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Further Issues in the Proper Choice of Techniques for Domestic Resource Cost Ranking

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The recent articles in this Journal (Balassa and Schydlowsky [1968], [1972], Krueger [1972] and Bruno [1972]) on the controversy between proponents of the Domestic Resource Cost (DRC) and the Effective Rate of Protection (ERP) criteria for industry selection seem finally to be stumbling toward a common conclusion, although the terminology remains somewhat confusing. Yet there are other issues in the actual use of either measure which need to be resolved before these techniques can take their proper place in the developmental tool kit.

One man's view of the possible conclusion of the current controversy is given in Section I, while a few of the methodological issues which now present themselves are discussed in Section II.

I.

The literature to date can be briefly summarized. Balassa and Schydlowsky [1968] began by arguing that import-substitution and export industries should be chosen on the basis of the ERP rather than the DRC criterion. Their argument was based upon the common practice of including nontraded goods in domestic value added when evaluating DRC, and of excluding nontraded goods from domestic value added when evaluating ERP, and their argument ran as follows:

> ...the ranking of domestic industries according to the cost of foreign exchange [DRC] reflects the implicit assumptions that 1) all existing industries will be maintained, and 2) the expansion of the output of any one commodity will require increased output of all domestic industries providing direct and indirect inputs into it.

> ...If our aim is that ultimately all industries should become competive on the world market, ...the desirability of individual industries should be evaluated by the use of effective protection measure rather than by the cost of foreign exchange, since temporary inefficiencies (high cost) in input-producing industries should not influence the choice among final products.[1]

Krueger [1972] attacks this position by arguing that although ERP is appropriate for measuring "resource pulls," it is not appropriate for measuring resource costs. She then goes on to show that if 1) not all goods are traded, 2) there are transportation costs, 3) factors of production are not perfectly mobile internally nor perfectly immobile internationally or 4) domestic markets are not perfectly competitive, DRC as commonly measured and ERP as commonly measured will not give the same results. Bruno [1972] concurs with Krueger's position, pointing also to the different emphases of DRC and ERP, DRC on resource costs and ERP on resource pulls, the latter being influenced by resource incomes.

It seems clear that to this point the participants in this dispute are arguing about two different things. To Balassa and Schydlowsky the normal ERP measure is useful for measuring resource costs as well as pulls, while to Krueger and Bruno the ERP concept has nothing to do with resource costs, but rather is concerned only with resource incomes. To Krueger and Bruno, therefore, even if the normal ERP measure did allow for the above four market imperfections, DRC and ERP would still differ since the way in which one allows for the imperfections depends upon whether one is measuring factor costs or factor incomes. All three had begun by defining ERP and DRC as mathematic expressions rather than concepts, and had then attached different concepts to the same expressions. The real issue is not whether ERP or DRC concept is the better concept for ranking industries by comparative advantage, but whether the traditional ERP measure or the traditional DRC measure is the better and

more realistic expression for calculating these rankings.

In their latest contribution, Balassa and Schydlowsky [1972] begin to clarify the issues by distinguishing between the direct DRC measure, which measures costs only at the last stage of production, and the total DRC measure, which measures resource costs at all stages of production. Unfortunately, they continue to equate the direct DRC measure with ERP, once again confusing expressions and concepts. In order to take account of the objections raised by Krueger and Bruno to the ERP measure, they argue that all of the points which Krueger held ERP incapable of handling-- nontraded goods, transportation costs, imperfect factor markets and imperfect domestic markets-- could indeed be incorporated in a "social effective rate" of protection (SERP). And they make it clear that the goal of SERP is to measure resource costs rather than incomes.

Yet where does that leave the controversy? Everyone is looking at resource costs, albeit under different names, and, indeed, Balassa and Schydlowsky under a name which refers neither to costs, nor has anything to do with effective protection as originally defined. Is there still any dispute over anything other than a name? In effect there is; and it is the same dispute as it was when it started. Balassa and Schydlowsky still argue for a ranking measure which looks at resource costs primarily at the last stage of production,[2] a measure called the SERP, and Krueger and Bruno still argue for a measure which looks at resource costs at all stages of production, a measure still called DRC. The methodological issue-- the proper treatment of nontraded goods-- remains the same even though the conceptual issue has disappeared.

In order to continue without further confusion in terminology this communication will employ the term "domestic cost of foreign exchange" (DCFX)

for the measurement of the resource cost per unit of foreign exchange earnings saved or earned by a given industry, and will treat DRC and SRRP as alternate methods for DCFX measurement.

Terminology aside, what is the proper method of measuring DCFX? Balassa and Schydlowsky [1972] argue, quite rightly it seems, that it depends upon the economic content. Where first-best market policies exist and there are nontraded goods, the answer is clear— both DRC and SRRP yield the same results— although in perfect markets, who needs economists? Where first-best market policies do not exist, or where there are nontraded goods, one must begin to apply shadow prices and other analytical paraphernalia. These issues are discussed at some length in Balassa and Schydlowsky [1972], but the authors seem more interested in defending their terminology than in giving concrete guidance. This note, too, promises no final answers, but it seems that some points which have an immense bearing on the choice of an appropriate measure have not yet been raised.

II

There are certain methodological issues in the use of DCFX which can, it is argued here, limit any realistic measurment of DCFX to the method advocated by Krueger and Bruno, that is, to the DRC measure. These issues include the partial equilibrium nature of the DCFX concept/measure, and the constancy of the parameters it employs.[3]

The DCFX measure is, as are most investment criteria, only a partial equilibrium measure. It is therefore appropriate only for measuring "partial", i.e., marginal, projects. A "project" such as that envisaged by Balassa and Schydlowsky [1968] which not only establishes appropriate export industries but also rationalizes their input structure is normally not such a change as can

be handled by a partial measure in a typically small LDC.[4] Balassa and Schydlowsky imply that their objective is to determine which projects would be most efficient if the rest of the economy were efficient as well. If the rest of the economy were indeed efficient, decisions concerning the one remaining project would be made correctly without the help of DCPX, or economists. If, on the other hand, several projects were required to "complete" the economy, the decisions made with respect to any one project would affect the decisions made with respect to the others; the projects interact yet the DCPX measure has no means of evaluating that interaction. (The interaction of projects is discussed further below.) The DCPX measure is valid only when all interactions can be ignored, and, in small economies, this means generally that the impact of each project under consideration must be marginal. Movements such as those implied by the assumptions underlying the use of ERP are typically non-marginal.

The use of a marginal DCPX measure is also dictated by empirical considerations. A major front of the attack on the normal measurement of effective protection by the ERP measure is the assumption of zero substitution elasticities. Travis [1968] argues that the assumption precludes any realistic application of the ERP expression. However, the whole substitution issue really has a very different, and smaller, impact on the DCPX concept than it does on the effective protection concept. Effective protection measures the effect of a given tariff structure on an economy; the invariability of the production process under a change in that structure (e.g., from free trade to the protected case) and under the resulting change in relative prices of inputs, is therefore crucial to the analysis. Relative price shifts are an integral part of the effective protection concept, and they are usually large. DCPX, on the other hand, is defined relative to a change in exports or import substitution (i.e. production)

rather than relative to a change in relative prices. Relative prices will not change under the application of the DRC measure as long as the elasticities of supply of inputs and factors, domestic and imported, are infinite. The issue with respect to DCFX is then not primarily substitution elasticities, but supply elasticities; only if supply elasticities are low will substitution elasticities become relevant.

Yet note the restrictions this puts upon the use of DCFX. Changes in output, and thus in the use of inputs, must be small enough that input and factor supply elasticities can be disregarded [illegible] if substitution elasticities are to be disregarded as well. More importantly, this precludes any wholesale changes in the structure and source of inputs-- as envisaged by the use of SERP and as ruled out by the use of DRC-- since the resultant changes in relative input prices will again cause substitution elasticities to raise their ugly head. It is true that DCFX measures can be altered to explicitly include supply and substitution elasticities, but the computations are difficult and the elasticities themselves are seldom available.

And, it is not enough to say that if the true input and cost parameters were somehow known for the new (but as of yet unattained) position, the elasticities could be disregarded. For how are these parameters to be evaluated? As Balassa and Schydlowsky point out, "to construct such values it would seem necessary to solve a general equilibrium system under present policies and simulate changes in policies in order to derive the time path of relevant variables. Needless to say, such an effort would involve substantial data and estimation difficulties and it could be attempted in a few developing countries."[6] If one had such a general equilibrium model, the solution of it would yield the proper level of all projects and DCFX measure would be redundant.

At the very least, one must know in evaluating DCFX which inputs are traded and which are not. The DRC measure normally makes the extreme assumptions that the structure of input sources will not change, while the SERP measure in theory makes the opposite assumption that all inputs will be traded. The former is at least observable, the latter is, as mentioned above, neither realistic nor capable of being handled by a partial equilibrium measure when not all goods are presently traded. And there is a further problem with the SERP assumption: treating all goods as traded is not necessarily the most efficient solution when there are transport costs. Some goods are more efficiently produced at home, even though they may not be traded. Balassa and Schydlowsky attempt to bypass this problem by allowing a "semi-output-input" approach to SERP which will allow some inputs to be considered as domestic goods; but which ones should they be? Certainly Balassa and Schydlowsky [1968] could not mean that a good must have an infinite C.I.F. price to be considered as nontraded; there are virtually no such goods.[7] If, on the other hand, they wish to treat as nontraded those goods which would not be traded under free trade, not only the realism of that assumption, but one's ability to identify those goods without a general equilibrium system must be seriously questioned. Finally, if Balassa and Schydlowsky wish to include as nontraded goods only presently efficient domestic inputs (as opposed to the domestic inputs with "temporary inefficiencies" which they believe "...should not influence the choice among final products") how, again, are they to identify those goods without analyzing each input and thereby facing the problems of interdependence discussed above?

Although the input assumptions associated with DRC are unimaginative, and perhaps even less useful than some of the possibilities under SERP, they do far less violence to the partial equilibrium nature of the DCFX measure.

To simply assume any other input structure than the present one (or, as suggested by Bruno [1972] and Staelin [1971], one only marginally different from the present structure) would be just as arbitrary, considerably less realistic and would involve considerably more problems with supply and substitution elasticities.

What then is an appropriate use for the DCFX measure? It seems most appropriate for measuring the domestic resource cost of a marginal unit of foreign exchange earned through the additional export or import substitution of a marginal unit of a given good. It is, therefore, a positive, descriptive measure related to a specific state of the economy, i.e. that state of the economy from which the parameters of the measure were taken. It should be emphasized that the appropriateness of this rather limited version of the DCFX concept, the DRC version, is dictated by empirical and methodological issues; the DCFX concept could, in theory, be altered to allow a much broader interpretation. Two questions remain: how marginal is marginal, and what is the usefulness of this rather limited version of DCFX?

The first question can be answered only in context. The importance of various supply and substitution elasticities[8] and of general equilibrium considerations is an empirical question; but, their importance is likely much greater than the users of DCFX measures have as yet recognized. Certainly the burden of proof lies with those who wish to ignore them.

Yet a marginal measure is not one devoid of interest and usefulness, although it is far from glamorous. Marginal DCFX rankings tell the policy maker where to direct his attention. (They do not tell him how <u>far</u> to go with changes in industrial structure unless all supply elasticities are infinite, or lacking that, supply elasticities are known, substitution elasticities are zero, and all the points at which nontraded goods become traded are known.) In general, the policy maker will have to approach optimally through a series of successive approximations: ranking industries, making small but significant

changes in industrial composition and levels (small, that is, relative to perceived elasticities and the range between ranking) ranking industries again using new data, and so on. Such a policy of small discrete movements is certainly not glamorous, but it may, given administrative and economic constraints, be all that many LDCs would be capable of doing anyway, even if the final optimal position were known. Furthermore, particularly in LDCs where technology and tastes are constantly changing, the single-minded pursuit of a far-off goal may only result in the achievement of a goal that has ceased to be desirable. It may be preferable to stop at certain intervals to recheck one's bearings.

The DCFX analysis is unlikely to be of great use in determining optimal production policy unless substitution elasticities are indeed zero. In particular, using the DCFX criteria to suggest wholesale changes in the import policy for exports is likely to be very risky. However, where substitution can be neglected, some interesting analysis is possible. Figure 2 shows the combination of domestic and imported inputs (including factors) which can be combined to produce one dollar's worth of export of a particular good. No substitution between inputs is allowed but inputs may be either imported or produced domestically. If all inputs are domestically supplied, production is at point A. Individual inputs, i,j,k, etc., are then imported rather than produced domestically, beginning with that input which if imported would save the most domestic resources, V_H (measured here in rupees), per unit of C.I.F. foreign exchange cost, M (i.e., that input with the highest DCFX). The curve AB can be traced out by importing successive inputs until point B is reached at which no further import is possible if the good is still to be produced domestically. At point B there may be negative value added, that is, the C.I.F. cost of inputs may exceed one dollar.

Figure 2 generalizes AB to a smooth curve. The marginal rate of substitution between domestic and imported resources, MRS_{VM}, is given by the slope of the curve at any point. For profit maximization, the optimal production mix is at the point where MRS_{VM} equals the official exchange rate plus tariffs. The optimal production point for society is at the point at which MRS_{VM} equals the shadow exchange rate. If the slopes of CN and EF are the shadow and official exchange rates respectively, G and H are respectively the social and private profit maximization points. DCFX is given by $V_H/(1-M)$, that is, the additive inverse of the slope of the line from unity on the foreign exchange axis, M, to the point on the curve. Minimum DCFX occurs at point K, but this would correspond to the socially optimal point only by coincidence. Although minimum DCFX is the proper criterion for choosing exports, it is not the proper criterion for choosing the optimal input source mix. In addition, it is obvious that the point of minimum import content, point A, is not usually the optimal input source mix, in spite of the belief of many LDC policy makers.

A society would like to minimize the DCFX <u>to the economy</u>. It does this by choosing its most efficient exports. But once the shadow rate of exchange of the marginal export is thus determined, it becomes the relevant rate for determining <u>all</u> input source alternatives. For the marginal export, its minimum DCFX and the shadow rate of exchange coincide.

All this has import implications for practical application of DCFX industry rankings. If policy succeeds in reducing the social cost of foreign exchange, the optimal input source mix between imported and domestic sources may also change. This may in turn change the DCFX of each individual industry and its DCFX ranking, leading finally to a further change in optimal industrial policies. This is possible <u>even</u> if substitution elasticities are zero. Therefore, a series of successive approximations may be called for

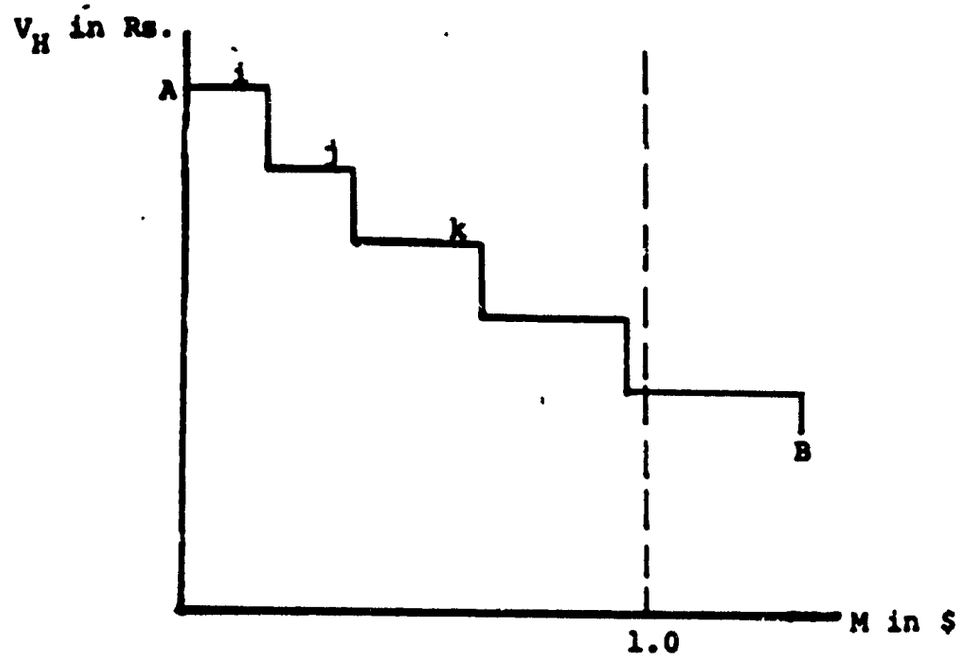

Fig. 1 --Discrete Substitution of Imports for Domestic Value Added.

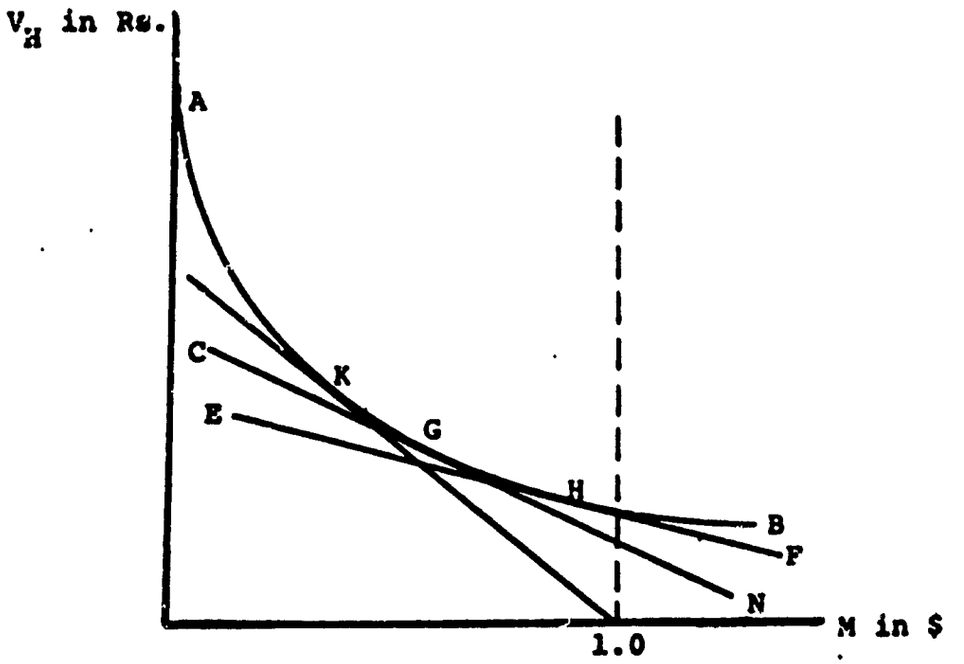

Fig. 2 --Continuous Substitution of Imports for Domestic Value Added.

in order to reach the optimal position. This is the problem of project interdependence mentioned above.

The emphasis of this communication has been mainly negative with respect to what DCFX can be realistically expected to do. However, the potential contribution of this measure, although constrained, is still great. Used within the appropriate limits, it gives guidance in an area of LDC policy-making which is vital to development and which has heretofore had few useful guidelines. If a tool cannot accomplish all that is wished, it may still be indispensable.

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Footnotes

[1] Balassa and Schydlowsky [1968], pp. 352-3.

[2] It is still hard to reconcile the goal of Balassa and Schydlowsky—the examination of resource costs at the last stage of production—with their methods of doing so. In an attempt to allow the ERP measure to handle nontraded goods, they state that a semi-input-output method be used to calculate domestic value added, a method which allows the cost of some nontraded goods (but which ones?) to be included in domestic value added. But the result does not then measure resource costs only at the last stage of production, but also resource costs at some other specially selected stages. This apparent inconsistancy, which does not seem to bother Balassa and Schydlowsky, is discusses further below.

[3] Many of these same issues are treated by Staelin [1971] and are touched upon by Bruno [1972].

[4] This is not necessarily an accurate observation if only one industry is being considered and it is allowed to rationalize its input structure through a free import policy. Yet in a second-best environment it can not be shown that a free import policy is optimal for the most efficient production of the final good, indeed, with an overvalued exchange rate it is quite likely that a free import policy is not optimal. True "rationalization of inputs can not be accomplished by this "partial" policy. In addition, the practical political obstacles to a free import policy ever being allowed, even for one good and even if it were optimal, are great. This latter point is touched upon in Bruno[[1972] and Staelin [1971].

[5] Again, this point is touched upon by Bruno[[1972] and Staelin [1971].

[6] Balassa and Schydlowsky [1972], p.

[7] Electricity is, for instance, normally considered a nontraded good although its C.I.F. price is often far from infinite.

[8] Notice that export-demand and import-supply elasticities have been disregarded as they are more easily entered into DCFX analysis, and are presumably more easily determined. See Staelin [1971].