The "Effects Method" of Project Evaluation

World Bank Staff Working Paper No. 231

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

Bank Staff Working Paper No. 231

March 1976

THE "EFFECTS METHOD" OF PROJECT EVALUATION

This paper critically evaluates the so-called effects method of project appraisal, originated by Charles Prou and Marc Chervel and widely used in French-speaking African countries. It is shown that under the effects method the benefits of the project are defined in terms of the net gain in foreign exchange. This involves valuing the product itself, as well as its direct and indirect imported inputs, at their shadow prices which are equated to world market (border) prices.

In turn, the principal criterion of project evaluation under the effects method defines costs in terms of capital investment. This involves assigning a zero opportunity cost to primary factors other than capital and introduces a bias in favor of projects which intensively utilize these factors. Also, in view of the assumption that the project will use domestically-produced inputs irrespective of cost, the effects method may lead to the rejection of industries that suit the country's resource endowment.

The paper makes recommendations for modifying the effects method by shadow pricing all primary factors and tradeable inputs. With these modifications, the effects method will become equivalent to the domestic resource cost and the internal rate of return methods which provide alternative expressions of the general economic profitability criterion.

This paper was written by Bela Balassa, Professor of Political Economy at the Johns Hopkins University, in the framework of the research project on Western Africa he directs in his capacity as Consultant to the World Bank.

The "Effects Method" of Project Evaluation

Bela Balassa

Introduction

In recent years, much attention has focused on the project evaluation manuals prepared for the OECD Development Center[1/] and for UNIDO[2/], respectively.[3/] The two manuals have also had several practical applications. In terms of the frequency of applications, however, they are much outnumbered by the applications of the so-called "effects method" (méthode des effets) that is widely used in French-speaking African countries from Algeria to Upper Volta. Yet, the effects method has not been considered in the discussions on project evaluation and it is probably not known to many of the protagonists of the debate.[4/]

1/ I.M.D. Little and J.A. Mirrlees, *Project Appraisal and Planning for Developing Countries, Volume II, Social Cost-Benefit Analysis*, Paris, OECD Development Center, 1968. A revised edition was published under the title, *Project Appraisal and Planning for Developing Countries*, London, Heinemann, 1974.

2/ Partha Dasgupta, Stephen Marglin, and Amartya Sen, *Guidelines for Project Evaluation*, New York, UNIDO, 1972.

3/ Cf. e.g. the "Symposium on the Little-Mirrlees Manual of Industrial Project Analysis in Developing Countries" in *Bulletin Oxford University of Economics and Statistics*, February 1972 and several articles on the concept and estimation of the shadow price of foreign exchange in *Oxford Economic Papers*, July 1974.

4/ The latter statement does not apply to Ian Little who has indicated to me in private conversation that the Little-Mirrlees method had been developed in part as a response to the effects method. However, an analysis of the effects method is not provided either in the original or in the revised version of the Little-Mirrlees manual.

At the same time, the originators of the effects method, Charles Prou and Marc Chervel claim that, by reason of its simplicity and the attention given to the indirect effects of the project, this method is superior to other methods of project evaluation. Also, the work of Prou and Chervel dominates the economic literature on project evaluation in France.[1/]

The purpose of this paper is to examine the main features of the effects method and to compare it with alternative methods of project evaluation.[2/] This will be done by the use of mathematical formulas, the absence of which has made the interpretation of the effects method difficult. In the discussion, reference will be made to the book by Prou and Chervel as well as to the articles in *Industrialization and Productivity* cited above.[3/] The discussion will proceed by considering the benefits and the costs of a project under the effects method, the criteria of project selection, the use of shadow prices, the treatment of intermediate goods, and the introduction of income distributional considerations.

1/ Cf. Charles Prou and Marc Chervel, *Etablissement des programmes en économie sous-développée, tome 3, l'étude des grappes de projets*, Paris, Dunod, 1970 -- For a brief summary of the method and practical examples, see M. Chervel, "Project Evaluation of the 'Effects' Method in Developing Countries", M. Chervel "Exercise in the Application of the Effects Method", and M. Chervel, M.-T. Courel, and D. Perreau, "Case Study; Industrial Fishing Complex in an African Port" in *Industrialization and Productivity*, Bulletin No. 20, New York, United Nations, 1974.

2/ A new entrant is the proposed method for project evaluation in the World Bank described in Herman G. van der Tak and Lyn Squire, *"Economic Analysis of Projects"*, Bank Staff Working Paper No. 194, Washington, D.C., February 1975.

3/ All these authors rely on description and on arithmetical examples. Also, alternative methods of project evaluation are compared in purely verbal terms in André Bussery, *Methods of Project Appraisal in Developing Countries*, Paris, Organisation for Economic Cooperation and Development, 1973.

The Benefits of the Project

Under the effects method, the benefits of a project are defined in terms of the increment in domestic value added in the processing activity itself and in the domestic production of its inputs. This involves a comparison of the "with project" and the "without project" situation, when the increment in domestic value added is taken to equal changes in domestic incomes (wages, profits, rent and government revenue) associated with the project's implementation and it is further identified with net gains in foreign exchange, expressed in terms of domestic currency at the actual exchange rate.[1/] In the case of import substitution projects, the increment in domestic value added is said to equal the difference between domestic value added in the project and in the production of its inputs, on the one hand, and the net loss in tariff revenue, on the other. For export projects, it is taken to equal domestic value added, with adjustment made for export subsidies or taxes.

The calculation of the benefits of a project involves decomposing the price of the final product into domestic value added and imported inputs used directly in the processing activity and indirectly in the manufacture of domestically-produced inputs. Full decomposition can be done by the use of an input-output table; if such a table has not been prepared, approximations need to be made on the basis of available data on the breakdown of domestically produced inputs into their value added and imported input components (Prou-Chervel, p. 140 ff).

1/ According to Chervel, the "total effect /of a project/ is equal, in all cases, to the extra value added brought into the economy by the implementation of the project; this extra value added (primary effect) is equal to the gain in foreign exchange" (op.cit, p. 8). It is further suggested "to adopt a 'national' rather than a 'domestic' approach and to try to measure the extra value added going to nationals: this can be done simply by subtracting from domestic extra value added the income going to foreigners in the form of wages and profits (which amounts to considering these jobs as imports)" (*Ibid*, p. 8). And, finally, it is said that "the extra income created, broken down by recipients (employee, State, entrepreneur) enables a better appraisal to be made of the project" (*Ibid*, p. 20).

Equation (1) expresses the domestic price of the product (p_i^d) in

$$(1) \qquad p_i^d = \sum_j a_{ji} p_j^d + \sum_m a_{mi} p_m^d + \sum_f a_{fi} p_f^d$$

terms of its direct input components, when p_j^d, p_m^d, and p_f^d refer to the price of domestically-produced inputs, imported inputs, and primary factors, respectively, and a_{ji}, a_{mi}, and a_{fi} indicate the amounts of these inputs used per unit of output.

The price of domestically-produced inputs is further broken down as in (1) and the process of decomposition continues by going back in the product chain until imported inputs or primary factors are reached. Denoting the total requirements of product j per unit of output of product i by r_{ji}, the full decomposition of the price of the product can be represented by equation (2).

$$(2) \qquad p_i^d = \sum_j \sum_m a_{mj} p_m^d r_{ji} + \sum_j \sum_f a_{fj} p_f^d r_{ji}$$

Equation (2) shows the domestic value of direct and indirect imported inputs and primary factors. The second term of the equation will thus indicate the remuneration of primary factors used directly and indirectly in the production of the commodity in question and equals direct plus indirect domestic value added per unit of output.

Under the effects method, it is further assumed that the domestic price of the product and of its imported inputs equals the sum of the world market or border price, expressed in domestic currency, plus the tariff or export subsidy (tax). Denoting world market prices expressed in terms of foreign currency by superscript w, the ad valorem tariff (subsidy) by t, and the actual exchange rate in terms of units of domestic currency per foreign currency by c, equation (2) can be transformed into (2a). Further re-arranging terms,

$$\text{(2a)} \qquad p_i^w c(1+t_i) = \sum_j \sum_m a_{mj} p_m^w c(1+t_m) r_{ji} + \sum_j \sum_f a_{fj} p_f^d r_{ji}$$

equation (3) will express the benefits of an import-substitution or export

$$\text{(3)} \qquad \sum_j \sum_f a_{fj} p_f^d r_{ji} - (p_i^w c t_i - \sum_j \sum_m a_{mj} p_m^w c t_m r_{ji}) = p_i^w c - \sum_j \sum_m a_{mj} p_m^w c r_{ji}$$

project as defined under the effects method.

The left-hand side of equation (3) shows the increment in domestic value added, defined as the difference between direct plus indirect domestic value added and the net loss in tariff revenue (i.e. the difference between tariff revenue foregone on the product and the tariff levied on imported inputs used directly and indirectly in its domestic manufacture). In turn, the right-hand side of the equation shows the net gain in foreign exchange (i.e., the difference between the world market price of the product and the world market cost of direct and indirect inputs) in terms of domestic currency. Thus, the benefits of the project, defined in terms of the increment in domestic value added, will necessarily equal the net gain in foreign exchange expressed in domestic currency.

In calculating the net gain in foreign exchange, export products are valued at fob prices and import-substituting products as well as imported inputs at cif prices. In turn, the net loss in tariff revenue is calculated under the assumption that an import-substituting project replaces foreign merchandise imported under tariff protection; export subsidies, too, will involve a revenue loss while export taxes represent a gain in revenue. In the following, we will consider an import-substituting project.

The calculation of a project's benefits under the effects method can be illustrated by an example. Assume that the domestic price of an import-substituting product is 540 CFAF, its world market price 8.00 French francs and the exchange rate 50 CFAF to the French franc, the tariff rate being 35 percent. In turn, the domestic value of direct plus indirect imported inputs per unit of output is 300 CFAF and their world market cost 5.00 French franc, the average rate of tariff on the inputs being 20 percent. Domestic value added per unit of output will now equal 240 CFAF and the net loss in tariff proceeds due to the replacement of imports by domestic production (the difference between tariff revenue foregone of 140 CFAF and the tariff derived on imported inputs used directly and indirectly in domestic manufacture of 50 CFAF) 90 CFAF. The increment in domestic value added as defined under the effects method (150 CFAF) will thus equal the net gain in foreign exchange expressed in terms of domestic currency (the difference between the domestic currency equivalent of the world market price of the product of 400 CFAF and that of imported inputs of 250 CFAF).

These results follow since the net loss in tariff revenue has been equated to the difference between domestic value added and the domestic currency equivalent of net foreign exchange savings. Such will not be the

case if the imports were subject to quantitative restrictions rather than tariffs before their domestic production is undertaken. This is because quantitative import restrictions affect domestic prices, and hence domestic value added, but the substitution of imports for domestic production does not entail a loss of tariff revenue as the scarcity premium under the quota accrued to the recipient of the licenses rather than to the government.

The preceding results can be reestablished, if the loss of quota profits following the replacement of imports by domestic production is treated in the same way as tariff revenue. This can be considered as the logical extension of the effects method since, in allowing for the income loss to the original beneficiaries of quota protection, various income recipients are treated in a consistent manner and equality between the increment in domestic value added and the domestic currency value of net foreign exchange savings is assured.

With adjustment made for quota profits, the increment in domestic value added and the domestic currency equivalent of net foreign exchange savings will be equal unless the introduction of domestic production entailed higher protection. This is the exception rather than the rule in most developing countries, however. Developing countries tend to keep tariffs low on products which are not manufactured domestically and raise tariffs or impose quantitative restrictions when their domestic production is undertaken. It is usually claimed that higher protection is required in order to offset the cost disadvantages of domestic production.

In the event of increased protection at the time domestic manufacturing is undertaken, the equality of the increment in domestic value added and the domestic currency equivalent of foreign exchange savings will no longer hold,

since domestic prices will rise as a result. In order to reestablish this equality, one would have to take account in the calculations of the hypothetical tariff proceeds lost under the assumption that the new, higher tariff (or quota) was applied. This would entail modifying the comparison of the "with project" and the "without project" situation to allow for the higher level of protection under the "without project" alternative. In this way, adjustment is made for the income loss to the consumer in the form of higher prices due to increased protection that entails a transfer from the consumer to the producer.

The Cost of the Project; The Loss in Tariff Revenue

In identifying the increment in domestic value added with net gains in foreign exchange expressed in terms of domestic prices, the method of project evaluation proposed by Prou and Chervel in fact values the project's benefits in terms of foreign exchange saved through import substitution or earned through exporting. This result is shown in all the examples provided in writings on the effects method, including the case when traditional production methods are replaced by manufacturing that involves the use of modern techniques (Prou and Chervel, pp. 201-04, Chervel, pp. 17-20). Correspondingly, the benefits of the project will be identified below in terms of the net gain in foreign exchange.

The next question is how costs are to be defined, and measured, for the purpose of making benefit-cost calculations on the basis of which decisions can be taken to accept or reject the project. Prou and Chervel consider three possible alternatives: identifying costs with the domestic cost of investment in the project, with the value of imports embodied in the investment, or with the loss in budgetary revenue. They further suggest that

the choice among these measures be based on the relative scarcity of domestic resources, foreign exchange, and budgetary receipts. (Prou-Chervel, pp. 222-23, 234-35).

The ratio of the domestic currency value of the net gain in foreign exchange to the net loss in tariff revenue will be the reciprocal of the effective rate of protection, defined as the percentage excess of domestic value added (W) over world market value added (V), if this is interpreted to relate to direct plus indirect value added.[1/] This is shown in equation (4) where the

$$(4) \qquad ERP = \frac{W}{V} - 1 = \frac{W-V}{V} = \frac{[(p_i^w c(1+t_i) - \sum_j \sum_m a_{mj} p_m^w c(1+t_m) r_{ji}] - (p_i^w c - \sum_j \sum_m a_{mj} p_m^w c r_{ji})}{(p_i^w - \sum_j \sum_m a_{mj} p_m^w c r_{ji})} =$$

$$= \frac{p_i^w c t_i - \sum_j \sum_m a_{mj} p_m^w c t_m r_{ji}}{p_i^w c - \sum_j \sum_m a_{mj} p_m^w c r_{ji}}$$

denominator of the formula for the effective rate of protection is the domestic currency equivalent of the net gain in foreign exchange and the numerator is the net loss in tariff revenue. Now, as domestic value added increases or the gain in foreign exchange declines, the effective rate of protection will rise and the ratio of the domestic currency equivalent of the net gain in foreign exchange to the net loss in tariff revenue decline, so that the project

---

1/ I am indebted to M. Gérard Rebois, formerly with the Ministry of Planning in the Ivory Coast and now with the French Ministry of Cooperation, on this point.

will be considered less desirable, irrespective of whether one or the other measure is used.[1/]

In the example cited, the effective rate of protection is 0.60 (240/150 - 1) and the ratio of the domestic currency value of net foreign earnings to the net loss in tariff revenue 1.67 (150/ 90). Were domestic value added to rise to 300 CFAF *or* the domestic currency value of net foreign exchange savings decline to 120 CFAF, both the effective rate of protection and the ratio of the domestic currency value of the net gain in foreign exchange to the net loss in tariff revenue would become 1.00, making the project less desirable[2/].

The ratio of the increment in domestic value added to tariff revenue will not provide an appropriate ranking of alternative projects, however, unless market and shadow prices of primary factors coincide. In that event, the effective rate of protection will equal the domestic resource cost of earning (saving) foreign exchange (DRC) which can be used as a criterion of project selection as noted below.

1/ The ranking of the projects will not change if we use the ratio of domestic value added (W) to the net loss in tariff revenue (W-V) as the criterion of project evaluation that is done in some French-speaking African countries. It can be easily shown that this ratio will equal the ratio of the effective rate of protection plus one to the effective rate of protection itself. Thus,

$$\frac{W}{W - V} = \frac{W}{V} \cdot \frac{V}{W - V}$$

2/ In turn, the ratio of domestic value added to the net loss in tariff revenue, 2.67 (240/240-150), will decline to 2.00, making the project less desirable.

The DRC measure will be discussed in the following in relation to the principal measure of project evaluation proposed by Prou and Chervel: the ratio of net gain in foreign exchange expressed in terms of domestic currency to the domestic cost of investment[1/] (Chervel, p. 9). This ratio will also be compared to the rate of return to capital (internal rate of return).[2/]

The Cost of the Project: The Domestic Cost of Investment

The domestic resource cost of earning foreign exchange and the rate of return on capital criteria represent alternative expressions of the general economic profitability criterion.[3/] Under the latter criterion, shown in equation (5), the project will be accepted if the discounted value

$$(5) \qquad R_i = p_i^w c^s - \sum_j \sum_m a_{mj} p_m^w c^s r_{ji} - \sum_j \sum_f a_{fj} p_f^s r_{ji} \gtreqless 0$$

of profits (R_i) exceeds or is equal to zero, and it will be rejected if this value is negative. The evaluation is made in terms of shadow prices: the domestic currency equivalent of world market prices for imports and exports, their opportunity cost in terms of output foregone (denoted by superscript s) for primary factors, and the marginal social valuation of foreign exchange (c^s) for the exchange rate.

1/ This necessitates reinterpreting the above formulas in terms of discounted values. If the flow of revenues and costs are constant over time, their present values can be approximated in dividing annual flows by the discount rate (Cf. Richard Layard, *Cost-Benefit Analysis*, Harmondsworth, Middlesex, Penguin, 1974, pp. 45, 66).

2/ We will not consider here the case when costs are defined in terms of the import content of investment as this alternative is given little emphasis in writings on the effects method.

3/ We exclude here cases when the internal rate of return is not uniquely defined because of the existence of more than one crossovers over time from profits to losses and vice versa.

Separating the contribution of capital from that of the other primary factors and rearranging terms in equation (5), we express in equation (6a)

(6a)
$$r^s = \frac{p_i^w c^s - \sum_j \sum_m a_{mj} p_m^w c^s r_{ji} - \sum_j \sum_{f \neq k} a_{fj} p_f^s r_{ji} - R_i}{\sum_j \sum_k a_{kj} p_k^s r_{ji}}$$

and (6b) the shadow price of capital or shadow discount rate (r^s) and the rate

(6b)
$$r_i = \frac{p_i^w c^s - \sum_j \sum_m a_{mj} p_m^w c^s r_{ji} - \sum_j \sum_{f \neq k} a_{fj} p_f^s r_{ji}}{\sum_j \sum_k a_{kj} p_k^s r_{ji}}$$

of return to capital in the project (r_i) respectively. It is apparent that, if the general economic profitability condition is fulfilled, the rate of return to capital in the project will be no less than the shadow discount rate, so that the project is accepted.1/

In equation (7a), the shadow exchange rate (c^s) has been expressed

(7a)
$$c^s = \frac{\sum_j \sum_f a_{fj} p_f^s r_{ji} + R_i}{p_i^w - \sum_j \sum_m a_{mj} p_m^w r_{ji}}$$

from the general economic profitability condition while equation (7b) provides

(7b)
$$c_i = \frac{\sum_j \sum_f a_{fj} p_f^s r_{ji}}{p_i^w - \sum_j \sum_m a_{mj} p_m^w r_{ji}}$$

the formula for the domestic resource cost of earning foreign exchange in the project (c_i). Again, if the general economic profitability condition is

---

1/ In the formulas, no account has been taken of the fact that capital may be embodied in imported goods.

fulfilled, the domestic resource cost of earning foreign exchange in the project will be equal or less than the shadow exchange rate, and hence the project will be accepted.

In comparing the principal project evaluation criterion under the effects method with the domestic resource cost method, we find that both define the project's benefit in terms of the net gain in foreign exchange but they differ in their evaluation of the costs: the DRC method defines costs in terms of the shadow value of domestic resources utilized in the project while under the effects method these are identified with the domestic cost of capital investment.[1/] In turn, while both the effects method and the internal rate of return method relate the project's benefits to capital investment, the former identifies these benefits with the net gain in foreign exchange whereas the latter deducts the domestic resource cost of other factors of production expressed in shadow prices from the gain in foreign exchange.

It follows that the principal difference between the effects method and the other two criteria of project appraisal lies in the fact that the effects method makes no allowance for the opportunity cost to the national economy of productive factors other than capital, such as labor and land. In the absence of an adjustment for the opportunity cost of these factors, the effects method will not provide an appropriate criterion for project evaluation. Thus, while the shadow price of foreign exchange and the shadow

---

1/ The reader will also note that the project's benefits are in the numerator of the formula under the effects method and in the denominator of the domestic resource cost formula. And, the former but not the latter expresses the gain in foreign exchange in terms of domestic currency.

discount rate serve as a benchmark for accepting or rejecting projects by the use of the domestic resource cost of foreign exchange and the internal rate of return criteria, respectively, there is no suitable benchmark for making decisions on projects under the effects method; nor will this method rank projects according to their economic profitability.

The use of the discount rate as a benchmark will be inappropriate because of the neglect of the domestic resource costs of labor and land under the effects method. Accordingly, it is incorrect to argue that subsidies would be warranted in the case when low private profitability is associated with a high ratio of the gain in foreign exchange, expressed in domestic currency, to the cost of investment (Chervel, Courel, Perreau, p. 35). Also, the ranking of projects by this ratio will give rise to a bias, inasmuch as the degree of overestimation of the project's benefits is positively correlated with the labor and land intensity of the project.

One may allow for the opportunity cost of labor and land in two possible ways. Under the first alternative, the project's benefits are continued to be identified with net gains in foreign exchange while the opportunity cost of labor and land is added to the cost of capital. In this way, the effects method would be transformed into the domestic resource cost criterion as expressed in equation (7b). Under the second alternative, the opportunity cost of labor and land is deducted from the project's benefits. This adjustment would create a difference between the increment in domestic value added and net gains in foreign exchange, and transform the effects method into the internal rate of return criterion represented in equation (6b).

In either case, adjustment needs further be made for the capital embodied in domestically produced inputs used by the project. This can be done by adding the opportunity cost of capital used indirectly to that used directly under the DRC method and adding the capital involved in manufacturing inputs to that used in processing under the internal rate of return method.

According to Prou and Chervel, such adjustment is not necessary in cases of underutilization of capacity in the domestic production of inputs (pp. 176, 196). However, it should be recognized that this will be in general a temporary situation as the same products may be eventually demanded by other branches of industry and, ultimately, capital will need to be replaced. In turn, if the new capacity created for the domestic production of a particular input exceeds the needs of the project, one would have to take account of the alternative uses of the input in question.

The Use of Shadow Prices

In identifying the project's benefits with the net gain in foreign exchange, the product itself as well as its direct and indirect imported inputs are effectively valued at their shadow prices (i.e. world market or border prices). However, Prou and Chervel decry the use of shadow prices for primary factors. They claim that the obstacles to the calculation of these shadow prices are so great that they are in practice not surmountable (p. 3). These obstacles include the problems encountered in calculating shadow prices, the difficulties of explaining their meaning to the decision-makers in developing countries, and the fiscal implications of the use of shadow prices (p. 2).

As a practical example, Prou and Chervel take the case when the shadow price of labor is 30 units and the market wage 100 units, implying a subsidy of 70 units per employee (p. 2). In criticizing the assumption of

zero opportunity cost of labor originating in agriculture, they further note that there is a production loss involved because agricultural labor tends to be fully utilized in peak periods (p. 127).

But, as we have seen, the opportunity cost of labor (and land) is in fact taken to be nil under the effects method. This choice is defended on the grounds that there is general underemployment in all labor categories (p. 191). And, while it is noted that one could take account of the loss of output elsewhere in the economy that results from employment in the project, Prou and Chervel claim that "all things considered, one would soon find, exceptions aside, that this would complicate the reasoning and lead to the loss of objectivity, without appreciably modifying the general aspect of the results or the ranking of the solutions" (p. 192). No evidence is offered in support of this proposition, however, and all calculations are made on the assumption of zero shadow price of labor (and land).

It appears, then, that despite their claims to the contrary, Prou and Chervel are in fact assigning shadow prices to labor and land (since cost is identified with capital, there is no need to use a shadow discount rate for ranking projects). And, the choice of zero shadow prices for labor and land is wholly arbitrary and it is open to the same objections the authors raised against the use of shadow prices in general. At the same time, it involves introducing shadow prices so to speak through the back door as with the project's benefits being defined in terms of the increment in domestic value added, the policy makers are not apprised that the shadow prices of labor and land have been taken to be nil.

Nor can this assumption be considered realistic in developing countries. Thus, the use of land will involve a cost to the national economy

unless it has no alternative uses or there is unutilized cultivable land in the country in question. Skilled, technical, and managerial labor are also in scarce supply in most developing countries. Furthermore, the preliminary results of a study of Ghana, the Ivory Coast, Mali, and Senegal, directed by the present author, show that in these countries unskilled labor, too, has an opportunity cost which in some instances equals its market price.

Nor can the cost of capital be appropriately valued in domestic prices as it is done under the effects method. This is because tariffs, or the tariff-equivalent of quotas, represent an income transfer rather than a real cost. Thus, imported capital goods should be valued at their world market (border) prices.

The use of shadow prices would also have to extend to foreign exchange, the scarcity value of which is not correctly represented by the exchange rate because of the existence of distortions in product and factor markets.[1/] While the use of a shadow exchange rate can be avoided if the project's benefits and costs are both expressed in foreign exchange, introducing the opportunity cost of primary factors will make its use necessary in order to convert values expressed in foreign prices into domestic currency (or vice versa).

Nor can the introduction of indirect effects in project appraisal be taken as a substitute for the use of shadow prices as claimed by Prou and Chervel (pp. 1-3), since indirect effects can be considered in project

---

1/ On the estimation of the shadow exchange rate see Bela Balassa, "Estimating the Shadow Price of Foreign Exchange in Project Appraisal; *Oxford Economic Papers*, July 1974.

evaluation, irrespective of whether shadow prices are used or not.[1/] At the same time, questions arise about the appropriateness of allowing for the backward linkages of a project by valuing inputs -- tradeables as well as nontradeables -- at their domestic cost of production. This question will be taken up in the following.

The Treatment of Domestically Produced Inputs

The application of input-output tables for estimating prospective input use in the project assumes that historically-observed relationships between the use of domestically-produced and imported inputs will continue. Expressed differently, the assumption is made that the marginal or incremental input-output coefficients equal the average coefficients observed in input-output statistics.

The same procedure is followed under the effects method in cases when, in the absence of an input-output table, industry data are used to determine the origin of inputs. Thus, it is noted that "in general, and very exceptional circumstances aside, additional needs are satisfied by domestic production..." (Prou-Chervel, p. 177). This conclusion is said to apply even though new investments may be needed to increase the capacity of the domestic production of inputs.

In this connection, distinction needs to be made between tradeable inputs, which can be exported or imported, and nontradeable inputs, including various services such as commerce, internal transport, electricity, gas, etc., which have to be procured domestically. While the choice between importation

---

1/ For a discussion, see Bela Balassa and D. M. Schydlowsky, "Effective Tariffs, Domestic Cost of Foreign Exchange and the Equilibrium Exchange Rate", *Journal of Political Economy* May-June 1968.

and domestic production, or between exportation and domestic use, does not arise in regard to nontradeables, it must be considered for tradeable inputs.

To begin with, even if tradeable inputs are produced at internationally competitive costs, a spurious gain is shown under the effects method in the event that domestically produced rather than imported inputs are used. This is because foreign exchange savings are augmented thereby, without however making allowance for the opportunity cost of primary factors involved in the domestic manufacture of the inputs.

Making allowance for the opportunity cost of primary factors, as suggested above, would eliminate this spurious gain in cases when tradeable inputs are produced domestically at internationally competitive costs. However, if domestic costs exceed international prices, the method proposed by Prou and Chervel may lead to incorrect decisions on projects. This can be illustrated by an example.

Let us compare two investment projects designed to manufacture precision equipment and clothing, respectively, when steel, the principal input of precision equipment, is produced under protection at costs exceeding the cif import price while the textile fabrics used in clothing manufacture are imported or are produced domestically at internationally competitive costs.[1/] Assume further that the clothing project appears preferable to the precision-equipment project in terms of economic profitability as defined under (5), when we combine the cost of processing the product and its domestically-produced inputs, but the ranking is reversed if domestically-

---

1/ This example has been taken from the article referred to in the preceding footnote.

produced inputs are valued at world market prices.

In the example, the inversion of the ranking is due to the fact that the high cost of domestically-produced steel penalizes the production of precision-equipment while the clothing project benefits from the availability of competitively priced inputs. In taking an historical accident as regards the domestic availability of inputs as given, this procedure may lead to rejecting new industries which suit a country's resource endowment. Thus, the country may not engage in the manufacture of labor-intensive precision equipment which is economically profitable *per se*, because it has earlier established a high-cost steel industry.

Rather than expanding high-cost steel production to provide for the needs of the precision equipment industry, a more appropriate solution would be to import steel. And while this conclusion may be modified in the presence of excess capacity, account would need to be taken of the eventual cost of replacement of the plant.

These considerations indicate the need to make a choice among alternative sources of inputs on the basis of their relative costs. Exceptions to this rule may be made only in cases when the importation of additional inputs is not politically feasible. But, even in this case, calculations should be made to indicate the excess costs involved in using domestically-produced inputs that could be obtained cheaper abroad.

Domestically produced tradeable inputs would thus need to be valued at world market (border) prices in project appraisal to reflect the fact that importation is an alternative to the use of domestically-produced

inputs in the project. The same considerations apply to inputs for which exportation provides the relevant alternative.[1/]

With tradeable inputs valued at their world market prices, only nontradeable inputs will be decomposed into tradeable inputs and primary factors. This involves replacing full decomposition by the use of an input-output table with partial decomposition by the so-called "semi-input-output" method.[2/] Tradeable goods which need to be produced domestically for reasons of political feasibility, although their costs exceed the cif import price, may be treated as nontradeables under this method.

Social vs Economic Profitability

Thus far, we have used economic profitability as the criterion of project evaluation under the assumption that increases in national income resulting from the implementation of a project are given equal weights, irrespective of the income recipient (wages, profits, rents and government revenue) and the use to which the income is put. The project evaluation manuals prepared for the OECD Development Center, UNIDO and the World Bank call for making adjustments in the calculations on the basis of income

---

1/ We abstract here from differences between cif and fob prices and assume that the country is a "price taker" in international markets. Should the country affect world market prices through its trading, which may be the case for some export products, the export alternative needs to be evaluated in terms of marginal revenue from exports.

2/ The use of this method was proposed independently by Jan Tinbergen, I.M.D. Little, and Bela Balassa and D. M. Schydlowsky. For references see the article of the latter authors referred to above (p. 354).

distributional considerations and the effects of the project on government income and savings. With these adjustments, a social profitability criterion is derived, the use of which is recommended for reaching decisions on projects.

Prou and Chervel suggest introducing income distributional considerations by assigning weights to various income recipients, private as well as public, which involves measuring the project's benefits in terms of a weighted sum of the increment in domestic value added. This method is incorrect, however, because it identifies benefits to income recipients with the incomes they derive from the project without considering alternative possibilities open to them.

Correctly defined, the benefits accruing to the income recipients should include only the excess of their remuneration over earnings in alternative occupations. At the same time, the net remuneration of primary factors so defined will not equal their contribution to the increment in domestic value added adjusted for the opportunity cost of factors, unless shadow and market prices coincide.

But even if income distributional effects are correctly defined, introducing these in project evaluation without allowing for their possible impact on savings would bias the results. This is because redistributing incomes will tend to reduce savings, with adverse effects on economic growth. Correspondingly, should one introduce income distributional considerations in project appraisal, savings effects would also need to be considered.

It is a different question whether project appraisal should be used in the place of general economic policies to pursue income distributional, savings, government revenue etc. objectives. This issue transcends the scope of

this paper and will not be considered here.[1/]

Conclusion

The purpose of this paper has been to critically evaluate the so-called effects method of project appraisal, originated by Charles Prou and Marc Chervel and widely used in French-speaking African countries. It has been shown that, with adjustments made for quota profits and increased protection imposed at the time of the project's implementation, the benefits of a project will be defined in terms of the net gain in foreign exchange under the effects method. This involves valuing the product itself, as well as its direct and indirect imported inputs, at their shadow prices which are equated to world market (border) prices.

In turn, defining the projects costs in terms of the net loss in tariff revenue entails valuing primary factors at their market rather than at their shadow prices. And, if costs are identified with the cost of investment, as is the case for the principal criterion of project evaluation under the effects method, zero opportunity cost is assigned to primary factors other than capital. As a result, a bias is introduced in favor of projects that intensively utilize these factors of production.

A further objection to the effects method concerns the assumption that the historically-observed relationship between the use of domestically-produced and imported inputs would continue, so that the possible choice among these sources of tradeable inputs is disregarded and one may be induced to reject industries that suit the country's resource endowment. Finally, the

---

1/ For a discussion, see Bela Balassa, *The Income Distributional Parameter in Project Appraisal*, Washington, D.C., World Bank, March 1976.

income distributional effects of a project are incorrectly estimated by neglecting earnings in alternative occupations.

In this paper, recommendations have been made for modifying the effects method by shadow pricing all primary factors and tradeable inputs. With these modifications, the effects method will become equivalent to the domestic resource cost and the internal rate of return methods which provide alternative expressions of the general economic profitability criterion.