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BENEFIT-COST ANALYSIS  
OF  
FOREIGN INVESTMENT PROPOSALS  
The Viewpoint of the Host Country  
by  
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## SUMMARY

Most governments require tools by which to appraise the merits of specific investment proposals made by foreign enterprises. In the absence of these, emotions will hold more sway than reason in the process of decision making on important questions of national policy.

The foreign investment proposals confronting a country are divided into two types: those involving alternative forms of operating within a sector and those implying choice between different sectors. For the former, the net present value criterion is suggested as appropriate; for the latter, the domestic resource cost of foreign exchange is preferred.

The relation of this last criterion to the social marginal productivity of capital is also touched on.

In both sets of circumstances it is clear that no general statement of the desirability of foreign investment can be made. Each host country must undertake to evaluate the projects offered it on a case by case basis.

# BENEFIT-COST ANALYSIS OF FOREIGN INVESTMENT

## PROPOSALS

### The Viewpoint of the Host Country

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#### I

#### Introduction

There is widespread consensus that the policy of less developed countries toward foreign private investment and investors is an important part of their general strategy for economic development. Only part of this concern can be accounted for by the numerical magnitude of the investments themselves or by the size of the return flow of profits they generate. In the developed countries with market economies, the policy towards foreign investment of the developing countries tends to be regarded as an indication of their realism and their commitment to economic development. It is argued that they are short of capital, technological, and managerial skill; foreign investment may provide all three, and, therefore, a country wishing to develop speedily will avail itself of these scarce factors to the maximum extent possible. From the viewpoint of the developing countries, foreign investors are often seen as bringing in scarce resources, but many times also as preempting investment opportunities from domestic entrepreneurs, as removing a sector of the economy partially from the effective policy influence of the country's government, and as imposing constraints on the general economic policy of the country through the possibility of sanctions on the part of the country whence the foreign investors come.

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Table I attempts to give a notion of the scope of foreign enterprise on the basis of a sample of 187 U.S. corporations included in Fortune's 500 for 1963 or 1964 and holding at least a 25% equity in manufacturing enterprises in six or more foreign countries. This sample comprises over 80% of U.S. foreign direct manufacturing investment outside of Canada.<sup>1/</sup>

Most investment decisions by foreigners (as indeed those of nationals) are subject to the policy influence of the host government. In the case of investments in raw material extraction this influence usually takes the form of special terms negotiated case by case under general mining regulations. In the case of manufacturing investments, at a minimum some form of protection against competing imports is negotiated. In general, foreign exchange regulations, import restrictions, industrial licensing, tax legislation, or administrative measures will be crucial to a decision to invest. Many of these incentives can be granted or withheld at the discretion of the executive branch of the government of the host country. In consequence, the host government is faced continuously with the need to assess the desirability of proposed investments from the point of view of their contributions to the development goals of the nation. In addition, the effect of various possible levels of incentive concessions on the benefits the country hopes to derive from the proposed investments must be determined.

In this context broad generalizations claiming either that foreign investment is good because it brings in scarce factors or that foreign investment is bad because it preempts scarce investment opportunities are not very useful. Rather, it is essential to calculate the

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<sup>1/</sup> For a further discussion of the sample and data, see James W. Vaupel and Joan P. Curhan The Making of Multinational Enterprise; Boston 1969: Harvard University, Graduate School of Business Administration.

Table I

Foreign Operations of U.S. Corporations Outside the Developed World  
(number of enterprises)

	<u>1945</u>	<u>1950</u>	<u>1955</u>	<u>1960</u>	<u>1965</u>	<u>1967</u>
U.S. Parents with Subsidiaries outside the Developed World	95	117	147	180	186	184
U.S. Parents with Manufacturing Subsidiaries outside the Developed World	74	93	120	157	179	177
Subsidiaries of U.S. Parents	537	729	1062	1665	2386	2597
Manufacturing Subsidiaries of U.S. Parents	205	297	413	740	1155	1260
Sales Subsidiaries of U.S. Parents	94	117	165	262	348	367
Extraction Subsidiaries of U.S. Parents	47	48	69	86	91	95
Other Activity Subsidiaries of U.S. Parents	82	116	208	300	383	431
Unknown Activity Subsidiaries of U.S. Parents	109	151	207	277	409	444

SOURCE: Vaupel, J.W. and Joan P. Curhan, The Making of Multinational Enterprise, Boston, 1969: Harvard University, Graduate School of Business Administration.

benefits and cost relating to each individual case. On the basis of such calculations, one would expect to find that a particular investment adds to the welfare of the country but nevertheless is better postponed to the future, another investment may represent a net loss to the country, and yet a third may be desirable and should be undertaken forthwith.

In designing an evaluation procedure to govern calculations of the kind described above, it is necessary first of all to define the development objectives in relation to which investment proposals will be measured. Most countries have a large number of such objectives including increase in per capita income, improvement of the balance of payments, more industrialization, greater employment, better social services, and greater equality in income distribution. In the case of foreign investment, a number of additional objectives of a political economy nature are relevant such as the degree of national control and the implicit constraints (economic and political) on the country's foreign policy. Many of these goals are not "ultimate goals" in themselves but merely proximate objectives. Thus, an improvement in the balance of payments is desired only rarely in order to accumulate a hoard of gold or foreign exchange (although a strengthening of reserves is not an unworthy ultimate goal). More often, a stronger balance of payments is desired in order to expand imports and increase the availability of goods and services in the economy, and thus the average per capita income. A similar argument relates to the proximate goal of industrialization. Ideally, an evaluation procedure should measure the contribution of each investment proposal to each one of the country's ultimate objectives. In practice, this becomes the quantification of the contribution to the

availability of goods and services, i.e., national income. Equity and political economy considerations enter the analysis at the point where government decision makers decide whether the net benefits in terms of national income justify whatever equity or political consequences may ensue.

Two different types of situations can usually be distinguished in the analysis of foreign investment proposals. In the first of these, the question at issue is when and how a natural resource shall be developed or a given market satisfied by domestic production. This is the case typified by mining ventures. The analytical context is therefore that of sub-optimization within one sector. In the second type of situation, the optimal deployment of the national factors of production is the central question. The context is therefore that of optimization economy wide. This case is most usually found in industrial investment proposals.

In a general equilibrium multi-period framework, both questions can be answered simultaneously. In a benefit-cost calculation framework, which is essentially of partial equilibrium nature, this is not so readily possible. In the sub-optimization case, we attempt to maximize the rent to a natural resource or given market and thus choose the best combination of national factors, foreign factors and timing. In choosing between sectors, we are maximizing returns to the factors of production available at any one given moment in time. The nature of the first case is largely a choice between alternatives at different moments in time. There is thus an inherent divergence in perspective between the two cases which can be expressed as a difference in the scarce budgeted factor to which returns are calculated.

We now turn to a closer examination of each of these two questions and the benefit-cost techniques suitable for their analysis.

II

Sub-optimization Within One Sector

It is useful to analyze this case against the backdrop of the typical situation of an ore deposit for the development of which a foreign investor has made a proposal involving the need for some kind of government action.

In the evaluation of such a proposal, the host government has before it the choice between four alternatives:

- (a) Not to have the ore body developed at all,
- (b) Let the foreign investor develop it,<sup>1/</sup>
- (c) Reserve the development for national entrepreneurs, and
- (d) Entrust the development to combinations of domestic and foreign interests. The more usual arrangements in this category are joint venture, management contracts, and production sharing systems.

It is usually of the essence in this type of situation that the three operating alternatives do not refer to the same point in time. The foreigners are mostly able to proceed immediately, otherwise they would not be bidding for the concession. The national entrepreneurs, however, can often not be expected to undertake the venture until some number of years in the future. The last alternative may also require enough domestic entrepreneurship to entail a certain delay. As a result of this time dimension, the trade-off

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<sup>1/</sup> There may often be more than one actual bidder or the government may believe that at a later time further foreign bids may eventuate. In either case, the number of options grows and so does the complexity of the calculations, albeit not their nature.

the government must analyze is between the exploitation and non-exploitation of the natural resource on the one hand, and between the form of the operation and its timing on the other.

Let us start by asking whether the operation by foreigners is preferable to the non-operation of the mine. Our criterion is the contribution to national income, i.e., to the availability of goods and services in the country.

Development of the mine will yield as gross benefit a contribution to the availability of goods and services in the country equivalent to the value of the ore. In the likely case that this ore is exported that value will be equal to the FOB price per ton multiplied by the amount of exports.

Furthermore, operation of the mine entails costs which reduce the availability of goods and services in the economy. The cost of materials directly absorbs goods; the use of labor will generally cause output to decrease elsewhere in the economy (unless this labor was underemployed or unemployed). In addition, the foreign investor will repatriate an amount representing amortization of the investment and profits after taxes.

When these costs are deducted from the mentioned gross benefits we obtain a quantity of goods and services which represent the value of the direct net benefit to the economy from operating the mine. If the market prices correctly reflect social costs this net benefit will be equal to the taxes, royalties and other payments of the company to the host government.<sup>1/</sup> Hence if the company pays any taxes, the net benefits from the operation of the mine to the country is positive. Therefore, one can conclude as a

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<sup>1/</sup> In the presence of unemployment and underemployment this formulation underestimates the net benefits. On the other hand, in the presence of indirect taxes, it represents an over-statement.

general rule that provided market prices equal social costs, if a raw material venture is profitable enough for a private foreign investor to wish to undertake it, it will be more beneficial to the host country to allow the foreign investors in than to leave the resource unexploited altogether. This by no means implies, even under these strong assumptions, that operating the mine under concession to foreigners is the best way of working the ore deposit. To draw such a conclusion the other operating alternatives must be evaluated. We turn first to the domestic alternative.

If nationals operate the mine and produce exactly the same output, the gross benefits to the economy will again be equal to the value of the ore produced. On the cost side, the national entrepreneurs will have to pay out a cost of capital in addition to operating costs which must both be deducted to arrive at the net benefits. Since there are no repatriations of equity or profits under this alternative, these net benefits will now include the profit after taxes in addition to the taxes themselves. If we assume that the domestic entrepreneurs have exactly the same capital costs as the foreigners, the difference between operating the mine under foreign ownership and under national ownership consists of four elements:

- i. the size of the foreign cash flow after taxes;
- ii. the opportunity cost of domestic capital;
- iii. the cost of waiting as perceived by the host country; and
- iv. the economic risk involved in the project.

If the cash flow is small, the cost of domestic capital high, the domestic economy has a high time preference and a high risk aversion, then other things being equal the foreign investment alternative will be pre-

ferred. On the other hand if the cash flow is large, the cost of domestic capital is low, and domestic time preference and risk aversion are also low, then the national alternative will be preferable. Therefore, even in this simplified case where it is assumed that the project will be executed in exactly the same way whether undertaken by foreigners or by domestic entrepreneurs, it is not possible to say in general whether one or the other alternative is preferable.

In addition, the execution of projects by foreign and domestic entrepreneurs exhibit some systematic differences which must be taken into account when evaluating the alternatives. Among these are the following:

a) Access to markets: foreigners are likely to have different access to export markets than domestic entrepreneurs. In some cases this may imply that when exports are undertaken by a foreign investor, a higher price would be obtained for the product. This is likely to be the situation when the foreign firm has a marketing organization in existence and even more so if it is a monopolist or oligopolist in such a market (e.g., oil). On the other hand, it is also possible that operation by the foreigner will signify a lower export price for the product. This is the case where a foreign investor's exports are sold to another company of the same multinational group and the transfer pricing policy of the parent requires it to sell at a price lower than that obtainable in transactions between unrelated firms. It should be noted that under some regimes and company needs, transfer pricing may work the other way. Then it generates a higher

price.<sup>1/</sup> Volume sold abroad by a foreign investor may also differ from exports by a national company. On the one hand, sister enterprises of the multinational family offer a ready market. On the other, location of production decisions taken for a multinational system as a whole may not be optimal from the point of view of any one component.

b) Structure and cost of capital: foreign investors are likely to be in a different situation than nationals with regard to the leverage they can obtain on the equity, and with regard to the cost of their debt. In some situations a foreign investor will be able to have a lower equity interest and a larger debt as well as lower carrying charges than the national company. On the other hand, it is also plausible that the national company may be able to obtain debt capital at preferential terms from bilateral or international development finance institutions.<sup>2/</sup>

c) Management quality: foreign investment is likely to imply management of a different quantity and quality of experience as compared to a national administration. This may well mean that the foreign investment alternative will have lower overall costs due to the greater expertise of foreign personnel in running a venture of this type. On the other hand, the domestic entrepreneurs will have the advantage of being more familiar with the local situation and therefore may be able to operate in a more effective fashion.

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<sup>1/</sup> A symmetrical argument relates to transfer pricing of inputs.

<sup>2/</sup> It should be noted that only project-specific foreign borrowing is relevant in this context. Drawing on the pool of foreign funding available in any case to the country is identical to drawing on domestic savings.

d) Time profile of prices: it is very unlikely that if the same project is undertaken at different points in time, it will face the same prices for its outputs and inputs. This is true of prices in the market place as well as of the social prices, should these differ from the former. A change in prices may, of course, work to the advantage of either alternative depending on whether the prices of output rise faster than the costs or vice versa.<sup>1/</sup>

All these elements must be estimated in a particular case in order to arrive at the appropriate comparison between domestic alternatives and the foreign investment proposal. Only when these factors are added to the four general principles previously discussed does it become possible to obtain the net difference in the benefits from national operation as compared to foreign operation.

In comparison with a foreign operation, the hired management alternative implies: (i) domestic provision of the capital invested, (ii) retention of the cash flow after taxes, (iii) payment of management fee, and, (iv) possible postponement of date of receipt of benefits. In the eventuality of equal real capital cost, the hired management alternative will only be preferable to foreign operation if the management fee is sufficiently less than cash flow after taxes less cost of capital to compensate for any delay in obtaining the benefits.

In comparison with the domestic alternative, the hired management alternative implies (i) payment of a management fee, and (ii) probable

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<sup>1/</sup> If more than one foreign proposal is considered and these differ in timing, changes in the tax that can be levied must also be considered.

earlier implementation of the project. If the management fee is low and the social time preference high, the domestic alternative will tend to be rejected; if the management fee is high and the time preference low, the domestic operation will be chosen.

In both of the above comparisons differences in the operating characteristic of a particular project under the different alternatives must be taken into account.

So far, we have addressed ourselves exclusively to the benefits occurring within the project itself. It is necessary, however, also to consider the effects of the project on the rest of the economy, i.e., its external economies or diseconomies. This type of benefit or cost is the hardest to capture and include into a systematic analysis. In part this is due to the diffuseness of the effects themselves; in part it is the result of the lack of an appropriate measure to make these externalities commensurate with the direct project benefits. Nevertheless, the general nature of these effects should be noted.

Three types of external economies can usefully be distinguished: a) effect of the project on the marginal productivity of national capital, b) effect of the project on the factor supply of the economy, and c) economic stabilization effects of the project.

The effect on the marginal productivity of national capital takes two main forms. The first of these results from the fact that if the foreigners undertake the project, domestic investors are precluded from making use of this investment opportunity at a later time. This is what has generally been called the displacement effect of foreign investment. The seriousness of this effect depends on the

relationship between the number of perceived investment opportunities available in the economy and the number of entrepreneurs and/or investors wishing to avail themselves of these opportunities. If the number of opportunities is large in relation to the number of investors, then the displacement effect is of little importance. If, on the other hand, the number of investment opportunities is small in relation to the number of individuals wishing to avail themselves of such opportunities, then this effect can be of great importance. It should be borne in mind additionally that the displacement effect is mitigated if there is a repurchase or time limitation clause.

The second type of external effect on the marginal productivity of domestic capital arises out of the linkages effects. Each project will provide pecuniary external economies to users (lower cost inputs) and to suppliers (larger markets). It will probably provide real external economies in the form of infrastructure as well. Furthermore, the existence of the project may well cause a change in the perception of investment opportunities on the part of prospective investors. These effects may in turn call forth a greater level of national savings and investment and the emergence of new entrepreneurs. All of these effects will take place at different points in time under the different alternatives of operation. Under the foreign investment alternative these effects will take place earliest; under the domestic exploitation alternative, last. As a result any benefits accruing under this heading would increase the attractiveness of the foreign investment alternative in relation to the hired management and domestic alternative, and would increase the desirability of the hired management alternative over the domestic one.

The external economies of the project on the supply of factors in the economy relates essentially to its training of labor.<sup>1/</sup> All alternatives will use some amount of unskilled manpower which they will train. The benefits of this training will accrue in part to the rest of the economy if there is any amount of turnover in personnel and if the skill learned is not specific only to this project. It is important to emphasize that the training effect obtains only if there is in fact an exchange of employees between the project and the rest of the economy. If all the individuals trained in the project work in it until the end of their useful life, then all the benefits from training will be reflected in the project benefits. If there are external effects, their time phasing will favor the foreign and hired management alternatives over the domestic one.

The impact of the project on economic stabilization is of three types. The first of these relates to fluctuations in the volume of production or in the price of outputs and inputs. Under the foreign investment alternative, the foreign firm absorbs in its profits a part of such fluctuations. The domestic economy absorbs the remainder of the fluctuation in the stream of its net benefits (whether tax payments are linked to profits or production). Should fluctuations be so large as to generate losses, they will be absorbed largely by the foreign enterprise. In the case of the domestic and hired management alternatives, the domestic economy must absorb the totality of the fluctuations. Therefore, the foreign investment alternative provides a further benefit in the form of a "fluctuations insurance". For comparison purposes it

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<sup>1/</sup> Note, however, the potential effects on savings and entrepreneurship arising indirectly out of the linkage effects.

is useful to think of this as an automatic and stabilizing capital inflow associated with the foreign investment alternative. The value of the "insurance" can then be taken as the cost to the country of an equivalent amount of counter-cyclical borrowing. The second external effect related to economic stabilization refers to the maintenance of inventories. Part of the stabilization effort may involve stockpiling of the output and in the case of the foreign investment alternatives this is likely to be financed from abroad by the foreign investor whereas in the case of the domestic alternative it would have to be financed by the country. This again is akin to a short run capital inflow associated with the foreign investor. The third external effect in this category relates to the situation when a devaluation is in the offing. It is to be expected that under these circumstances, the foreigner is more likely than the domestic company to attempt to hedge to prevent an exchange loss. This is so in part because of the differences in the perception of risk and in part due to the differential access to information and financial markets. This consideration therefore operates to some extent to make the domestic alternative preferable to the foreign alternative.

A final caveat to the application of the evaluation principles suggested above should be noted. In essence, what has been suggested is a differential forecasting procedure. As all forecasts, it entails uncertainty. Thus a decision based on "average" values or "best guess" values may well turn out after the fact to be wrong. Unfortunately, no fully satisfactory solution to this problem has yet been found. The analyst is therefore well advised to conduct sensitivity analyses to determine the extent to which a decision will be affected by variations

in the prices, coefficients or other parameters used in the analysis.

### III

#### A Simple Case Study <sup>1/</sup>

##### The Minta Company in Latinia

The Minta Company approaches the Government of Latinia with a proposal to open a large latinium mine in the Eastern part of the country. Total investment is to be \$200 million of which Minta will invest \$100 million of equity, the remainder to come from an Export-Import Bank Loan carrying 8% interest and payable in 25 years with a six year grace period, equal to the construction period. The breakdown of the investment costs is shown in Exhibit A.

The annual production of the mine is to be 100,000 short tons and reserves are estimated at about 1,800,000 tons. The FOB export price of latinium is expected to be between 38 and 42¢ per pound. Current costs are shown in Exhibit B.

The corporate income tax levied by the government of Latinia is 48% of profits. Depreciation rules allow straight line depreciation of fixed assets over 12 years. There are no import duties on capital goods. Minta requests a reduction of the profits tax to 35% and straight line depreciation of investment at 12.5% per year.

The government anticipates that Latinia could undertake the venture on the basis of domestic entrepreneurship ten years hence. Hiring foreign management is not regarded as practicable. The question

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<sup>1</sup> This case is modeled after the real world situation presented in Papanek, G.F., D.M. Schydrowsky and J.J. Stern, Decision-Making for Economic Development, Text and Cases, (Boston, Houghton-Mifflin, 1971)

Exhibit A

Total Investment Cost

	<u>\$ millions</u>
1. Port Development	16
2. Railroad	20
3. Roads and Truck Equipment	6
4. Towns	12
5. Water Supply System	9
6. Maintenance Shops	6
7. Power plant and Transmission Lines	18
8. Mining Equipment	56
9. Concentrator	22
10. Smelter and Shops	26
11. Construction Equipment	3
12. Working capital	<u>6</u>
	200

Exhibit B

Operating Costs

	<u>¢/lb. of latinium ore</u>
1. Mining including stripping	8.38
2. Concentrating	3.74
3. Rail transport	0.55
4. Smelting	2.32
5. Ocean freight	1.21
6. Refining in U.S.	3.06
7. Several expenses	0.74
8. Contingencies	<u>0.94</u>
	20.94



Gross Benefits:

Export of latinium ore 100,000ts at \$800/tn = \$ 80 million

Cost:

Operating Costs 100,000ts at \$420/tn = \$ 42 million

Interest 8% on average balance \$50 million = 4 million

Gross Cash Flow:

Profit before taxes \$34 million

Taxes 35% 11.9 million

Profits after taxes 22.1 million

Total cost: \$ 68.1 million

Net Benefit: 11.9 million

Therefore the flow of net benefits from the foreign alternative can be summarized as follows (counting from year of beginning of construction).

Year 7 through 14 net yearly benefit \$ 3.15 million

Year 15 through 24 net yearly benefit \$11.9 million

Under the domestic alternative we have the same gross benefits and operating costs. If the same Eximbank loan is obtainable, we shall have the same interest charge. However, instead of deducting a repatriation cost equal to depreciation and profits after taxes, we must deduct the domestic cost of capital, i.e., its yearly yield elsewhere in the economy. Let us assume this is 20%. We would then obtain the following statement:

Gross Benefits:

Export of latinium ore 100,000ts at \$800/tn = \$ 80 million

Costs:

Operating Costs 100,000ts at \$420/tn = \$ 42 million

Interest 8% on average balance \$50 million = 4 million

Cost of capital 20% on \$100 million = 20 million  
\$ 66 million

Net Benefit: \$ 14 million

In consequence, the flow of net benefits under the domestic alternative will be a yearly \$14 million from year 17 through 34.

Comparison of the two alternatives can be undertaken by calculating their present value at year zero. This operation results in the following:<sup>1/</sup>

<u>Discount Rate</u> <sup>2/</sup>	<u>P.V. Foreign</u>	<u>P.V. Domestic</u>
6%	\$ 48.9 million	\$ 57.9 million
8%	35.2 million	36.8 million
10%	25.7 million	23.7 million
12%	19.1 million	15.7 million

We can therefore that if the social time preference is 9% or higher the foreign alternative should be preferred. Before this conclusion can be translated into a policy recommendation, however, sensitivity analysis on the uncertain estimates must be carried out. We shall illustrate the procedure with regard to the price for latinium ore.

The price for latinium is expected to be within the range of 38¢/lb. to 42¢/lb. It is therefore useful to calculate the present value of each of the alternatives at prices varying between these limits by 1¢/lb. at a time. The resultant values are presented in Table II. Several interesting features stand out: (i) at lower prices, the foreign alternative is relatively more attractive, (ii) the discount rate at which

<sup>1/</sup> Taken as the value on Jan. 1 of the Year Zero of continuous streams during the years of the life of the project.

<sup>2/</sup> Note that in general the social discount rate need not equal the marginal productivity of capital. For disequilibrium situations this is obvious; for competitive equilibrium, it depends on the suboptimality of the income distribution or on external interdependence in the utility function.

Table II

Present Values of Foreign and Domestic Alternatives  
(35% profit tax)

Price of Latinium

<u>Discount</u> <u>Rate</u>	<u>38¢</u>	<u>39¢</u>	<u>40¢</u>	<u>41¢</u>	<u>42¢</u>	<u>Change</u> <u>per</u> <u>1¢/lb.</u>
6% F	38.5	43.7	48.9	54.1	59.3	5.2
D	41.3	49.6	57.9	66.2	74.5	8.3
8% F	27.2	31.2	35.2	39.2	43.2	4.0
D	26.2	31.5	36.8	42.1	46.4	5.3
10% F	19.5	22.6	25.7	28.8	31.9	3.1
D	16.9	20.3	23.7	27.1	30.5	3.4
12% F	14.3	16.7	19.1	21.5	23.9	2.4
D	11.3	13.5	15.7	17.9	20.1	2.2

both alternatives have the same present value depends critically on the price, and (iii) a higher social time preference can be compensated by a higher price but only up to a point. These interrelations can be clearly seen in Figure 1. Combinations of discount rates and prices lying above the line imply that the foreign alternative has a higher present value than the domestic one. Points lying below the line indicate combinations in which the obverse holds. It should be noted that above a discount rate approximating 11% no price will make the domestic alternative preferable to the foreign investment one while yielding positive net benefits.

The indifference line of Figure 1 is dependent on the tax rate assumed, as well as on all the other parameters of the problem. Tables III and IV present the same data as Table II for tax rates of 38.5% and 28% respectively. The corresponding indifference lines are shown together with the original one in Figure 2. It immediately stands out that at the same price and discount rate a higher tax rate favors the foreign alternative. On the other hand, a tax rate of 38.5% reduces the decision problem substantially: at a discount rate of 8% or higher price becomes irrelevant and the foreign alternative should be chosen. The converse happens with a 28% tax rate: unless the price falls substantially below 38¢/ lb. and the discount rate is below 8%, the domestic alternative is definitely the more desirable.

The effect of introducing shadow prices which differ from market prices can be analyzed in similar fashion.

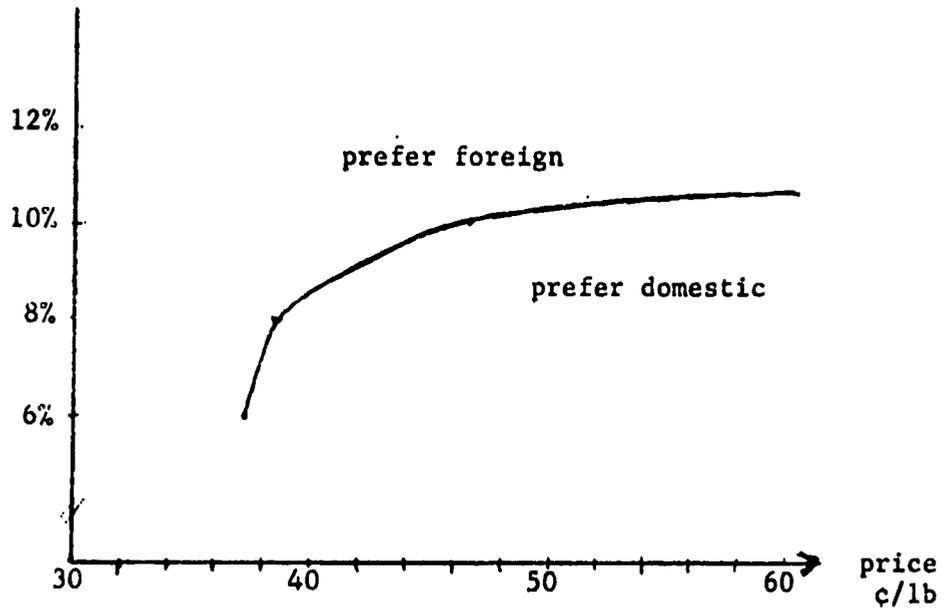


Figure 1

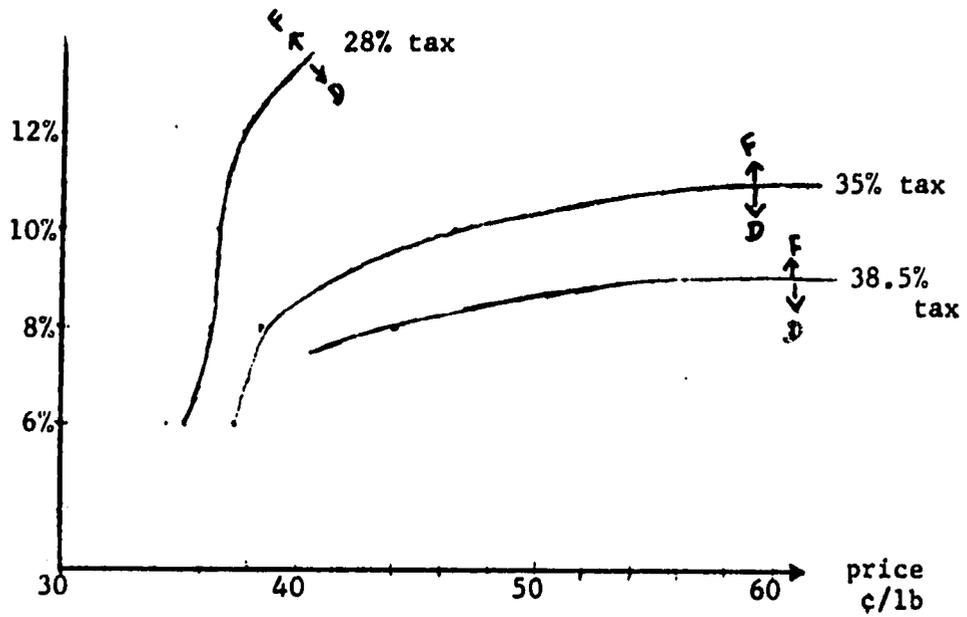


Figure 2

Table III  
Present Values of Foreign and Domestic Alternatives  
 (38.5% profit tax)

		<u>Price of Latinium</u>					Change per 1¢/lb.
<u>Discount Rate</u>		<u>38¢</u>	<u>39¢</u>	<u>40¢</u>	<u>41¢</u>	<u>42¢</u>	
6%	F	32.4	38.1	43.8	49.3	55.0	5.7
	D	41.3	49.6	57.9	66.2	74.5	8.3
8%	F	29.9	34.3	38.7	43.1	47.5	4.4
	D	26.2	31.5	36.8	42.1	47.4	5.3
10%	F	21.5	24.9	28.3	31.7	35.1	3.4
	D	16.9	20.3	23.7	24.1	27.5	3.4
12%	F	15.9	18.5	21.1	23.7	26.3	2.6
	D	11.3	13.5	15.7	17.9	20.1	2.2

Table IV  
Present Value of Foreign and Domestic Alternatives  
 (28% profit tax)

		<u>Price of Latinium</u>					Change per 1¢/lb.
<u>Discount Rate</u>		<u>38¢</u>	<u>39¢</u>	<u>40¢</u>	<u>41¢</u>	<u>42¢</u>	
6%	F	30.7	34.9	39.1	43.3	47.5	4.2
	D	41.3	49.6	57.9	66.2	74.5	8.3
8%	F	22.2	25.2	28.2	31.2	34.2	3.0
	D	26.2	31.5	36.8	42.1	47.4	5.3
10%	F	15.6	18.1	20.6	23.1	25.6	2.5
	D	16.9	20.3	23.7	27.1	30.5	3.4
12%	F	11.4	13.3	15.2	17.1	19.0	1.9
	D	11.3	13.5	15.7	17.9	20.1	2.2

Optimization Across Sectors

In the previous sections we have examined the problem of selecting the mix of local and foreign enterprise which extracts the greatest economic rent for a country from its existing natural resources or markets. The focus in that analysis was longitudinal in time. The complementary approach takes a cross-sectional view over all economic sectors during one period in time and queries how national factors of production<sup>1/</sup> are best used to maximize national income (or consumption). In a general framework both questions can be raised simultaneously and optimal allocation and scheduling determined together. If general equilibrium is postulated and mathematical programming used, subject to data limitations, an optimal solution can be determined. In economies under general disequilibrium, the simultaneity of the general equilibrium solution is broken by constraints emanating from the institutional framework or government policy. Under these conditions, partial equilibrium analysis becomes appropriate but forces a choice of maximizing rent through scheduling or welfare through sector (or product) choice. The former alternative is preferable for natural resource development and the assignment of captive national markets; the latter alternative is more appropriate to general industrial project choice.

The general rule for choosing projects which are to be executed with the same limited amount of national resources prescribes calculating the net benefits they generate in each of the various alternatives. In practice, the budgeted factor is most often capital and therefore evaluations of this kind have traditionally taken the form of calculating the social

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<sup>1/</sup> In this context, foreign capital that is not project specific (e.g. consortium aid available for any development project) should be counted as national capital.

marginal productivity of capital, a criterion also called the benefit-cost ratio. Foreign investment projects, however, may use no national capital at all, operating only with national labor and skills. The budgeted factor, therefore, would not be capital, but rather the bundle of other national factors used in the project. Under such conditions, the respective benefit cost ratio would lack a denominator and become undefined. As a consequence the traditional social marginal productivity of capital criterion is not appropriate for the comparison of foreign investment projects with other domestic projects. These projects must be compared, however, since foreign investment projects use some resources scarce to the economy too, such as labor and skills. In consequence it is appropriate to examine whether this use is a desirable one.

An alternative measure of the desirability of investment projects starts from the consideration that in an economy that trades with the rest of the world, most new projects will produce output which substitutes for existing imports or represents new exports. Under these circumstances the contribution of these projects to the availability of goods and services in the economy is equivalent to their net generation of foreign exchange. It therefore follows that maximizing the contribution to goods and services is equivalent to maximizing the contribution to foreign exchange availability. On the other hand all projects use some amount of the scarce national factors of production (labor, capital, management, etc.). In consequence, maximizing the contribution to goods and services from the available resources implies maximizing the net availability of foreign exchange per composite unit of domestic resources used.

A simple way to show the equivalence of the benefit-cost ratio and the domestic resources cost of foreign exchange in a one time period<sup>1/</sup> analysis for an economy consisting entirely of internationally traded

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<sup>1/</sup> It is obviously equally valid for the case of permanent and equal annual flows.

goods is as follows:<sup>1/</sup>

The SMP is defined as

$$P_k = \frac{\text{Output} \times P_{\text{output}} - \text{Inputs} \times P_{\text{inputs}} - \text{Labor} \times P_L}{\text{Capital}}$$

In or out of equilibrium, the commodity prices in social project evaluation are taken at their international prices times the shadow price of foreign exchange. Thus we can rewrite the above as:

$$P_k = \frac{(\text{Output} \times P_{\text{cif/fob}} - \text{Inputs} \times P_{\text{cif/fob}}) \times P\$ - L \times P_L}{K}$$

Rearranging, we get:

$$\frac{K \times P_k + L \times P_L}{\text{Output} \times P_{\text{cif/fob}} - \text{Inputs} \times P_{\text{cif/fob}}} = P\$$$

which is precisely the usual expression for the domestic resource cost of foreign exchange. It is obviously easy to show that

$$\text{SMP} > \bar{P}_k \quad \text{implies} \quad \text{DRC} < P\$$$

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<sup>1/</sup> Bruno, Michael, "The Optimal Selection of Export Promoting and Import Substituting Projects" in U.N. Planning the External Sector: Techniques, Problems, Policies, New York, 1965.

Inspection of the DRC formula shows why it can be used to evaluate projects with foreign capital as well as projects with national capital. All that is required is to keep in the numerator only national factors of production, <sup>2/</sup> the foreign ones (primarily capital but also expatriate labor) are regarded as part of the material inputs. Thus foreign investment projects have a DRC based entirely on the national labor content (plus whatever other scarce national factors may be used) whereas the national projects have a DRC based also on payments to national capital. If a given project can be undertaken with national or foreign capital, it will have two different DRC's. Since this switchability is common in industrial projects, the total ranking of investment opportunities will include most options twice: once using only foreign capital and once using only national capital. If joint ventures are also contemplated, then each project will appear additional times with different DRC's every time. Good allocation then requires that the projects with the lowest DRC's be chosen until the national resource availability is exhausted. In the process of going down the ranking, the nationality of the capital will be determined automatically.

If benefits and costs are spread over more than one period, the equivalence of SMP and DRC becomes more complex but still holds. <sup>1/</sup>

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<sup>2/</sup> Cf. Footnote 1, page 19.

<sup>1/</sup> Cf. Bruno, Michael, "Development Policy and Dynamic Comparative Advantage" in NBER Technology and Competition in International Trade, (forthcoming)

$$P_k = \frac{\sum_i (O_{cif/fob} - I_{cif/fob})_i P\$_i (1+r)^{-i} - \sum_i L_i P_{Li} (1+r)^{-i}}{\sum_i K_i (1+r)^{-i}}$$

where O=output, I=inputs, r=discount rate

If the relevant shadow price of foreign exchange is constant, the transition to DRC is exactly analogous to the one-period case. Should it be a stable function over time,  $P\$_i = P\$_i(t)$  a further degree of complexity is added to yield the following expression:

$$P\$_i = \frac{\sum_i K_i (1+r)^{-i} P_k + \sum_i L_i P_{Li} (1+r)^{-i}}{\sum_i (O-I)_i (1+r)^{-i} P\$(i)}$$

It is important to point out that all projects with  $P_k$  greater than the marginal  $P_k$  will have,  $DRC < P\$_i$ , thus the "menu" of intramarginal projects will be the same on either criterion. Nevertheless, the ordering within the intramarginal and extramarginal group will, in general, not be identical. <sup>2/</sup>

The problem is further complicated, and indeed becomes unsolvable in a partial equilibrium context, if the capital to be invested in different projects comes from independent yearly budgets, i.e., from amounts of savings available in different budgeting periods. In this

<sup>2/</sup> This point has been forcefully made by Lawrence J. White in a paper presented to the Harvard Development Advisory Service Dubrovnik Conference entitled "Alternative Methods of Selecting Industries for Investment and Expansion in Developing Countries". I am grateful to him for extensive exchange of ideas on this topic.

case, the projects do not compete for the same scarce resources but they may supply the same market or use the same national resource.

Three indicators are used widely to approximate the DRC calculation, the first of these suggests that industries be ranked according to the share of domestic value added in total cost and the best industry is the one with the highest domestic component; the second criterion suggests that industries be ranked in accordance with the net contribution to the availability of foreign exchange per unit of product and that the industry with the largest contribution be regarded as the most desirable one; the third criterion suggests that industries be ranked directly in terms of the DRC criterion itself. Let us look at each of these criteria in turn.

a) Domestic value added component.

This criterion argues that industries with the highest proportion of direct and indirect domestic value added per unit of output should be chosen as the most desirable from the point of view of increasing the welfare of the country. The assumption crucial to this conclusion is that domestic value added accurately measures the contribution to the availability of goods and services. Unfortunately, this assumption does not hold when there are tariffs on the output or any of the inputs. Then, the domestic value added consists of two parts: (i) substituted foreign value-added, and (ii) production subsidy given through the tariff system. The first of these elements is equivalent to the net foreign exchange made available and therefore measures the contribution to the availability of goods and services. The second element of domestic value added is merely a measure of protection. Furthermore, the calculation of the domestic component is usually under-

taken with regard to the value of production and not with reference to the domestic resources used in the production process. <sup>1/</sup> The consequences of using this criterion can easily be seen in the following example:

Consider the choice between projects designed to produce products A and B with the following cost structures:

	<u>P R O D U C T</u>	
	<u>A</u>	<u>B</u>
1 \$ = 40 pesos		
1. Imported Inputs \$90	P. 3600	P. 3600
2. Domestic Value Added	<u>1400</u>	<u>2400</u>
3. Total Cost	5000	6000
4. Cost of the equivalent import \$100	P. 4000	4000
5. Net contribution to availability of foreign exchange	\$ 10	10
6. Domestic component (2/3)	28%	40%
Foreign value added substituted	8%	6.6%
Tariff subsidy	20%	33.3%
7. Contribution to national income per peso of domestic resources (5/2)	\$ 0.00714	\$ 0.00417

Maximizing the domestic component would lead to the choice of product B since its domestic value added is 40% of total cost compared to 28% for product A. This choice would not be conducive to achieving the greatest contribu-

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<sup>1/</sup> Automobile assembly regulations specifying increasing local value added components are a usual application of this misinterpretation of the DRC criterion.

tion to domestic welfare since product A generates almost twice as much welfare per peso of resource use as B.

b) Foreign exchange earnings:

This criterion states that the most desirable industries are those that generate the largest possible net availability of foreign exchange per unit of output. The assumption implied is that there is no cost to using domestic resources, however such a basis of analysis is only justified when all resources are in infinite supply or are unemployed in the relevant time spectrum. The consequences of using this criterion can be seen in the following example:

Consider the choice between products C and D with the following cost structures:

	<u>P R O D U C T</u>	
	<u>C</u>	<u>D</u>
	1 \$ = 40 pesos	
1. Imported Inputs	P. 3,500	P. 3,000
2. Domestic Value Added	<u>1,500</u>	<u>7,000</u>
3. Total Cost	5,000	10,000
4. Cost of the equivalent import	4,000	4,000
5. Net contribution to availability of foreign exchange	\$ 12.50	25.
6. Contribution to national income per peso of domestic resources(5/2)	\$ 0.00833	\$ 0.00357

It is apparent that a unit of product D generates more foreign exchange availability than a unit of product C. Nevertheless the latter contributes almost three times as much to national income as the former.

c) Domestic resource cost of foreign exchange:

This criterion regards as most desirable those industries that have the least cost in domestic resources per unit of net foreign exchange made available. The rationale behind this criterion is precisely the maximization of the contribution to national income per domestic resource unit used. The net availability of foreign exchange measures the contribution to

goods and services; the domestic resource cost measures the amount of domestic factors of production used. The contribution of domestic factors to national income is determined by calculating the ratio between the net contribution to foreign exchange and domestic resource cost. The domestic resource cost of foreign exchange is calculated by determining the ratio of the domestic resource cost to the net contribution to the availability of foreign exchange. One measure is thus the inverse of the other. Therefore maximizing the contribution of domestic factors to national income is equivalent to minimizing the domestic resource cost of foreign exchange. The use of this criterion can be understood in the following example:

Consider again the products used in the previous examples.

		<u>P R O D U C T</u>			
		<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
1 \$ = 40 pesos					
1. Imported Inputs	P.	3,600	3,600	3,500	3,000
2. Domestic Value Added		<u>1,400</u>	<u>2,400</u>	<u>1,500</u>	<u>7,000</u>
3. Total cost	P.	5,000	6,000	5,000	10,000
4. Cost of the equivalent import	P.	4,000	4,000	4,000	4,000
5. Net contribution to availability of foreign exchange	\$	10	10	12.50	25.
6. Domestic Resource Cost per \$(2/5)	P.	140	240	120	280
7. Contribution to national income per peso of domestic resources (5/2)	\$	0.00714	0.00416	0.00833	0.00357

It is clear that product C has the lowest domestic resource cost per unit of foreign exchange made available and the highest contribution to national income per unit of domestic resources as well.

It is worthwhile to pursue this example one step further. Let us assume we have one million pesos worth of domestic resources to invest. Their yield in terms of contribution to the availability of goods and services (national income) in each of our four alternative industries is as follows:

if used in product A	\$ 7,140
if used in product B	\$ 4,160
if used in product C	\$ 8,330
if used in product D	\$ 3,570

When comparing industries A and B, the former is to be preferred. This coincides with the ranking of these industries by their domestic resource costs of foreign exchange (140 vs. 240). But industry B has the higher domestic input coefficient. Thus it is confirmed again that this latter indicator would have lead us to the wrong choice.

The comparison of industries C and D reveals that C is preferable. This again is consistent with a lower domestic resource cost of foreign exchange (120 vs. 280). Choice according to the domestic component would have led to preferring product D (70% vs. 30%) and choice by foreign exchange available would also have yielded D (25 vs. 12.50). It is further demonstrated thereby that these last two rules are prone to lead us to error.

In comparing all four industries, C turns out best as is predicted by the fact that it has the lowest domestic resource cost of foreign exchange.

In the above examples, the DRC was taken at market prices. In most LDC's these will diverge systematically from the "true" scarcity prices in the economy. It is necessary therefore to replace DRC or value added at market prices by their equivalent at shadow prices. One way to obtain these is through the use of an appropriate programming model. Such a model will yield a consistent set of factor prices and maintain the equivalence between the DRC and the SMP for all activities in which the country should optimally engage (i.e., which are in the

optimal basis). <sup>1/</sup> Unfortunately, such a model also assumes perfect allocation of the available resources and analogues the workings of a competitive market. It is therefore very questionable whether the resulting prices are relevant measures of scarcity in a situation of general disequilibrium in which the basic factor markets (capital, labor, foreign exchange) are not in competitive equilibrium, where rationing is the rule rather than the exception and where micro and macro distortions abound. An alternative set of shadow prices, derived from market information which reflects the existing distortions, can be calculated with some ease for foreign exchange, labor, and time, but with much greater difficulty for capital. It follows that shadow priced project analysis under general disequilibrium is easier to undertake with an SMP formula than with a DRC formula, although both are still equivalent and can rank all projects that do not make the disequilibrium constraints redundant (the analogue to not switching the basis). A full exploration of this issue is outside the scope of this paper.

To complete our analytical framework we also need to add a cut-off point. Above what level of resource cost of foreign exchange should projects (domestic as well as foreign) be rejected? The answer is derived from two general principles: (a) every economy should endeavor to reduce continuously its domestic resource cost of foreign exchange; and, (b) the value to consumers of the foreign exchange made available must be at least as great as the cost.

The first of these general principles merely embodies the desideratum of maximizing national income. In application it means that if a given project will draw resources away for activities where the domestic

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<sup>1/</sup> Bruno, "Development Policy and Dynamic Comparative Advantage".

resource cost of foreign exchange is higher, such a project should be undertaken. An approximation of the foregoing is to undertake all projects having a domestic resource cost of foreign exchange below the average for the economy.

The second general principle states little more than "benefits should be greater than costs." Yet in many economies instances can be found of industries in which the domestic resource cost of foreign exchange exceeds the utility derived by consumers from the foreign exchange (imports) thus made available. This may be due as much to an underpricing of imports as to a choice of high cost industries. A useful rough guide to the value of additional foreign exchange to consumers is the price a dollar's worth of imports sells for on the domestic market. <sup>1/</sup>

V

Conclusion

In this essay we have recognized at the outset that host governments require tools by which to appraise the merits of specific investment proposals made by foreign enterprises. In the absence of these, emotions will hold more sway than reason in the process of decision making on important questions of national policy.

The foreign investment proposals confronting a country were divided into two types: those involving alternative forms of operating within a sector and those implying choice between different sectors. For the former, the net present value criterion was suggested as appropriate; for the latter, the domestic resource cost of foreign exchange was preferred.

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<sup>1/</sup> For a more detailed argumentation of this point cf. Schydrowsky, D.M., "On the Choice of a Shadow Price for Foreign Exchange", EDR #108, Oct. 1968.

In both sets of circumstances it is clear that no general statement of the desirability of foreign investment can be made. Each host country must undertake to evaluate the projects offered it on a case by case basis.