} + \Delta X) - M_{(1)}' Y_{(1)} \tag{3}$$

$$\Delta M = \Delta M' X_{(1)} + M'_{(2)} \Delta X \tag{4}$$

$$\Delta M = -M'_s X_{(1)} + M'_{ns} \Delta X \tag{5}$$

Equation (5) states that the change in imports will be composed of two parts:

(i) the direct reduction in imports due to import substitution, and

(ii) the increase in imports due to a higher level of domestic activity.

To evaluate the second term, we require a relationship between ΔX and $M'_s X_{(1)}$. This we now turn to.

Assume that $M'_s X_{(1)}$ equals k units of s. Then we know that the new domestic demand generated by import-substituting $M'_s X_{(1)}$ is

$$Fk \tag{6}$$

The corresponding increase of total output is

$$\underset{rxr}{(I-A)^{-1}} \quad \underset{rx1}{F} \quad \underset{1x1}{k} \tag{7}$$

This increase in output creates additional demand for s equal to

$$\underset{1xr}{M'_s} \quad \underset{rxr}{(I - A)^{-1}} \quad \underset{rx1}{Fk} \tag{8}$$

which to be satisfied requires further gross output of

$$\underset{rxr}{(I-A)^{-1}} \quad \underset{rx1}{F} \quad \underset{1xr}{M'_s} \quad \underset{rxr}{(I-A)^{-1}} \quad \underset{rx1}{Fk} \tag{9}$$

By iteration, the total increase in output required can be found to be as follows:

$$\Delta X = (I - A)^{-1} (Fk) + (I - A)^{-1} F\left[M'_s (I - A)^{-1} F\right] k +$$

$$+ (I - A)^{-1} F\left[M'_s (I - A)^{-1} F\right]^2 k +$$

$$+ (I - A)^{-1} F\left[M'_s (I - A)^{-1} F\right]^3 k + \ldots +$$

$$+ (I - A)^{-1} F\left[M_s (I - A)^{-1} F\right]^n k \qquad (10)$$

$$\Delta X = \frac{1}{1 - M'_s (I - A)^{-1} F} (I - A)^{-1} Fk \qquad (11)$$

1xr 1xr rxr rxl

If we now call $\lambda = M'_s (I - A)^{-1} F$, then

$$\Delta X = \frac{1}{1 - \lambda} (I - A)^{-1} Fk \qquad (12)$$

Inserting (12) in (5) we have

$$\Delta M = -M'_s X_{(1)} + \frac{1}{1 - \lambda} M'_{ns} (I - A)^{-1} Fk \qquad (13)$$

Since the new domestic industry also requires direct imported inputs, we must add these to (13) and obtain

$$\Delta M = -M'_s X_{(1)} + \frac{1}{1 - \lambda} M'_{ns} (I - A)^{-1} Fk + \frac{1}{1 - \lambda} \phi k$$

$$\Delta M = -M'_s X_{(1)} + \frac{k}{1 - \lambda}\left[M'_{ns} (I - A)^{-1} F + \phi\right] \qquad (14)$$

In order to evaluate the sign of (14), we must make use of the following proposition:

Under free trade, the direct and indirect cost of production is equal to the value of the output. Thus:

$$1_s = VA' (I - A)^{-1} F + M'_{ns} (I - A)^{-1} F + M'_s (I - A)^{-1} F + \emptyset + \chi \qquad (15)$$

where 1_s stands for one unit of s, χ is the direct value added in the production of one unit of s and VA is the column vector of value added elements per unit of output of each commodity.

If production takes place under protection, (15) will no longer hold; however, if we assume that there is some value added in every domestic activity at free trade prices, then we can define

$$VA_1' (I - A)^{-1} F > 0 \qquad \chi_1 > 0 \qquad (16)$$

such that

$$1_s = VA_1' (I - A)^{-1} F + M'_{ns} (I - A)^{-1} F + M'_s (I - A)^{-1} F + \emptyset + \chi_1 \qquad (17)$$

From here we have

$$M'_{ns} (I - A)^{-1} F + \emptyset = 1 - M'_s (I - A)^{-1} F - VA_1' (I - A)^{-1} F - \chi_1 \qquad (17.1)$$

$$M'_{ns} (I - A)^{-1} F + \emptyset = 1 - \lambda - VA_1' (I - A)^{-1} F - \chi_1 \qquad (17.2)$$

Replacing in (14) and setting $M'_s X_{(1)} = k = 1$, we have

$$\Delta M = -1 + \frac{1 - \lambda - VA_1' (I - A)^{-1} F - \chi_1}{1 - \lambda} = - \frac{VA'_1 (I - A)^{-1} F + \chi_1}{1 - \lambda} \qquad (18)$$

which by (16) always has to be negative.

Equation (16), however, merely expresses the application throughout the economy of the simple exchange saving criterion. It thus follows that if import substitution is undertaken only in commodities where the cost of direct imports falls short of the import cost of the product, then the fulfillment of this criterion also implies that total (direct and indirect) imports are less than the import cost of the product.

III

In this section we wish to examine the consumption effect on imports of import-substituting projects.

A simple statement of these effects is embodied in the following hypothesis:

> Import-substituting production generates new domestic income and thus new demand for imports and for domestic goods containing imported inputs. These new inputs should be subtracted from the imports saved in production to derive the net foreign exchange saving of the import-substituting production.

Only production that is a net foreign exchange saver on this calculation is import-substituting.

Unfortunately, this hypothesis as stated eliminates all possibility of a net foreign exchange saving. We know from the foreign trade multiplier analysis that the economy tends to an equilibrium in which imports equal exports. Thus the introduction of an activity which saves foreign exchange in production generates an expenditure stream that will result (through the multiplier) in the spending on imports of all the foreign exchange saved. In consequence, foreign exchange saving would become impossible by definition.

The hypothesis can be rescued, however, by eliminating the multiplier stream and imputing to the import-substituting production only the demand for imports created by the total value-added generated in new import-substituting production itself, i.e., considering only the first round of expenditure.

A further difficulty arises with two implications of the hypothesis. The first of these is that consumption is not amenable to policy control. To each level of final demand corresponds an inexorably given level of imports. This appears a rather unrealistic assumption. The second implication is that the new consumption imports are a cost and thus should be deducted from the exchange savings. It appears more appropriate, however, to consider these new imports part of the benefits of the exchange saving made in production.

We may charitably interpret the hypothesis now in the sense that consumption imports are benefits but that demand control is imperfect, thus there may be situations in which the combined production and consumption foreign exchange requirements exceed the import cost of the substituted product. To the conditions under which this may take place, we now turn.

Using the symbols of Section II we can define the increase in total value added as:

$$\Delta WA = WA'\Delta X + \frac{1}{1-\lambda}\not{\Delta} k = \frac{k}{1-\lambda}\left[WA'\ (I - A)^{-1}\ F + \not{\Delta}\right] \qquad (19)$$

where WA is the column vector of value added under protection and $\not{\Delta}$ is the element of direct value added under protection. This WA will generate a demand for imported goods M_{ns}, for newly domesticated goods M_s and for domestic goods, i.e., new domestic value added.

In accordance with the reasoning developed above, we only consider the import requirements of the first round. These are equal to:

$$M'_{ns}\,(I - A)^{-1}\,C\,\frac{k}{1-\lambda}\left[WA'\,(I - A)^{-1}\,F + \chi\right] + \frac{1}{1-\lambda}\,M'_{ns}\,(I - A)^{-1}\,F.$$

$$\left\{M'_{s}\,(I - A)^{-1}\,C\,\frac{k}{1-\lambda}\left[WA'\,(I - A)^{-1}\,F + \chi\right]\right\} \qquad (20)$$

where C is a vector of consumption quantities per unit of final demand.

This expression is very difficult to evaluate and integrate into th savings of exchange in production equation (18), thus let us simply say that

$$\Delta M_{c} = \frac{m_{c}}{1-\lambda}\left[WA'\,(I - A)^{-1}\,F + \chi\right] \qquad (21)$$

where ΔM_{c} stands for increased imports due to consumption and m_{c} represents the marginal proposity to import:

Inserting (21) into (18) we have

$$\Delta M = -1 + \frac{1 - \lambda - \left[VA_{1}'\,(I - A)^{-1}F + \chi_{1}\right] + m_{c}\left[WA'\,(I - A)^{-1}\,F + \chi\right]}{1 - \lambda} \qquad (22)$$

Whether ΔM is positive or negative depends on two elements:

(i) the size of m_{c}, the marginal propensity to import;

(ii) the ratio

$$1 + Z = \frac{WA'\,(I - A)^{-1}\,F + \chi}{VA_{1}'\,(I - A)^{-1}\,F + \chi_{1}},$$

the average rate of protection on value added.

We can now rewrite (22) as

$$\Delta M = -\left[VA_{1}'\,(I - A)^{-1}\,F + \chi_{1}\right]\,(1 - m_{c}\left[1 + Z\right])\,\left(\frac{1}{1-\lambda}\right) \qquad (23)$$

Since the first term is always positive by (16) and the third term is always positive by (17), the sign of ΔM depends only on the second term.

We thus conclude that the consumption effect can annul exchange savings in production only if the product of the marginal propensity to import and the average effective rate of protection is greater than one.

IV

In the previous sections the following conclusions have been established:

a) "Direct" foreign exchange savings are an unequivocal indication of the existence of total savings if all activities in the economy have "direct" savings.

b) Import demand generated from the income side and imputable to the import substituting activity will not annul the savings on the production side and thus constrain execution of the project unless:

(i) there is insufficient control of demand, and

(ii) the marginal propensity to import and the average effective rate of protection in the economy are high, yielding a product greater than one.

It is therefore possible to conclude that the simple criterion for import substitution is considerably less unreliable than often stated.