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# NOTES ON THE PREMIA FOR
# FOREIGN EXCHANGE AND NONTRADABLES OUTLAYS


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In the examples just presented, all of the release of capacity to meet the project's demand was accomplished through a mechanism of price adjustment -- a rising price displaced some demand that would otherwise be present, and at the same time stimulated an increase in the quantity supplied. In short, we analyzed the adjustment process using what economists call a partial-equilibrium, supply-and-demand scenario. Such a scenario is valid: a) when the demand and supply for the good or service in question are not substantially affected by the way in which the project funds are (assumed to be) raised, and b) when the distortions that are involved in the raising of these funds either do not exist (or are unimportant), or are taken into account at some other stage of the analysis. In what follows we will deal with both these two provisos in turn, focusing initially on the project's demand for tradable goods.

When our project's total outlays are listed, they naturally fall into two great categories -- tradables and nontradables. We handle each of these broad categories separately. Figure 6 shows the supply and demand for tradables as a function of the real exchange rate E. For the moment, we assume that there are no distortions in either sector.

When we analyze the demand (here assumed to be 600) that goes to the tradables market, we do not assume that we move upward on the price axis to point Eu, where there is a gap of

600 between $T_o^s$ and $T_o^d$, the quantities of tradables demanded and supplied. That would be analogous to what we did earlier in the case of lodging rooms, but it would not be appropriate here. Instead we must take into account the fact that in raising 600 of funds we have displaced the demand for tradables by some fraction (say 2/3) of this amount, and the demand for nontradables by the rest (the other 1/3).

Our scenario, then, is that we shift the demand curve for tradables to the left by 400, and simultaneously insert a wedge of 600 between that new demand $T_1^d$ and the supply curve of tradables $T_o^s$. The 600 of tradables resources used by the project thus comes from threc different sources -- a downward shift of tradables demand of 400, a movement backward along the "old" demand for tradables of 120 and a movement forward (of 80) along the supply curve of tradables. The real exchange rate does not rise to anywhere near $E_{\underline{u}}$ under this scenario. Instead, it rises just from $E_o$ to $E_1$.

We will be able to use Figure 6 for a whole series of exercises, each involving a different set of distortions. In order to be able to do this, we have to interpret the demand and supply curves as being net of any distortions that are present in the system -- in particular, the demand for imports and the supply of exports are those which describe the market for foreign exchange Thus, the import demand curve will be defined as being net of import tariff distortions and the export supply curve as being net of any export subsidy. Likewise, the demands for tradable and nontradable goods will be defined to be net of the value added tax distortion. (When we make this assumption we are in no way constraining people's tastes or technologies. It should be clear, however, that we are not allowed, when we use this artifice, to trace the economy's reaction to the imposition of <u>new</u> tariffs or value added or other taxes or distortions). Readers can think of

Figure 6 as representing the net position of different economies with different tax setups, but which happen to have the same set of "market" demand and supply curves for foreign currency, for tradables and for nontradables.

Figure 6b tells the same story as Figure 6a but with important additional details. The connection between the two is the famous national accounting identity $(X^s\text{-}M^d) \equiv (T^s\text{-}T^d)$, where $X^s$ is the supply function of exports and $M^d$ the demand function for imports. The shift in the demand for tradables of 400 has now to be broken down into a portion (here -300) striking the demand for importables and its complement (here -100) striking the demand for exportables. These components cause corresponding shifts in the import demand curve (shifting to the left by 300) and the export supply curve (shifting to the right by 100). The above identity guarantees that the gap at $E_1$, between the shifted curves $X_1^s$ and $M_1^d$ will be 600, and that between the unshifted curves $X_0^s$ and $M_0^d$ will be 200.

Note, however, that the movement along the supply curve of exports (+100) is different from the movement along the total supply curve of tradables (+80), and similarly that the movement along the demand function for imports (-100) is different from that along the demand for total tradables (-120). This simply reflects the fact that the demand for imports is an excess-demand function $I^d - I^s$, where I stands for importables, and that the export supply is an excess-supply function $J^s - J^d$, where J stands for exportables. The demand for tradables $T^d$ is equal to $I^d + J^d$ and the supply of tradables $T^s$ equals $I^s + J^s$.

Thus, if we are asked, where did the 600 of foreign exchange come from, in order to meet our project's demand? we can actually respond with two equally correct answers. We can say that it came 520 from reduced demand for tradables and 80 from increased tradables supply. Or we can equally well respond that it came from a displacement in other imports of 400 and an increase in actual exports of 200. Both answers are correct, and if we do our calculations correctly, one will never contradict the other.

Suppose now that the only distortion present in this economy is a uniform import tariff ($\tau_m$) of 12%. If there were no shifts of the import demand and export supply curves, the new equilibrium would be at $E_u$ and would entail a displacement of other import demand of 300, and an increase in export supply of 300. Our calculation of the economic opportunity cost of foreign exchange would be

$$EOCFX = 0.5\ E_m(1.12) + 0.5\ E_m = 1.06\ E_m$$

The economic opportunity cost would be 6% higher than the market exchange rate.

But given the shifts depicted in Figure 6, we have that the reduction in other imports (400) is twice as large as the increase in export supply. Hence in the presence of these shifts we have

$$EOCFX = 0.67\ E_m(1.12) + 0.33\ E_m = 1.08\ E_m$$

The shifts depicted in Figure 6 are due to the way in which the money for the project was obtained (or "sourced"), or is deemed to have been sourced. We here, and basically throughout this manual, operate on the assumption that the standard source of funds at the margin is the capital market (see box). When funds are withdrawn from the capital market, we assume here that they came either from displaced domestic investment or from newly stimulated domestic saving (displaced consumption). Later, we will bring in a third source -- capital flowing in from abroad -- to complete the picture.

In Figure 6 we show how this displacement of spending through the "sourcing" of the project's funds is reflected: a) in the demand for tradables taken as an aggregate (Fig. 6a), and b) the demand for imports and the supply of exports considered separately (Fig. 6b).

Figure 6a is built on the assumption that the "sourcing" of 600 of project funds displaces tradables demand by 400 and nontradables demand by 200. In Figure 6b the reduction of 400 of demand for tradables is broken down into 300 affecting the demand for importables $I^d$ and 100 affecting the demand for exportables $J^d$. These moves in turn are reflected in a leftward shift of the demand for imports $(M^d = I^d - I^s)$ and in a rightward shift in the supply of exports $(X^s = J^s - J^d)$. Note that because of these relations -- imports being an excess demand relation, exports one of excess supply -- there is no reason why the slope of the $X^s$ curve should be the same as that of the $T^s$ curve, nor why there should be any similarity between the slope of $T^d$ and that of $M^d$. Thus no contradiction is involved when the residual "gap" of 200 is filled 40% by a movement forward along $T^s$ and 60% by a movement backward along $T^d_o$, while at the same time the filling of the same gap entails movements of equal amounts (100 each) forward along $X^s_o$ and backward along $M^d_o$.

**Introducing Value Added Taxation**

For the most part, the literature on cost-benefit analysis has ignored value added taxation, and even indirect taxation in general, in its methodology for calculating the economic opportunity cost of foreign exchange and/or related concepts. Perhaps this is because value added taxes did not even exist before 1953, while the methodology of cost-benefit analysis has roots going back far earlier. Also, many expositions of the value added tax treat it as a completely general tax, applying equally to all economic activities. This may have led cost-benefit analysts to assume that all sorts of resource shifts could take place as a consequence of a project without causing any net cost or benefit via the VAT, because the same rate of tax would be paid (on the marginal product of any resource) in its new location as in its old.

Our own real-world experience has led us to conclude, however, that the above assumption is grossly unrealistic. In the first place, value added taxes never strike anywhere near 100% of economic activities -- education, medical care, government services in general, the imputed rent on owner-occupied housing, plus all kinds of casual and semi-casual employment -- all typically fall outside the VAT net, even in countries which pride themselves on the wide scope of their value added taxes. In the second place, and partly for the reason just given, the effective average rate of value added taxation is typically much higher for the tradable goods sector than it is for nontradables. Our work in Argentina and Uruguay, both of which at the time had "general" value added taxes of around 22%, suggested that actual collections are compatible with "effective" VAT rates of about 20% for tradables and of about 5% for nontradables. In the exercise that follows we will use these VAT rates, together with an assumed general import tariff of 12%, to recalculate the economic opportunity cost of foreign exchange plus a new, related concept, the shadow price of nontradables outlays.

The formal exercise to be performed is already illustrated in Figure 6. We assume we are raising 600 in the domestic capital market and spending it on tradable goods. In the process we displace 400 of other (nonproject) imports, on which the tariff is 12%. The result is a distortion "cost" of 48 (= .12 × 400). Now, in addition we must take into account what is happening with respect to the value-added tax. In the tradables sector, non-project demand is displaced to the tune of 520 -- 400 from the leftward shift of demand due to the sourcing of project funds in the capital market, and 120 from the movement back along $T_o^d$, which should be interpreted as a demand substitution away from tradables and toward nontradables. The net result of all of this is a distortion cost of 104 (= .2 × 520).

Finally, we turn to the nontradables sector, whose movements are not directly depicted in Figure 6 but can be inferred from it. The initial downward shift in the demand for nontradables can be inferred to be 200, as 600 of funds was assumed to be raised in the capital market, of which 400 came from a downward shift of tradables demand. On the substitution side, we have the reflection of the downward movement of 120 in tradables demand (along the demand curve $T_o^d$). As this substitution is away from tradables it must be toward nontradables. This leaves a net reduction of demand of 80 in the nontradables market. The distortion cost here is 4 (= .05 × 80), reflecting the effective VAT rate of 5%.

To close the circle we perform a simple consistency check. We have seen that, for the tradables, other demand is down by 520, and supply is up by 80. The difference here is represented by our project's own demand of 600, here assumed to be spent on tradables. So we have supply equal to demand, in the post-project situation, in the tradables market. Similarly, we have the supply of nontradables down by 80 (reflecting the release of resources to the tradables sector), matched by a decline of 80 nontradables demand, as shown in the previous paragraph.

To get the foreign exchange premium we simply add up the three types of distortion costs (48 + 104 + 4) and express the result as a fraction of the 600 that our project is spending on tradable goods and services. Thus we have a premium of 156/600, or 26%. Hence EOCFX = 1.26 $E_m$.

The related concept that we must now explore is the Shadow Price of Nontradables. To obtain this we perform an exercise quite similar to the one we have just completed, simply altering the assumption about how the money is spent. We can use Figure 6 once again to describe this case. But now, instead of assuming that project demand of 600 enters in the tradables market to bid up the real exchange rate to $E_1$, we instead have zero project demand for tradables, but the same "sourcing" shifts as before. So equilibrium is now at $E_2$ rather than $E_1$. This entails a net reduction of 100 in total imports (and also in non-project imports because the project is here demanding only nontradables). On this the distortion cost is 12 (= 100 × .12) from the 12% import tariff. In the tradables market the gap of 400 which exists at $E_o$ between $T_o^s$ and $T_1^d$, must be closed by moving along both curves. The example of the movements along $T_o^d$ and $T^s$, between $E_1$ and $E_o$, shows that this gap of 400 will be closed by a movement of 240 along $T^d$ and of 160 along $T_1^s$. Starting from the initial point at $E_o$, the gap of 400 will be met by an increase of 240 along $T^d$, and by a decline of 160 along $T^s$. With a value added tax of 20% on tradables demand, we have a distortion cost of 32 (= 160 × 0.2). (Tradables demand has shifted to the left by 400 and moved to the right along $T^d$, by 240.)

In the nontradables market, we have a shift to the left of demand equal to 200 (from sourcing 600 in the capital market) plus the introduction of a new demand of 600. At the original real exchange rate $E_o$ this means a gap of 400 will be opened between supply and demand. The elimination of that gap entails the movement of the real exchange rate down to $E_2$. In the process "old" nontradables demand will decline by 240 (the counterpart of the movement from $E_o$ to $E_2$ along $T^d$) and nontradables supply will increase by 160 (the counterpart of the movement along $T^s$ between $E_o$ and $E_2$. So altogether we have a reduction of old nontradables demand by 440. Applying the VAT rate of 5% to this decline, we have a distortion cost of 22 (= .05 × 440).

Our total distortion cost in the case of project demand for nontradables is thus 66 (= 12 + 32 + 22). Distributing this over a project demand for nontradables of 600 we have a percentage distortion of 11%, and a shadow cost of project funds spent on nontradables equal to 1.11 times the amount actually spent.

Consistency checks can now easily be made for this case. In the tradables market, supply has dropped (from the initial point $E_0$) by 160, moving along $T^s$, and demand has dropped by a like amount (a "sourcing" shift downward by 400, plus an increase along $T_1^d$ of 240). In the nontradables market we have 160 of extra resources, plus displaced demand of 440 (200 from the downward shift of nontradables demand due to "sourcing" of the funds to be spent, plus 240 of reduced nontradables demand as people moved downward from $E_0$ to $E_2$ along $T_1^d$). Together, these are sufficient to free up the 600 of nontradables output that our project is here assumed to be demanding.

**<u>Introducing Value-Added-Tax Exclusions (Credits) For Investment Demand</u>**

In the real world, most value added taxes are of the consumption type, and are administered by the credit method. In calculating its tax liability, a firm will apply the appropriate VAT rate to its sales, then reduce the resulting liability by the tax that was already paid on its purchases. In the consumption type of tax, this credit for tax already paid applies both to current inputs and to purchases of capital assets. In this way, investment outlays are removed from the base of the tax.

At first glance it would appear easy to correct our previous figure to accommodate this additional nuance, simply by scaling down the distortion costs we originally attributed to the VAT. On second thought, the matter is not quite so simple, for investment and consumption are likely to be very differently affected by: a) the act of raising funds in the capital market on the one hand, and b) the process of demand substitution in response to real exchange rate adjustments, on the other. In particular, one should expect a large fraction (we here assume 75%) of the funds raised in the capital market to come at the expense of displaced investment, while a considerably smaller fraction, perhaps roughly reflecting the relative importance of gross investment in the GDP, would seem to be appropriate when a standard, price-induced substitution response is considered (we here use an investment fraction of one third).

Thus, rather than a single adjustment to account for the crediting of tax paid on investment outlays, we have to make two -- one adjusting downward by 75% the distortion costs linked to the VAT in the response to the raising of project funds in the capital market, and the other, adjusting downward by one third the distortion costs (or benefits) associated with the readjustment of relative prices so as to reach a new equilibrium.

Tables 1 and 2 provide a very convenient format in which to make these adjustments. At the same time they can be used to show how the opportunity cost of foreign exchange (EOCFX) and the shadow price of nontradables outlays (SPNTO) are modified as additional complications are introduced.

The figures in the table correspond exactly to those underlying Figure 6 and embodied in our earlier calculations. There are three columns under the general rubric of distortion cost. In the first of these, only a 12% import tariff is considered. The point to be noted here is that even with this superclean and simple assumption, there is a need to allow for a shadow price of nontradables outlays (see the first column under distortion costs in Table 2).

In the second column a value added tax of 20% in tradables ($v_t = .2$) and of 5% on nontradables ($v_h = .05$) is introduced. This yields precisely the numbers that emerged from the two exercises we have already conducted incorporating a value added tax.

Finally, in the third column under distortion costs we build in the exclusions (credits) for investment outlays. It is for this purpose that we have segmented the changes into two sets -- the first associated with the sourcing of project funds in the capital market, and the second linked with the substitution effects emanating from the real exchange rate adjustment corresponding to each case. Readers can verify that in the upper panels of Tables 1 and 2, the distortion costs linked to "tradables demand" and to "nontradables demand" are reduced by 75% as one moves from the second to the third "distortion cost" column. Likewise, in the lower panels of these tables, the corresponding distortion costs are reduced just by one third as one moves from the second to the third distortion cost column.

This simple process of accounting for the crediting of investment outlays under the value added tax has a major effect on the calculation of the economic opportunity cost of foreign exchange and on the shadow price of nontradables outlays. The former moves from 1.26 $E_m$ to 1.1375 $E_m$, while the SPNTO moves from 1.11 to 1.0175.

Obviously, general expressions for concepts like EOCFX and SPNTO have strong advantages over numerical exercises. Hence we here present them, together with numerical checks based on the exercises of Tables 1 and 2.

Definitions:

$s_1$ = share of project funds sourced by displacing the demand for importables,

$s_2$ = share of project funds sourced by displacing the demand for exportables,

$s_3$ = share of project funds sourced by displacing the demand for nontradables,

$f_1$ = fraction of a gap between the demand for imports and the supply of exports that is closed by a movement along the demand function for imports as the real exchange rate adjusts to bring about equilibrium,

$\delta_1$ = fraction of a gap between the demand and the supply of tradables that is closed by a movement along the demand function for tradables as the real exchange rate adjusts to bring about equilibrium,

$c_1$ = fraction of the change value added stemming from a capital market intervention, that takes the form of consumption goods and services,

$c_2$ = fraction of the change in value added stemming from an equilibrating real exchange rate adjustment, that takes the form of consumption goods and services.

Table 3 summarizes the general expressions for the premia on tradables and nontradables outlays. This table follows the same sequence as Tables 1 and 2 -- i.e., first the case of a uniform tariff ($\tau_m$) as the only distortion is treated, second, the value added taxes $v_t$ and $v_h$ on tradables and nontradables are added to $\tau_m$, but with no credit for outlays on investment goods. And finally, the credit for such outlays is added, with the realistic assumption that investment goods will represent a higher fraction of the spending that is displaced by sourcing in the capital market than they will of spending that is displaced or added via price-induced substitution effects.

**Sourcing In the Foreign Capital Market**

The analysis of this section is built on the assumption that all of the project's funds are drawn from the external capital market. We do not consider this to be a realistic assumption except in rare cases (a point to be treated below) but it is an extremely useful expository device. Our plan is to calculate in this section the premia in tradables and nontradables outlays on the assumption of sourcing in the external market, and then form a weighted average in which the premia applying to domestic sourcing and to foreign sourcing are combined, using weights designed to simulate the way natural market forces would respond to an increased demand for funds by the country in question.

Table 4 is presented in the same format as Tables 1 and 2. It differs only in that the project funds are assumed to be sourced in the external capital market instead of the domestic market.

The first point to note is that we have no table dealing with the premia that apply when funds that are raised abroad are spent on tradables. The reason is that in such a case there should be no repercussion in the domestic market. If the funds are spent on imports, that simply means an extra truck or electric generator or ton of coal arrives at the country's ports. If the funds are spent on exportables that means that at the prevailing world prices of those exports (assumed to be determined in the world market and beyond the influence of the country in question), the country's exports will be reduced in the amount of the project's demand. Hence there is no variation of any distorted local market incidental to the spending of foreign-sourced funds on tradable goods.[1]

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[1]Readers should be aware that in developing the economic opportunity cost of foreign exchange and the shadow price of nontradables outlays, we do not incorporate the distortions that apply to the products on which project funds are spent. These are taken into account as aspects of project's budgeted spending on specific items. Even with a uniform tariff, project imports often enter the country duty free (especially when imported by government agencies). More generally, we must know the specific imports of a project before we can determine what tariff rate applies. The case is similar with the value-added and other indirect taxes. We take all relevant distortions into account at some point in the analysis. The question is not whether we count them but where. The whole concept of economic opportunity costs and shadow prices presupposes that essentially the same pattern of distortions is involved each time a certain operation (e.g., spending project funds on tradables or nontradables) takes place. The use of EOCFX and SPNTO represents a shorthand way of taking into account such repetitive patterns of distortions. Hence in calculating them we want to include all relevant parts of such a

The situation is quite different when money from abroad is allocated to the purchase of nontradables. In the framework of Figure 6, this would be reflected in an excess supply of foreign exchange, together with an excess demand of 600 in the nontradables market. This situation is quite analogous to that at $E_2$ which represents an excess demand for nontradables of 400. So we expect the same kind of story as is told in Table 2, except that we do not have the distortion costs stemming from sourcing in the domestic capital market (and shown in the upper panel of Table 2). And, of course, the story of the bottom panel of Table 2 has to be augmented by 50% to reflect an excess nontradables demand of 600 rather than 400. To meet this demand in the nontradables market, 600 of foreign exchange must be converted to local currency. This entails stimulating imports by 300 (along the demand curve for imports) and displacing exports by a like amount (along the supply curve of exports). These movements are shown under import demand and export supply in Table 4. The real exchange rate moves to a level $E_3$ (not shown in Figure 6), which entails a movement of 360 forward along the demand curve for tradables and one of 240 downward along the supply curve of tradables.

We thus have 240 less of tradables being produced, hence 240 more of nontradables. And we have 360 more of tradables being demanded. This uses up 360 of the 600 of foreign exchange that came in to finance the project. The other 240 replaces the reduction in tradables supply, just mentioned.

The 600 of project demand for nontradables is met from the 240 of increase in their supply, plus the 360 induced reduction in their demand (the counterpart of the increase in

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repetitive pattern. But we do not want to take into account idiosyncratic distortions -- i.e., those that depend in the particular pattern in which project funds are spent. These come into the cost-benefit calculus at the point where these specific outlays are treated.

demand for tradables induced by the fall in the real exchange rate from $E_0$ to $E_3$).

The same gap of 600 which is closed by an increase of 300 in imports and a fall of 300 in exports is reflected in an increase of 360 in total tradables demand and a fall of 240 in total tradables supply, as shown in Table 4. These being substitution effects, they are reflected in moves of equal magnitude and opposite sign for the nontradables (also in Table 4).

The rest of Table 4 should be easy to interpret. It follows exactly the same principles as Tables 1 and 2. The only notable feature of Table 4 is that, rather than distortion costs, we obtain in each case an external benefit from the use of foreign-sourced funds in order to purchase nontradables. In the example of Table 4, we have an external benefit of 6% of the expenditure on nontradables when there is only a 12% tariff, a 15% benefit with that tariff plus a value added tax ($v_t = .20$); $v_h = .05$) with no credit in investment goods purchases, and a 12% percent benefit on the latter case, when such a credit is given. All this comes from the facts that: a) there is no external effect linked with the actual sourcing of the (foreign) funds in this case; b) that there is an unequivocal benefit (tariff externality) from the increase in imports that this case entails; and c) that the demand substitution involves more spending on tradables with a higher VAT($v_t = .20$) and less (substitution-induced) spending on nontradables with a lower VAT($v_h =$ .05).

Table 5 simply codifies the results of Table 4, presenting general expressions for the premia, together with numerical checks to link the results to Table 4.

**Sourcing From Both Domestic and Foreign Capital Markets**

In Table 6 we combine Tables 3 and 5, calculating weighted average premia for tradables and nontradables outlays. We use weights $g_d = .7$ and $g_f = .3$, indicating a 70/30 split as between domestic and foreign sourcing of funds. These weights may appear arbitrary, but in principle one should think of them as market-determined. A simple supply and demand exercise, with many suppliers meeting a total demand, leads to the prediction that an increment of demand may in the first instance fall on one supplier or another, but market equilibrium requires that in the end, all suppliers will move upward along their supply curves from the old to the new equilibrium price. The distribution of the increased quantity among the different suppliers thus depends on the slopes of the supply curves from different sources.

We follow the same logic in thinking of the distribution of sourcing between the domestic and the foreign capital markets. We profoundly reject the idea that developing countries face an infinitely elastic supply curve of funds at the world interest rate (or at the world interest rate plus a specified country risk premium). The implications of such a setup are far too strong for us (and for most economists familiar with developing countries) to accept. For example: a) even high government investments financed in the first instance by borrowing in the domestic capital market will in the end be effectively financed from abroad; this means no crowding out of domestic investment via the local capital market; b) any new increment to public or private saving will end up abroad; c) any new increment to public or private investment will end up being financed from abroad; d) the economic opportunity cost of public funds is simply the world interest rate.

Rather than try to live with the above unrealistic implications of a flat supply curve of funds facing the country, we postulate an upward rising curve. This means that funds drawn from the capital market are effectively sourced from:

i) displace other investments

ii) newly stimulated domestic savings (displaced consumption), and

iii) newly stimulated "foreign savings", i.e., extra foreign funds obtained by moving along the supply curve of such funds, facing the country.

Items i) and ii) were incorporated in the analysis of Tables 1-3. The effects of item iii) are traced in Tables 4 and 5. Table 6 joins the two types of sourcing on the assumptions indicated.[2] It is interesting to note that within each panel of Table 6, the difference between the premia on tradables and nontradables remains the same as one moves from one sourcing column to another. This makes perfect sense. In the middle column we have the polar cases, of 600 being spent on tradables or on nontradables, with no distortion costs associated with sourcing. The benefits appearing there (as negative premia for nontradables outlays) represent the net externality linked to closing an excess demand gap of 600 in the nontradables market. This same gap is split, in the cases of Tables 1 and 2 between an excess supply of 200 in the first case and an excess demand of 400 in the second.

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[2]An added implication of an upward rising foreign supply curve of funds is that the marginal cost of funds lies above the average cost, i.e., above the interest rate actually paid. It is this marginal cost which is averaged in, along with the estimated marginal productivity of displaced investment and the marginal rate of time preference applicable to newly stimulated saving, in order to obtain the economic opportunity cost of capital -- i.e., the appropriate rate of discount for public-sector projects.

# TABLE 1

## CALCULATION OF ECONOMIC OPPORTUNITY COST OF FOREIGN EXCHANGE

600 of Project Funds Sourced in Capital Market And Spent on Tradables

| | | Applicable Distortion | $\tau_m$ Alone | $\tau_m$ $v_t$ $v_h$ | $\tau_m$ $v_t$ $v_h$ $e_{is}$ $e_{ia}$ |
|---|---|---|---|---|---|
| <u>Change Due To Capital Capital Market Sourcing</u> | | (exclusion for investment $e_{is} = 0.75$) | | | |
| Tradables Demand | -400 | $v_t = .20$ | n.a. | -80 | -20 |
| Import Demand | -300 | $\tau_m = .12$ | -36 | -36 | -36 |
| Export Supply | +100 | - | n.a. | n.a. | n.a. |
| Nontradables Demand | -200 | $v_h = .05$ | n.a. | -10 | -2.5 |
| <u>Change Due To Real Exchange Rate Adjustment</u> | | (exclusion for investment $e_{ia} = 0.33$) | | | |
| Tradables Demand | -120 | $v_t = .20$ | n.a. | -24 | -16 |
| Tradables Supply | +80 | - | n.a. | n.a. | |
| Import Demand | -100 | $\tau_m = .12$ | -12 | -12 | -12 |
| Export Supply | +100 | - | n.a. | n.a. | |
| Nontradables Demand | +120 | $v_h = .05$ | n.a. | +6 | +4 |
| Nontradables Supply | -80 | - | n.a. | n.a. | |
| <u>Total Distortion Costs (-), Benefit (+)</u> | | | -48 | -156 | -8 |
| <u>Distortion Cost/ Project Expend. = Premium on Tradables Outlays</u> | | | .08 | .26 | .1375 |
| <u>EOCFX/ Market Exchange Rate</u> | | | 1.08 | 1.26 | 1.1375 |

# TABLE 2

## CALCULATION OF SHADOW PRICE OF NONTRADABLES OUTLAYS

600 of Project Funds Sourced in Capital Market And Spent on Nontradables

| | | Applicable Distortion | $\tau_m$ Alone | $\tau_m$ $v_t$ $v_h$ | $\tau_m$ $v_t$ $v_h$ $e_{is}$ $e_{ia}$ |
|---|---|---|---|---|---|
| Change Due To Capital Capital Market Sourcing | | (exclusion for investment $e_{is} = 0.75$) | | | |
| Tradables Demand | -400 | $v_t = .2$ | n.a. | -80 | -20 |
| Import Demand | -300 | $\tau_m = .12$ | -36 | -36 | -36 |
| Export Supply | +100 | - | n.a. | n.a. | n.a. |
| Nontradables Demand | -200 | $v_h = .05$ | n.a. | -10 | -2.5 |
| Change Due To Real Exchange Rate Adjustment | | (exclusion for investment $e_{ia} = 0.33$) | | | |
| Tradables Demand | +240 | $v_t = .2$ | n.a. | +48 | +32 |
| Tradables Supply | -160 | - | n.a. | n.a. | n.a. |
| Import Demand | +200 | $\tau_m = .12$ | +24 | +24 | +24 |
| Export Supply | -200 | - | n.a. | n.a. | n.a. |
| Nontradables Demand | -240 | $v_h = .05$ | n.a. | -12 | -8 |
| Nontradables Supply | +160 | - | n.a. | n.a. | n.a. |
| Total Distortion Costs (-), Benefit (+) | | | -12 | -66 | -10.5 |
| Distortion Cost/Project Expend. = Premium in Nontradables Outlays | | | .02 | .11 | .0175 |
| Shadow Price of Nontradables Outlays | | | 1.02 | 1.11 | 1.0175 |

**TABLE 3**

GENERAL EXPRESSIONS FOR PREMIA ON TRADABLES AND NONTRADABLES

(Project Funds Sourced 100% in Domestic Capital Market)

With Uniform Import Tariff ($\tau_m$) Alone:

Premium on Tradables $= (s_1 + f_1 s_3)\tau_m$
Numerical Check: $.08 = [0.5 + 0.5(.33)](0.12)$

Premium on Nontradables $= [s_1 - f_1(s_1+s_2)]\tau_m$
Numerical Check: $.02 = [0.5 - 0.5(.67)](0.12)$

With Uniform Import Tariff ($\tau_m$) Plus Value Added Taxes ($v_t$ and $v_h$)
(No Credit For Investment Goods)

Premium on Tradables $= (s_1 + f_1 s_3)\tau_m + (s_1+s_2)v_t + s_3 v_h + \delta_1 s_3(v_t-v_h)$
Numerical Check: $= .08 + (.67)(0.2) + .33(0.05) + 0.6(.33)(0.15)$
$.26 = .08 + .1333 + .0167 + .03$

Premium on Nontradables $= [s_1 - f_1(s_1+s_2)\tau_m] + (s_1+s_2)v_t + s_3 v_h - \delta_1(s_1+s_2)(v_t-v_h)$
Numerical Check $= .02 + .1333 + .0167 - (.6)(.67)(0.15)$
$.11 = .02 + .133 + .0167 - .06$

With Uniform Import Tariff ($\tau_m$) Plus Value Added Taxes ($v_t$ and $v_h$)
With Credit for Investment Goods

Premium on Tradables: $= [(s_1+f_1 s_3)\tau_m] + c_1[(s_1+s_2)v_t+s_3 v_h] + c_2[\delta_1 s_3(v_t-v_h)]$
Numerical Check: $= .08 + (.25)[.1333+.0167)] + (.67)(.03)$
$.1375 = .08 + .0375 + .02$

Premium on Nontradables: $= [s_1 f_1(s_1+s_2)]\tau_m + c_1[(s_1+s_2)v_t+s_3 v_h]$
$- c_2[\delta_1(s_1+s_2)(v_t-v_h)]$
Numerical Check: $= .02 + (.25)(.1333+.0167) - .67[.6(.67)(.15)]$
$.0175 = .02 + .0375 - .04$

Note: $c_s = (1-e_{is})$
$c_a = (1-e_{ia})$

**TABLE 4**

CALCULATION OF SHADOW PRICE OF NONTRADABLES OUTLAYS

600 of Project Funds Sourced Abroad And Spent on Tradables

| | | Applicable Distortion | $\tau_m$ Alone | $\tau_m$ $v_t$ $v_h$ | $\tau_m$ $v_t$ $v_h$ $e_{is}$ $e_{ia}$ |
|---|---|---|---|---|---|
| Change Due To Capital Capital Market Sourcing | | (exclusion for investment $e_{is} = 0.75$) | n.a. | n.a. | n.a. |
| Change Due To Real Exchange Rate Adjustment | | (exclusion for investment $e_{ia} = 0.33$) | | | |
| Tradables Demand | +360 | $v_t = .2$ | n.a. | +72 | +48 |
| Tradables Supply | -240 | - | n.a. | n.a. | |
| Import Demand | +300 | $\tau_m = .12$ | +36 | +36 | +36 |
| Export Supply | +100 | - | n.a. | n.a. | |
| Nontradables Demand | -360 | $v_h = .05$ | n.a. | -18 | -12 |
| Nontradables Supply | +240 | - | n.a. | n.a. | |
| Total Distortion Costs (-), Benefit (+) | | | +36 | +90 | +72 |
| Distortion Cost/ Project Expend. = Premium on Nontradables Outlays | | | -.06 | -.15 | -.12 |
| Shadow Price of Nontradable Outlays | | | 0.94 | 0.85 | 0.88 |

**TABLE 5**

GENERAL EXPRESSIONS FOR PREMIA ON

TRADABLES AND NONTRADABLES

(Project Funds Sourced 100% Abroad)

With Uniform Import Tariff ($\tau_m$) Alone

| | |
|---|---|
| Premium on Tradables | = zero |
| Premium on Nontradables | $= -f_1\tau_m$ |
| Numerical check | -.06 = -(.5)(.12) |

With Uniform Import Tariff ( ($\tau_m$) Plus Value Added Taxes ($v_t$ and $v_h$) (No Credit For Investment)

| | |
|---|---|
| Premium on Tradables | = zero |
| Premium on Nontradables | $= -f_1\tau_m - \delta_1(v_t-v_h)$ |
| Numerical Check | -.15 = -(.5)(.12) - (.6)(.15) |

With Uniform Import Tariff ($\tau_m$) Plus Value-Added Taxes ($v_t$ and $v_h$) With Credit For Investment

| | |
|---|---|
| Premium on Tradables | = zero |
| Premium on Nontradables | $= -f_1\tau_m - c_a\delta_1(v_t-v_h)$ |
| Numerical Check | -.12 = -(.5)(.12) - (.67)(.6)(.15) |

Note: $c_s = (1-e_{is})$
$c_a = (1-e_{ia})$

# TABLE 6

## WEIGHTED AVERAGE PREMIA WITH "STANDARD" CAPITAL MARKET SOURCING

$g_d$ = fraction of project funds effectively sourced in the domestic capital market

$g_f$ = $(1-g_d)$ = fraction of project funds effectively sourced in the foreign capital market

## PREMIA ON TRADABLES AND NONTRADABALES

Project Funds Sourced From:

| Applicable Distortions | Domestic Capital Market | Foreign Capital Market | Both Markets $g_d = .7$ $g_f = .3$ |
|---|---|---|---|
| $\tau_m = .12$ | | | |
| Project Funds Spent | | | |
| On Tradables | .08 | -0- | .056 |
| Nontradables | .02 | -.06 | -.004 |
| $\tau_m = .12, v_t = .20, v_h = .05$ | | | |
| Project Funds Spent | | | |
| On Tradables | .26 | -0- | .182 |
| Nontradables | .11 | -.15 | .032 |
| $\tau_m = .12, v_t = .20, v_h = .05, e_{ih} = .75, e_{ia} = .33$ | | | |
| Project Funds Spent | | | |
| On Tradables | .1375 | -0- | .09625 |
| Nontradables | .0175 | -.12 | -.02375 |

**Figure 6a**

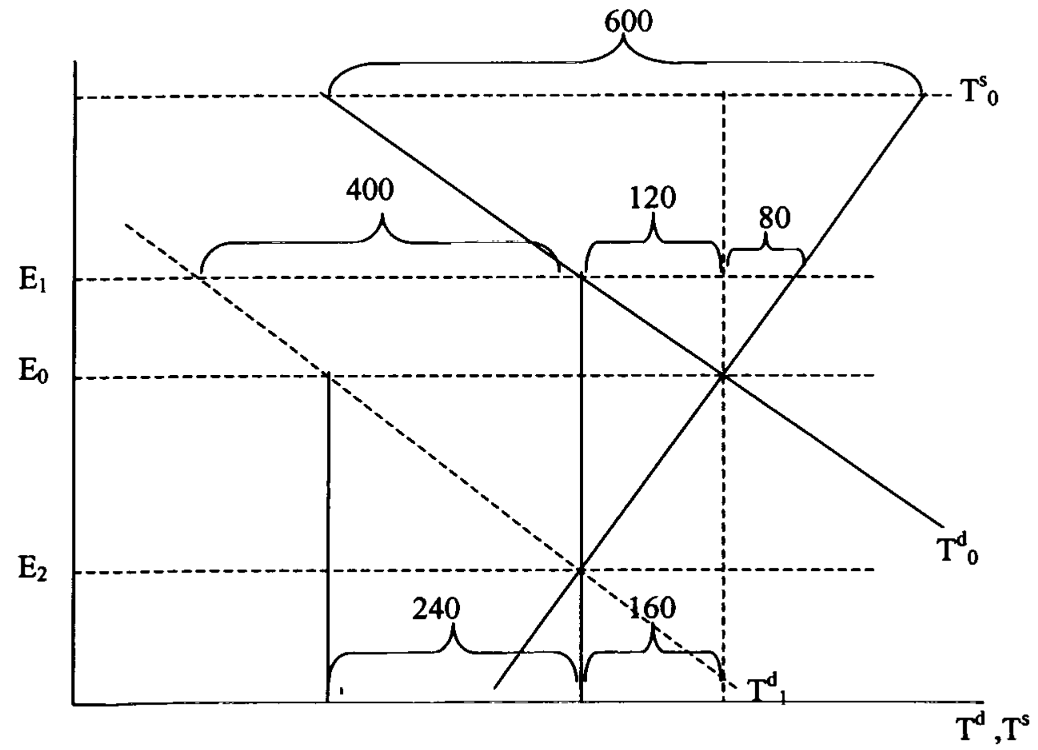


**Figure 6b**