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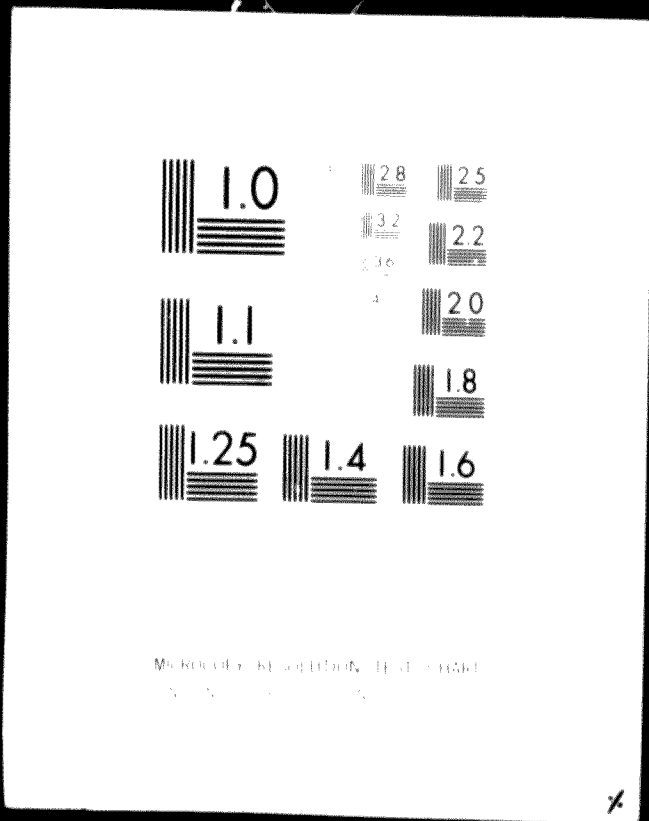
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INTEGRATION OF ACCOUNTING AND ECONOMIC CONCEPTS
OF COSTS AND BENEFITS IN EVALUATION
OF INDUSTRIAL PROJECTS

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The views expressed in this paper are those of the author.

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I. INTRODUCTION

A. PURPOSE AND METHOD

This paper is intended to describe and in some respects to develop further a calculus by which the data and accounting methods normally used within the private sector for the economic evaluation of industrial projects can be adapted to provide an optimum technique for the comparative evaluation of the economic gains to society or to a nation of alternative projects to which resources might be allocated.

It is expected that this calculus will be of primary use to those industrial economists charged with evaluating the economic merit of industrial projects from the standpoint of a nation or of a similar social unit with a view to determining the attitude and associated policies that a governmental or quasi-public body may wish to take toward a project.

The calculus recommended and used in this paper has come to be called the benefits-costs method. The calculus begins with measuring benefits, benefits being the value added in the project, regarding that value as equal to the market value of the output of a comparable productive operation in existing industry,¹ less the amount paid for material used in production of that output. Thus, if existing production of a given quantity of a product utilizes materials for which the producer pays 45 monetary units and the manufactured output is sold for 75 units (net 30 units) the value or benefits deemed to be added by the project under consideration (using the same materials at the same prices and producing the same quantity) would also be 30 units. In short, the benefits of a project are conceived to be equal to the value being added by a comparable operation within existing competitive enterprise.

The calculus also requires measuring the costs of the project which are conceived to be the value of opportunities foregone. Thus each factor scheduled to be allocated to the project is priced at its opportunity cost, that cost being the value added by the factor in its present use.

Benefits are values that can be created in the project; costs are values now being created by the factors which will be employed in the project. Benefits minus costs provide the increment to total value of product to be made possible by transferring the factors which will be employed in the project from present use to projected use. The ratio of benefits to costs of any project is a useful measure by which projects can be compared to identify those economically most advantageous to a nation or to society.²

¹ This generalization is subject to qualifications later presented but is adequate for the argument at this point.

² Many of the methodological disagreements and misinterpretations respecting project evaluation are traceable to differences or misunderstandings as to benchmarks or standards of comparison. Various evaluation methods use various standards. A given project may be evaluated against any one or more alternative ways of obtaining the same manufactured good and/or against any one or more alternative uses of the package of resources involved in the project. The approach here recommended calls for taking existing allocations and prices as the standard.

B. BENEFITS-COSTS COMPARED WITH PROFITABILITY

The significant features of the benefits-costs approach can be pointed up most effectively by comparing it with the principal alternative method of computing the magnitude of the economic gain expected from a project. Essentially, the alternative (herein called "the profitability method") is to make appropriate modifications in the statement of the prospective profits of the projected enterprise to its owners, modifications which result in a summation which depicts the social or national profitability of the project.

The benefits-costs calculus we here recommend for estimating social or national economic gain, while not entirely distinct from the profitability method, differs sufficiently to make comment on the differences desirable at this point. Illustrations of these differences are presented later in this paper.

In the first place, the benefits-costs method recognizes that the private gains from a project are gains to all the factor suppliers that participate, and frequently to the consumers as well-- that the gains are not confined to those inuring to the benefit of equity investors-entrepreneurs. Although the profitability method can be explained and practiced in ways that acknowledge adequately the values gained by others, the method so frequently concentrates upon entrepreneurial profit that other gains are slighted if not ignored.

A second contrast is that the benefits-costs calculus seeks directly to identify and measure the economic impact of a project upon each party affected by it. The profitability method, on the other hand, in calling for a series of modifications to an estimate of entrepreneurial profit, focuses upon a single magnitude (usually "return on investment") which is estimated and re-estimated at each stage of the calculation and which, at many of the intermediate stages, is almost impossible to define or comprehend. We believe that the rationale of the benefits-costs calculus is simpler and more easily understood and that there is less danger of ambiguity or controversy as to its meaning. Moreover, the benefits-costs calculus utilizes concepts and produces intermediate numbers which are useful in their own right.

A third difference between the two methods is the characteristic of the profitability method to tempt the analyst to seek to relate the modified profits only to capital investment, allowing the computation of a rate of return on capital. Considering that capital is not the only factor of production, it can be grossly misleading to treat gains attributable to all factors as a return on capital. More importantly there is the danger that evaluators will attempt to compare projects in terms of relative rates of return on capital, a comparison that can lead to an uneconomic preference for projects employing relatively little capital. (It must be ~~acknowledged~~, however, that projects requiring little capital are frequently highly advantageous to developing countries.)

The benefits-costs method also facilitates the measurement of gains likely to be shared among nations participating in a multi-national project or economically affected by a project in another nation. Factors and their gains can be identified by their national origins. The profitability method, on the other hand, does not lend itself to the calculation of nation-by-nation gains.

A related occasional drawback to the profitability calculus is that some persons not fully understanding it may be led to suppose that nations gain from a project in proportion to their right to receive entrepreneurial profits from the enterprise.

A fifth advantage of the benefits-costs calculus is that it uses social accounts concepts. Increasing reliance is being placed upon social accounts as a framework for economic analysis in the world today; an economic calculus that can fit that frame thus has additional utility. Benefits represent the social or national income which will be produced by the projected enterprise; costs comprise the social or national income now being produced by the factors scheduled for allocation to the prospective project. For example, if the national income is presently 1000 monetary units and if, by diverting to the project resources now earning 10 units (costs), the nation can produce benefits of 30 units, the national income is increased to 1020 units. The benefits (30) compared with the costs in national income foregone (10) represent a benefits-costs ratio of 3:1. That ratio, here defined through illustration, constitutes one of the best means of evaluating and comparing alternative projects. The nation can then proceed to implement first the projects that carry the highest benefits-costs ratios--i.e., it can do so if the benefits and costs have been detailed and authenticated and all parties requisite to implementation are convinced of the wisdom, on all grounds--including noneconomic considerations--of proceeding to that objective.

To point up a final difference between the benefits-costs calculus and at least some variants of the profitability approach, we reiterate that the recommended method takes as one objective the measuring of the whole of the economic gain of a project insofar as that gain can be measured via the social accounts. In contrast, the profitability approach employed by some analysts stops short of attempting to measure the magnitude of economic gain; it is content with a measure merely proportionate to economic gain, although it is a measure that allows the comparison and thereby the ranking, of projects from a social or national economic standpoint. But lacking a measure of the magnitude of the economic effects, a government is in a poor position to make a judgment of the magnitude of the governmental assistance (or impediment) appropriate for the project.

There is no need to assume, in order to be able to advocate the use of the benefits-costs calculus (or of any alternate method) that forecasts of demand, supply, and internal efficiencies are any more accurate than development economists know them to be. Precise forecasts are impossible; the economist and all users of project information must bear this impossibility in mind. But rough numbers are nevertheless superior to no numbers at all.

It needs to be conceded that, meritorious as we believe the benefits-costs calculus set out in this paper to be compared to available alternatives, the calculus suffers from imperfections which will become evident in the paper. The concepts of social or national benefits and costs are not precise and elegant. Many of the conceptual and methodological choices that have to be made

¹ It can be granted that once projects deserving implementation have been identified by a ranking process, they can be examined further to determine the amount of gain it is reasonable to expect and then the amount of governmental encouragement which would be justified.

are made to some extent arbitrarily; thus they can be criticized by persons who would make different arbitrary choices. Choices should be debated, but all critics may agree at the outset that, with perfection in concept and method beyond reach, the approach sought should be one which is least defective. The criterion must be such simplicity as will enable the industrial economist quickly to fit together readily available data in a manner that leads to a pertinent conclusion.

C. INITIAL INFORMATION

Our approach begins with the project information that is usually compiled to determine the likely profitability of the project to the suppliers of equity capital, or to the suppliers of all capital if the capital structure has not been decided. The problem of comparing profits attributable to alternative allocations of capital is examined.

It can then be noted that however helpful profits may be as a guide (and an incentive) to the most productive allocations of resources, profits--i.e., increments to profits--are not a measure of the economic benefits to society of a projected enterprise. These benefits redound to all the factors, and only as one compares the prospective earnings of all the factors--managerial and non-managerial labor, rented land, and loan capital, as well as equity capital--in the project as against earnings in their present employments can one move toward a measure of total economic benefit.

The prospective earnings of each factor are regularly part of project information (because they are estimated expenses to the enterprise) but the body of information needs to be increased to include present earnings as well since these are to be taken as the measure of costs to which benefits in any project using these factors can be related.

While a sequence of calculating social or national benefits and costs which begins with a measure of entrepreneurial profit (the sequence adopted in this paper) may appear to be suitable only for projects in which at least part of the equity is provided from private sources, it will be seen that the method set out in this paper can accommodate the whole range of ownership patterns including projects fully government-owned.

D. ORGANIZATION OF PRESENTATION

It is convenient to consider first the calculation of benefits and of costs as seen from the standpoint of each of the private parties--resource suppliers, consumers, and parties involved in competitive industries--who may be affected by the project once it is implemented. The private standpoint is distinguished from national or social standpoints in Chapter II. Chapter III then concentrates upon the measurement of the private benefits and costs of a project.

Chapter IV sets out the social accounting frame which is used in the calculus and shows the manner in which the calculus facilitates the measurement of benefits and costs to each of the nations affected by the project. Chapter V then considers the modifications that must be made to private benefits and costs calculated at market prices in order to arrive at social or national benefits and costs. The needed modifications often require the conversion of

market prices to what have been called social or accounting or shadow prices; it can be noted here, however, that the needed conversions have been minimized by the use of existing factor earnings in the earlier computation of private costs. Most of the conversions referred to in Chapter V are occasioned by the impact of governmental activities upon market prices. Taxes and subsidies are given particular attention.

We have tried to incorporate into the calculus of the social or national benefits-costs ratio as many economic facts as can be monetarily quantified and can with good economic sense be combined mathematically with other facts. Chapter VI discusses the insertion into the calculus of some of the indirect effects of the project as it prompts changes in social or national income elsewhere in the economy. The impossibility of incorporating into the benefits-costs calculus the impact of a project upon the international balance of payments is frankly acknowledged in Chapter VII, while Chapter VIII points to other economic consequences that are not registered in social accounting aggregates.

Chapter IX provides conclusions in terms of the ways in which the benefits-costs calculus can be used by governmental bodies in deciding (a) which projects are economically most deserving of implementation and (b) the size of the fiscal operations required to give appropriate encouragement to favored projects, and appropriate discouragement to disfavored ones.

II. CONCEPTS, TERMS, AND EVALUATION VIEWPOINTS

The purpose of this chapter is to set the stage for the calculus by defining some of the needed conceptual tools and viewpoints from which quantities can be estimated. Generally we are here concerned with the stage setting for the private calculus; the additional tools needed for elaboration into a social calculus are set out in Chapter IV.

A project is, in almost all instances, initially conceived as an enterprise that is less than fully integrated, i.e., it has occasion to buy some materials and supplies from other enterprises and/or it does not sell directly to final consumers. Thus any new industrial enterprise is likely to give rise to some additional activity within the organizations from which it buys and to which it sells.

The evaluation of a project should take account of this additional activity. Thus project will from here forward be broadly conceived: the term will refer to all the productive (income-creating) activities that must be performed if the products of the core enterprise as initially conceived are to reach the consumer. Included is the "production" of the physical facilities of the project, i.e., the manufacture of the machinery and equipment to be installed. Excluded from "project" as here conceived are the activities needed to make such manufacture possible, e.g., the construction of the machine manufacturer's own plant. These indirect effects, which are those often referred to in discussions of the economist's "acceleration principle" must, of course, be considered in any full evaluation of a project. But they can be classified as secondary effects rather than as part of the project proper; they are discussed in Chapter VI.

It needs to be borne in mind that the value added or benefits produced by a project are not necessarily the same as the sales revenue of the project; insofar as the sales revenue includes any values produced prior to the project or prior to the accounting period being used, revenue will be larger than value added.

The concepts of benefits and of costs require careful attention to avoid any possibility of misunderstanding. From the viewpoint of factor owners the benefits of a project are the incomes or earnings they expect from it. On the other hand, the costs of allocating resources to any projected use are the loss of the opportunity to continue to put them to their existing use. Costs may thus be regarded as benefits foregone. Expenses in any one use, existing or projected, must be subtracted from the revenues in that use to arrive at earnings of (value added by) the factor in that use. In summary, the prospective earnings in a project are benefits, while the earnings in the present use which will have to be sacrificed are the costs of the project.

It is convenient to separate private benefits and costs, on the one hand, from governmental benefits and costs on the other. Private and governmental effects combined, and then corrected for any market prices that may have been to some degree arbitrary, are the social, or the national benefits and costs of the project.

The word private should ordinarily not require definition, but in one respect we shall want to use it to embrace a governmental body. It is helpful to distinguish between, on the one hand, parties that supply factors and purchase products and those, on the other hand, that levy taxes and provide subsidies. When governmental bodies act in the former capacity it is useful to regard them as private parties; when their actions fit in the latter capacity, the bodies fully deserve to be regarded as governments.

The total private benefits and the total private costs of a project are the sum of the benefits, and the sum of the costs,

- (a) to all the suppliers of factors to the project,
- (b) to the consumers of the output of the project (benefits only--no costs involved),
- (c) to the suppliers of factors to competing enterprises who will need to reallocate their resources, and
- (d) to the consumers of the present output of the factors to be allocated to the project (benefits only).

It has become common to use the words society and social rather loosely to refer comprehensively to people (the private sector) and their government. The terms usually carry a connotation of universality: society includes all of us. This connotation is accepted in this paper.

We shall need in addition to the concept of society the concept of nation, which we can define broadly to refer to any political grouping of a people and their government comprising less than the whole of society.²

¹ Thus depreciation is never part of value added.

² Both society and nation incorporate people as producers and as consumers, while enterprises incorporate them only as producers.

Society is being defined then as a closed unit; it is not part of a larger whole, and may be thought of as comprising more than one nation. A nation is an open entity. And nation shall be used to refer to any open political unit--village, district, state, province, region, etc., as well as any group of political bodies that may be less than universal in its membership. Thus the United Nations, or any of its specialized agencies, or any multi-nation community, may be connoted by the word nation as used in this paper.

As may well be supposed, the purpose of these terminological niceties is to permit us easily to handle projects that affect two or more nations, to recognize and analyze situations where the economic benefits and costs of a project to the parties who compose one nation may be different from the benefits and costs of that project from the standpoint of another nation. Since in many developing countries most industrial projects of sufficient size to deserve evaluation by government will involve parties of two or more nationalities, it behooves us to have evaluative techniques to facilitate the separation of any project into components by nationality of participation.

While we are considering the concept of nation, it may be useful to distinguish a nation from a country. A country may be regarded as a geographic entity containing, in the sense of physical presence, an aggregate of material resources without regard to the nationality of their ownership and a collection of human resources without regard to their nationality. A nation may be regarded, at least for purposes of this paper and the recommended calculus, as a political entity which embraces all persons who are "nationals" of the entity regardless of their country of residence and all productive factors owned by those nationals regardless of the country of their physical location. This aspect of the meaning of nation will need to be borne in mind for referral later when we consider national accounts concepts such as national income and national product.

Although ideally it might be urged that each project should be evaluated from the standpoint of each nation affected, typically the only national evaluation undertaken is that from the standpoint of the developing nation in which the project (or the principal part of it) is situated. In discussing in this paper the national calculus, the viewpoint of the developing nation is regularly taken, but only as a convenience; the same evaluative method can be used for any affected nation.

III. MEASURING PRIVATE BENEFITS

In this chapter we shall concentrate upon the quantitative facts that each of the suppliers of factors to a projected enterprise will wish to establish in order to determine the probable economic benefits and costs to him of his participation. Our assumption (throughout this chapter, at least) is that each party is motivated by prospects of economic gain, and that his participation will be forthcoming if he foresees greater gain in this venture than in any alternatives of which he is aware.¹

¹ Included within the scope of this chapter are governments and quasi-public bodies to the extent that they are examining a project from the standpoint of a prospective factor supplier concerned to maximize his own economic gain. Governments occupy two other standpoints with respect to each project: (1) that of an institution which collects taxes and expends funds, including the payment of subsidies; and (2) that of the arbiter of national or social welfare which evaluates the national or social economic benefits and costs of the proj-

While this paper is not concerned with measuring private economic gain as such, the data needed for such measurements are the materials which, with appropriate modification, become the gauge of net economic benefit to society and to each of the nations involved in the project.

Although these data come into being (and thus become part of the project, as we use that word) as private parties attempt to determine their own interest, even a project which is expected from the outset to be fully public in ownership should be buttressed with all the facts that are needed for private evaluations. Evaluation of any project in terms of national or social interest requires all the information that each of the private parties associated with the project might need.

A. MEASURING ENTREPRENEURIAL BENEFITS

It is well to begin with the accounting data and gauges that will be sought by the party examining any prospective enterprise from the point of view of the entrepreneur who provides venture capital in return for the prospect of profits and who typically carries responsibility for planning the project, mobilizing the other productive factors needed, executing the plans and controlling the operating enterprise.

The entrepreneur is concerned to forecast the profit that can be earned on the risk capital to be invested in the projected enterprise by him and others who may be willing to provide capital on an equity basis. For this purpose he will wish to assemble reliable data for each year (or even shorter periods) during the expected life of the enterprise covering sales revenues and expenses¹ associated with operations and with providing the fixed assets. These data require a forecast of the entire economic and extra-economic matrix in which the project will fit, including prices, and perhaps quantities, and influences thereon, of items moving through all markets in which the firm may have occasion to buy or sell. The entrepreneur takes prices as he finds them or as he expects them to be; that is, he generally regards prices he will pay or receive as objective facts over which he has no control and to which the enterprise will adjust.² Revenues need to include not only proceeds from sales but also any cash subsidies. Expenditures must include taxes and excises, etc.

From these quantities expected profits (entrepreneurial income) in each accounting period can be computed.

The entrepreneur cannot regard a table showing profits in each year during the life of the project as the end of his calculus. Understandably he would prefer a single sum which can be representative of the entire project.

¹ As emphasized in Chapter II, these expenses which are used in calculating benefits must be clearly distinguished from costs which are present earnings (present revenues minus present expenses) that must be foregone if the project is implemented.

² Although market prices are used in the evaluation of each private interest in a project, the evaluation of the national or social interest requires the testing of market prices and the correction of those that are arbitrary in respects that can give faulty guides to resource allocation. Price corrections are considered in Chapter V.

The simplest route to a single sum is to compute the mean average of the prospective earnings in each year, thus arriving at an average annual level of earnings.¹

A somewhat more sophisticated, and nowadays much discussed, method is to compute the present worth of each annual benefit or cost. These present worths of annual magnitudes can then be summed to find the present value of the entire stream of benefits or of costs over the lifetime of the project.

The calculation of present value requires the choice of a rate of time discount (interest) which recognizes that the more distant in time a given sum may be the lower will be its present value. For example, if the selected rate of time discount is 5%, the sum of \$1 payable two years hence has a present value of roughly 91¢ while \$1 payable 20 years hence has a present value of only 38¢, roughly.³

It should be stressed that the rate of time discount selected has no necessary connection with the rate of interest on money or the rate of return on equity capital that may be relevant to a project. Time discount manifests the fact that the more remote in future time the receipt or payment of a given sum, the less important now the right to receive or the obligation to pay that sum. Rates of interest and return on equity capital are thus indications of how rights to receive money in the future are valued currently in capital markets.

As between these two general ways of handling a stream of profits or of any benefit or cost we suggest that the estimation of an average annual sum is the most practical route to be taken by the industrial economist charged with evaluating the prospective social or national gains from a project. The method is fast and relatively simple. Moreover, the resultant number is an annual figure which may readily be inserted into the calculation of national or social income which is regularly expressed in annual terms. Finally, the concept of the present worth of a multi-year stream of benefits or costs may not be readily grasped by nonspecialists within government who may help decide government's stand respecting any project.⁴

B. PROFITS AS A RATE OF RETURN

The entrepreneur regularly finds it worthwhile--in order to compare various investment opportunities, if for no other reason--to relate average annual profit to his (average) investment, i.e., to compute a percentage rate of return on capital that a project is likely to afford.

¹ The method of calculating a representative or normal annual profits figure can be varied; occasionally some figure other than the mean average can be the most typical sum.

² "Present" can refer to any selected point in time, such as the date of the first expenditure on a project or the production day of the enterprise.

³ $\frac{\$1}{1.05^2} = \$0.91; \quad \frac{\$1}{1.05^{20}} = \0.38

⁴ We recognize this choice as decidedly controversial. It may be argued, for example, that government projects tend to be relatively capital-intensive and

But the manner in which the calculation can properly be made is not simply prescribed. Even for a single year there is the less-than-easy task of placing a value upon the investment principal. Additional complexity is introduced as one undertakes to devise a satisfactory method for calculating the rate of return on an investment (or a series of investments) the returns from which are spread over a number of years. The problem has generated a sizable body of literature--and is still far from solved to everyone's satisfaction.

One popular and relatively simple method is to calculate the average annual return on average investment as follows: sum the total cash flow (depreciation plus profits) expected from the investment, subtract the total investment (the remainder equals, of course, total profit over the life of the investment), and divide that remainder by the number of years the investment is expected to continue to be productive and by one half the amount of the investment.

For example, an investment costing 1000 and providing receipts (depreciation plus profits) of 1400 over a five-year lifetime provides an average rate of return of 16%:

$$\frac{1400 - 1000}{5 \cdot 500} = .16$$

This method notes that the average annual profit during the five years is 80 and assumes that the principal is amortized (depreciated) to zero value at the end of the productive life of the investment in a pattern such that the average investment is one half the initial investment.

This method of calculation is entirely satisfactory when the assumptions are at least in rough accord with reality, i.e., when entire investment is made at the outset and when receipts are the same amount each year.

The entrepreneur, in addition to calculating prospective profits and an associated rate of return, may also compute the payback (or payout) period for his investment. Put simply, this is done by noting the period of time required for the cash flow (capital consumption plus profits) generated by the investment to equal the amount of that investment. The payback measure, which is mentioned here only in passing, is supplementary to, and thus not a substitute for, other measures by which returns on alternative investments can be compared. The payback criterion is particularly relevant in evaluating high risk investments such as those, for example, serving markets which might suddenly collapse.

C. ENTREPRENEURIAL BENEFITS-COSTS RATIO

In having already declared our preference for the benefits-costs ratio calculus as the best available means of gauging the national or social economic desirability of a project, we have made evident our belief that the profits-as-a-rate-of-return method, however appropriately modified and framed, is not the best means. More will be said on this matter in the following chapter.

¹ John G. McLean, "How to Evaluate New Capital Investment," Harvard Business Review November-December, 1958, p. 59; Ray. I. Reul, "Profitability Index for Investments," Harvard Business Review July-August, 1957, p. 116; Robert H. Baldwin, "How To Assess Investment Proposals," Harvard Business Review May-June, 1959, p. 48. Also, Manual on Economic Development Projects Part Two; Chapters P O L I C Y 1958

The completion of the computation of the benefits-costs ratio pertinent to equity capital as a factor requires the estimation of the costs to the entrepreneur of foregoing the benefits (earnings) of the equity capital in its present use.¹ In other words, the expected level of capital earnings--the revenues from present investments (or likely alternative future investments) minus expenses such as payments to the other contributing factors--becomes the costs entry for the entrepreneurial calculus.

Average annual costs can be computed in the same way as average annual benefits.

If the refinement of estimating present worth (as a supplement to or an alternative to average annual figures) is being undertaken, the analyst normally should use the same rate of time discount in handling costs as he employs in computing present worth of benefits.² Moreover, the same number of years must be used in each calculation; assuming that the present worth of all the benefits over the full life of the project was computed, that lifetime in years must be used in computing the present worth of costs.

It is important to observe that the benefits-costs ratio is to the equity investor as adequate a guide as the rate of return in enabling him to compare projects. In choosing those which promise the highest benefits-costs ratios he is choosing those which promise the highest rates of return. The benefits-costs ratio approach is also appropriate to all other factor suppliers; the rate of return, on the other hand, cannot be used for factors like labor which are not priced as assets.

D. EARNINGS OF OTHER FACTORS

Earnings on loan capital are relatively easy to handle. Loan interest is precise and certain, and it is known to all. The amount and terms of all loans anticipated for a project are included in project documentation by the time plans are finalized. Costs in the sense of present interest earnings foregone can be accurately estimated from financial market information. Both benefits and costs can be refined by working the lender's operating expenses into the calculation.

Projects which utilize loan capital supplied by governments or public financing institutions frequently enjoy interest rates that are below going market rates. Both costs and benefits should be entered at the reduced or subsidized rates. While this practice may introduce an artificial element on occasion, we recommend that factor suppliers be kept conceptually distinct from government qua government which provides subsidies or imposes taxes. Thus the body that provides a subsidized loan to a project may best be regarded as in turn subsidized by government.

¹ This is sometimes referred to as the "opportunity cost" of the project.

² If there is a substantial difference in the risk factor, as between costs and benefits, it may be desirable to select different rates of time discount for each rates which realistically reflect the estimate of risk.

Often a project must be evaluated before all decisions about the capital structure of the enterprise have been made. If the equity-debt ratio is not known, profits and interest cannot be separately calculated. But observe that the sum of profits and interest will, of course, be calculable. Thus the benefit to capital providers as a group can be computed, as can the benefit to society and to any nation or any party which knows it will be providing either all of the capital or none of it.

Rents require only brief mention. If the project is to use leased land carrying an annual rent, that amount may be entered as the average annual benefits. If the land is to be purchased, the annual benefits may be inferred from the price of the land multiplied by the going interest rate. The costs of using the land for the project are the present annual rental. Typically in developing countries plots appropriate for industrial projects add remarkably little value in their present use. Thus the benefits-costs ratio for the land factor can be high indeed.

The consideration of wages, for both managerial and non-managerial labor, in terms of the benefits-costs ratio calls for entering as benefits the wages expected to be paid by the projected enterprise. Costs may be awkward to decide. As regards non-managerial labor, costs are wages presently being earned. To the extent labor will be drawn from the ranks of the unemployed, costs can be entered as zero except for any unemployment benefits that will cease once the worker secures employment.

The present earnings of managerial personnel may have to be estimated rather roughly. If their present employments are in their home countries and their projected employment is in another country, part of the difference between benefits and costs will be traceable to expenses of international relocation, etc., but the occasion for the differences does not affect the way in which the amounts need to be recorded for a project evaluation calculus.

Advocates of the rate-of-return approach sometimes seem to argue that wages can be treated as a rate of return on the capital value of labor. Apart from other objections that might be made to this suggestion, we believe it sufficient to note that labor can be assigned a capital value only by the process of capitalizing earnings; since the process requires the assumption of a rate of return it hardly provides a method by which a rate of return can be computed.

E. IMPACT ON CONSUMERS

One other private party, the customer or consumer, is in a position to benefit from, or be hurt by, a new industrial enterprise. The consumer gains to the degree that he can, from the project, obtain the good more cheaply than before, or can obtain better good without a commensurate increase in price. The consumer's welfare is impaired to the degree that he must pay a higher price for the product, or generally obtain a less satisfactory good for a given outlay.

Although one can and should think of the existing price as the standard by which to measure consumer benefits which appear as lower prices for a given product, there is no occasion to attempt to visualize costs or a benefits-costs ratio for the consumer. Costs do not enter the picture in that, apart from government--which is still to be considered--all the costs of the shift of resources to the project have already been entered and summed as we noted costs

and benefits for the several factors. But if the consumer is affected through a change in prices, any benefit through lower prices should be added to factor benefits in the process of arriving at total economic benefits; any loss to the consumer via an increase in prices should be subtracted from total factor benefits.

In those instances in which the project is to manufacture a product which is new to the intended purchasers, how does one measure the net consumer benefits (positive or negative)? The problem may be typified by a project to manufacture an enriched food to raise nutrition levels in a developing country. There is no earlier price in the country which can serve as a standard for measuring the incremental benefits. If there is a market elsewhere for the product the cost of obtaining it in that market may be used; otherwise the evaluator may have to estimate the monetary amounts needed to attract the required resources to implement the project.

F. IMPACT ON COMPETITIVE RESOURCES

All too commonly, but still understandably, ignored in any calculation of society's or the nation's economic gain from a project are the consequences for the factors that are presently involved in producing the goods that are scheduled to be produced instead by the projected enterprise, i.e., the consequences for competitors. The omission is understandable in that most project evaluations are made from a national rather than a social standpoint and the nation in which the project is to be situated is often not the nation in which competitors are producing. The injured competitors are typically omitted from most social evaluations for two additional practical reasons. First, it is usually difficult to predict which competitors will be hurt and to what extent. Second, and particularly convincing as a reason, even if the competitors and their injuries are identified, the use that will be made of the released resources is almost impossible to predict with any assurance whatsoever. This prospective use provides benefits to be measured against the costs to competitive resources as they are forced out of existing employments. For example, if a project, which is to use factors now producing goods worth 100, is to produce goods that now sell for 140, the benefits-costs ratio for the project proper is 1.4. Competitive factors necessarily (by definition) worth 140 are shunted into what may be less remunerative activities worth, let us say, 130. The picture for society would then be as follows:

	<u>Benefits</u>	<u>Costs</u>	<u>Difference</u>	<u>Ratio</u>
Project	140	100	40	1.4
Competitive resources	130	140	-10	0.93
Total	270	240	30	1.13

It may be agreed that even if magnitudes like the above could be hazarded, the repercussions would not have been fully registered: the forced-out competitive resources may shift into activities that displace still other resources, and so on without end. All of this may be granted but it remains the responsibility of the evaluator to estimate the sum of these repercussions, however roughly.

G. IMPACT ON PRESENT COMPETITIVE USE OF RESOURCES

On the other front of the repercussion chain are the changes initiated by the purchasers of the existing goods (priced at 100 in our example) who will need to find other factors to produce substitute items worth the immediate costs of the project. A series of repercussions may be expected here also--and it is the evaluator's task to estimate them.

H. SUMMING PRIVATE BENEFITS AND COSTS

We have mentioned the variety of private benefits and costs which the industrial economist will wish to insert into his calculations. These benefits, and these costs, of factors scheduled for the project, of competitive factors, and of factors mobilized to produce goods now made by project factors, can be summed into a meaningful benefits total and a meaningful costs total. And the ratio of the two sums is the relative gain to private parties caused by the changes directly engendered by the project.

The benefits and-costs totals are then ready for adjustments reflecting the governmental impact of the project, adjustments that carry the evaluation process toward measures of national and social economic gains.

Before these adjustments are essayed in Chapter V, Chapter IV will set the stage, and will also note specifically what is excluded from the setting.

IV. MEASURING SOCIAL OR NATIONAL BENEFITS AND COSTS

A. GOVERNMENTAL VIEWPOINTS

A government may evaluate the economics of a project from one or more of several viewpoints. One viewpoint, mentioned earlier, can be taken by any government which supplies productive factors to a project. This viewpoint is essentially the same as that of a private factor supplier.

Other viewpoints are taken in this chapter. One of these, which is taken only incidentally, is that which calls for examining the project in terms of fiscal benefit to government; from this viewpoint government looks for its own selfish benefit, again much like any private party involved in the project. It seeks to enlarge tax and other governmental receipts as against governmental outlays.

Government is also expected to evaluate each project from the viewpoint of maximizing national economic gain measured by the ratio of national benefits to national economic costs. Alternatively the government viewpoint can be that of society as a whole. It is the evaluation from this last point of view which is the primary function of this paper--and especially of this chapter.

Stripped to its essentials, the purpose of our calculus is to estimate the social or national value (benefit) that will be generated within the implemented project and to compare that value with the value (cost) presently being generated by the factors to be reallocated to the project. The ratio between the projected value and present value we believe to be a particularly useful measure for comparing the economic merits of projects.

In other words, the net economic benefit of a project to a nation may be regarded as the addition to the national income or product made likely by the project. If the national product is presently 1000 monetary units, and if by diverting to the project resources now earning 10 units, the nation can produce benefits of 30 units, the national product can be increased to 1020 units. The benefits of 30 as related to the costs (national value foregone) of 10 indicate a benefits-costs ratio of 3:1. The nation can then proceed to implement first the projects that carry the highest benefits-costs ratios--that is, it can do so if the benefits and costs have been detailed and authenticated and all parties requisite to implementation are convinced of the wisdom (on all relevant grounds) of proceeding to that objective.

If the prices of all factors scheduled for the project were consistent with market forces and if governmental activities were neutral in the sense that net taxes paid and public services received in present employments were the same as in the projected employment, the calculus described in the earlier chapters would be fully adequate for measuring the social primary benefits and costs of a project. But prices can be arbitrary--and misleadingly so; the problem is evaluated in the next chapter.

The analytical problem occasioned by governmental activities is considered in this chapter. Also given further consideration are ways of estimating benefits and costs for each of the nations affected by a project.

Preliminary to the discussion of these two topics, more must be said about the social or national accounts framework of the calculus.

B. SOCIAL OR NATIONAL ACCOUNTS

A system of social or national accounts may be thought of as a consolidation of the accounts which are kept, or might be kept, by all the individuals or families, enterprises, governments, and other private or public entities which compose society or the nation. These accounts--and here we are interested in the operating (or income and expense) accounts--show, or can be interpreted to show, the net income (revenues minus expenses) earned by any entity in any economic pursuit in which it may be engaged. Similarly the accounts kept by any of these entities in their capacities as consumers show outlays for the products of economic activity.

Our accounting concepts and terminology, except where explicitly indicated otherwise, are those of the United Nations' system of national accounts.¹ While the accounts are set out as national accounts which can accommodate the measurement of activity within an open economy, the system works equally as well for the measurement of a closed economy, i.e., society as a whole. Terminologically the only need is to replace the adjective national with the adjective social. Social accounts are simpler in that all provisions in national accounting for transactions with the rest of the world can be disregarded. As a convenience we shall frequently use only national accounting nomenclature. But the entire analysis, except for that concerned with international transactions, can be applied to society as well as to any part of it, here called nation.

¹ cf. United Nations, A System of National Accounts and Supporting Tables, Statistical Office of the United Nations, Studies in Methods, Series F., No. 2, Rev. 2, United Nations, New York, 1964.

The one important respect in which we recommend deviation from governmental national accounting is in the delineation of parties by nation to which they or their physical resources are regarded as attached for accounting purposes. Conventionally, national product (or income) is defined as the total of production attributable to factor services supplied by residents of a country.¹ For our purposes, which call for noting the nationalities of the suppliers of resources to a project, it is helpful to regard national product or income as the value attributable to factor services supplied by entities who are nationals of a country. The distinction is significant: in a developing country many of the factor suppliers may be expatriates who are residents of the country but are not, of course, nationals of it.

We are taking the liberty, then, to redefine national product or income to refer to the economic contribution of nationals, not of residents, of a country. (We would recommend new nomenclature were not the literature already so burdened with national accounting terms.)

Our interest is in (a) the decrement to national income or product that is occasioned by the withdrawal of resources from present employments as they are reallocated to the project, this decrement being the costs of the project, and (b) the gross increment to national income or product that will be effected by the project, this increment being the benefits of the project. The gross increment minus the decrement is, of course, the net increment or net benefits possible through the implementation of the project. We shall use the term national product only in the sense of net national product: net national product is the market value of the output of the nationals of a nation during a given period of time (usually a year) exclusive of capital consumption allowances (gross national product is similar except that the total value is inclusive of capital consumption allowances).

National income is the sum of payments to (earnings of) factors supplied by nationals of a nation. National income, measured at factor prices, differs in total amount from national product measured at market prices only as a government collects indirect taxes or pays subsidies, subsidies being regarded as negative indirect taxes.

We shall need to measure costs and benefits in terms of changes in product at market prices rather than in income at factor prices. This choice is dictated by the need to recognize the national impact of indirect taxes and subsidies. Such recognition is especially important in instances where two or more nations are involved in a project and governmental receipts of indirect taxes or payments of subsidies are altered as the project is implemented.

Heed must also be given to direct taxes and to transfer payments, the latter being thought of as negative direct taxes. Attention to these flows is again especially important when two or more nations are affected by a project. The international sharing of costs and benefits is influenced as governments have occasion to impose taxes upon, or make transfer payments to, expatriate entities.

¹ United Nations, op. cit., p. 7.

The estimation of the impact upon costs of indirect taxes and subsidies is typically not easy. It is difficult in most instances to forecast the enterprises, paying indirect taxes or receiving subsidies, from which factors will be withdrawn in order to implement the project. But such an estimate must be made in order to gauge the fiscal impact upon government of the contemplated shift of resources.

The impact of the project upon governments enters the calculus in still another way. Any payments to factors of production by government occasioned by a project must be included in the benefits to that project while any governmental payments to factors of production occasioned by present activities due for elimination as the project is mounted deserve to be included among the costs of the project.

C. PRICES PAID BY CONSUMERS

We can now take note of one key respect in which social or national accounting measurements as modified to this point can be misleading as a gauge of benefits and costs. This respect can be set out by example. If society or a nation were to encourage a project by placing a prohibitive tax upon the existing method for producing the item, thus protecting the new project from competition, and enabling it to charge higher prices, there might appear to be a net benefit because value as measured by market prices for the new project's production would be greater. Plainly such an increase in "value" of product carries no net economic benefit as we conceive such benefits.

Another example of the same phenomenon characterizes almost all projects. Factor mobility is less than perfect and factor owners typically must be offered a premium to induce them to shift resources out of existing employments into the projected one. These factor price increments are justifiably included in benefits only as they are warranted by higher productivity in the projected employment. If the factor price increments are to be passed on to consumers in the form of higher prices than consumers presently pay for the same product, there is no benefit.

The adjustment called for in the calculus is simple, and is probably expected: any increase in price¹ to the consumer should, as price increment times annual quantity, be subtracted from benefits. This adjustment should be made in any event when prices to consumers are expected to rise as a result of the project. The basic rationale of the calculus can here be recalled: society benefits to the extent that the present market value of the goods to be produced by the project exceeds the present market value of the goods presently produced by the factors scheduled for allocation to the project.

Social or national values as measured by market prices can also fail to register benefits. For example, increased efficiency of production expected from a planned project can reduce the "value" of the product insofar as the efficiencies are passed along to consumers in the form of lower prices. Thus, just as any increase in prices paid by consumers for an equivalent product calls for a downward adjustment of benefits, any decrease in prices to consumers for

¹ Any reduction in the quality of the product at a given price should be considered as a higher price; similarly any improvement in quality should be treated as a reduction in price.

an equivalent product justifies an upward adjustment of benefits attributable to the project.

We have not attempted here to catalog the imperfections of the social or national accounts as gauges of benefits and costs, but these we have mentioned coupled with those treated in the example that follows should be sufficiently suggestive to enable the evaluator to identify, and then offset, those that may appear in any given project.

D. A CALCULATION OF BENEFITS AND COSTS

Our entire presentation to this point of the benefits-costs calculus can now be illustrated quantitatively. This is done in the accompanying table. Through this strictly hypothetical example we have tried to illustrate as many patterns as can be incorporated into one illustration without undue complexity.

The project may be regarded as one to produce in the developing country items, now being imported duty free, at an annual cost of 147 monetary units above the cost of materials which will need to be imported by the project enterprise. The 12 columns provide for tabulating the effects of the project upon society (the world as a whole), upon nation x, which is the developing country in which the project is to be sited, and upon the rest of the world. For each of these three social or national units there are four columns: the first to show benefits, the second for costs, the third for benefits minus costs (net benefits), and the fourth for the benefits-costs ratios.

The uppermost six rows depict five categories of factor payments and their sums which are social or national income. Nation x is expected to contribute factors which earn 83 monetary units annually in their present employments (column 6) and are due to be paid 131 in the projected use (column 5). Factors to be contributed by the rest of the world (equity and loan capital and managerial talent) now earn 17 (column 10) and are expected to earn 26 in the project (column 9). Local and expatriate factors combined compose the factor package for the project and are set out in columns 1 and 2 which depict the project from the standpoint of society. In terms of income the ratio of benefits to costs is 1.58 for nation x and 1.53 for the rest of the world. To this point in the calculus it appears that the project can appear attractive to all factor owners scheduled to participate.

Row G shows the effects of indirect taxes and subsidies. The absence of quantities in this row in the "rest of world" columns indicates that no indirect taxes are imposed on, and no subsidies are paid to, the present employments of these factors; it may be assumed here that these factors are presently employed outside nation x. Nation x factors are presently being subsidized in the amount of 12 and the government of nation x expects to have to pay subsidies of 30 annually to the projected enterprise. These subsidies may be thought of as taking the form of import duty relief on materials. Further we may think of the subsidy as needed to enable the firm to pay the price differentials needed to attract factors and to permit price reductions in the product (as shown in row K, column 5).

Row H depicts the changes in net social or national product occasioned by the project. In nation x costs show as 71 units of national product to be foregone and 101 units worth of product to be produced by the project.

ECONOMIC BENEFITS AND COSTS EXPECTED FROM IMPLEMENTATION OF

HYPOTHETICAL INDUSTRIAL PROJECT IN NATION X

(Annual data expressed in hypothetical monetary units)

	<u>World (Society)</u>				<u>Nation X</u>				<u>Rest of World</u>			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	<u>b</u>	<u>c</u>	<u>b-c</u>	<u>$\frac{b}{c}$</u>	<u>b</u>	<u>c</u>	<u>b-c</u>	<u>$\frac{b}{c}$</u>	<u>b</u>	<u>c</u>	<u>b-c</u>	<u>$\frac{b}{c}$</u>
A. Profits	18	10	8	1.8	4	3	1	1.33	14	7	7	2
B. Interest	6	5	1	1.2	2	2	0	1.0	4	3	1	1
C. Rent	10	5	5	2.0	10	5	5	2.0	-	-	-	-
D. Managerial Wages	11	10	1	1.1	3	3	0	1.0	8	7	1	1
E. Non-managerial Wages	112	70	42	1.6	112	70	42	1.6	-	-	-	-
F. Social or National Income (Sum of Factor Payments)	157	100	57	1.57	131	83	48	1.58	26	17	9	1
G. Difference Between Indirect Taxes (+) and Subsidies (-)	-30	-12	-18	-	-30	-12	-18	-	-	-	-	-
H. Net Social or National Product	127	88	39	1.44	101	71	30	1.42	26	17	9	1
I. Direct Taxes Paid By Factors (-)	-28	-23	-5	-	-15	-17	2	-	-13	-6	-7	-
	99	65	34	-	86	54	32	-	13	11	2	-
J. Direct Taxes Recd. By Governments (+)	28	23	5	-	20	17	3	-	8	6	2	-
	127	88	39	1.44	106	71	35	1.49	21	17	4	-
K. Consumers' Price Savings (+)	20	-	20	-	20	-	20	-	-	-	-	-
L. Adjusted Benefits & Costs of Project	147	88	59	1.67	126	71	55	1.78	21	17	4	-
M. Adjusted Benefits & Costs to Competing Factors	144	147	-3	148	-	-	-	-	144	147	-3	-
N. Adjusted Benefits & Costs to Competing Consumers	71	80	-9	.89	71	80	-9	.89	-	-	-	-
O. Composite Adjusted Benefits & Costs	362	315	47	1.15	197	151	46	1.30	165	164	1	-

Key: b : benefits. c : costs. b-c : net benefits (benefits minus costs).
 $\frac{b}{c}$: benefits - costs ratio.

Direct taxes (rows I and J) make no difference in the totals for society, but they are significant nationally. In nation x expatriate factor incomes are expected to yield direct revenues of 5 units. This expectation is shown (column 5) by the listed collection of 20 units of direct taxes (row J) while only 15 units of these revenues are to be paid by factors furnished by nationals of x. The 5 units of direct taxes to be paid x by expatriates is also evident from column 9, rest of world, where foreign governments are expected to collect only 8 units of direct taxes from their own nationals associated with the project while these nationals pay taxes of 13 (8 to their own governments and 5 to the government of x). National product benefits need thus to be adjusted for the international tax flows occasioned by the project.

A second adjustment to national (and social) product is called for by the price reduction expected to be extended to nation x consumers of the projected output (row K) in consequence of the subsidy already mentioned.

The adjusted benefits and costs of the project are then entered (row L) showing that nation x gains by 55 units annually (column 7) and enjoys a prospective benefits-costs ratio of 1.78. The rest of the world also gains, though by a smaller margin both absolutely and relatively.

The table might be terminated with row L but a more nearly complete estimate of the benefits and costs of the project can be reached by introducing rows M and N which may be thought of as drawn from tabulations analogous to this one.

Row M is the same as the adjusted benefits and costs row of a table which sets out the expected consequences in the rest of the world of the reallocation of the factors that are presently producing the imports into x which will be discontinued once the project is executed. Costs (column 10) are the present earnings of the factors due to be displaced; these earnings, 147, are, of course, equal to the 147 units (row L, column 1) listed as the adjusted benefits of the project. The table shows (row M, columns 9 and 11) that the due-to-be-displaced factors are expected to find alternative employments in which they will earn 3 units less annually than in their present use. This expected reallocation pulls the rest of world benefits-costs ratio down to a mere 1.01 (row O, column 12).

In nation x the consumers now enjoying the output of the nation x factors marked for the project find that in order to obtain goods now valued at 71 (row N, column 5, as well as row H, column 6), they must have recourse to factors now producing output worth 80; thus these consumers are faced with a negative net benefit of 9 units.

The numbers for adjusted benefits and costs to competing factors and to competing consumers are included in the tabulation only to be suggestive of the wide implications of a project, implications which are not subsequent or in any sense remote but which will be occasioned immediately as factors are shifted to the projected enterprise.

The lowest row in the table shows composite benefits and costs providing a ratio of 1.3 for nation x and a mere 1.01 for the rest of the world, leaving the relative improvement to society at 1.15.

E. EVALUATION APPROACHES UTILIZING RATES OF RETURN

Now that the benefits-costs approach to project evaluation has been set out in sufficient detail to expose its essential merits and flaws, it may be appropriate to examine somewhat further a few of the alternative approaches, especially those that utilize the concept of rate of return.

Since a rate of return is a ratio in which one magnitude is expressed as a percentage of another, the term "rate of return" might be used in reference to any of a number of possible relationships between a flow taken as a numerator and a prerequisite flow or stock. We shall undertake to mention the varieties of rates of return that have been advanced as appropriate gauges of the economic merit of a project to society or to a nation.

The rate of return generally meant when the term is used is annual entrepreneurial profits as a fraction of invested equity, capital, or, possibly, annual profits plus interest as a fraction of combined equity and loan capital. Such a rate of return is the most common gauge used by private investors of capital in comparing alternative investment opportunities. The preeminence of the gauge for the purpose has understandably led to the suggestion that capital earnings as a fraction of capital, with appropriate modifications if needed, be used as the prime measure of the social or national gains to be expected from an industrial project.

Such a rate of return, as well as other varieties of rates of return which we shall mention as we proceed, entails such serious inadequacies as a social or national measure that we cannot recommend its use. The basic objection is twofold: (1) there are substantial direct benefits of any project in addition to those categorized as profits; and (2) invested capital is only one of the types of resources that must be allocated to any project.

At this point it needs to be recognized that the truth of this objection can be admitted without abandoning the entire case for the capital earnings/capital measure. It can be argued that while capital earnings are not the whole of benefits, and capital is not the whole of the body of factors, the first as a rate of the second tends to be proportionate to social or national benefit, and thus can be relied upon as a sufficient measure to permit the comparison of projects. It may be added that in private enterprise market-guided economies prospective rates of return are allowed to determine the patterns in which resources are allocated.

It is, in our opinion, sufficient answer to this argument to say that the whole purpose of project evaluation is to determine whether the rate of return on capital as seen by the entrepreneur is consonant with national or social economic benefit. One is not entitled to assert out of hand the adequacy of the rate of return guide; its applicability must be demonstrated in each case.

The answer to the argument can be bolstered by observing that the argument, in suggesting that the most beneficial projects are those affording the highest rate of return on capital, implies that capital is the only resource that is scarce, the only factor that must be rationed. Since projects using relatively little capital as against labor would tend to show higher rates of return, the method contains a bias in favor of labor-intensive projects. While the substantial underemployment of human resources that prevails in most developing countries can lead many persons to believe that this pro-labor-intensive

emphasis is highly desirable, the end result of such bias is to put labor to work with fewer and less-productive tools than would project selection using unbiased methods.

The rate-of-return-on capital concept as a national or social criterion has been advocated in another form. Rather than considering only capital earnings, the argument goes, the sum of all factor earnings can be taken as a percentage of the investment in a project. This guide might be useful if all projects were equally capital intensive, but they are not.

Once this critical defect is conceded, as we believe it must be, an attempt may be made to remedy it by suggesting that all factors to be allocated to a project be assigned a capital value. Then all factor earnings may be related to the value of the combined factor package, producing a truly comprehensive rate of return. Attractive as this device may appear at first glance, its attractiveness vanishes as it is noted that human resources can be given asset values only by capitalizing earnings, a process that requires the assumption of a component of the very rate of return that is to be calculated.

We are thus forced to the conclusion that none of these rates of return is adequate as a means of gauging the economic merits of a project either absolutely or in comparison with other projects.

As a final remark, we can note that in opposing the adoption of a rate-of-return approach we have not by that opposition rejected the idea of enlarging or generalizing profits or capital earnings to arrive at a measure of social or national benefits. Such a generalization can be effected by estimating the entrepreneurial profits desirable from a project which could obtain the services of all other factors at their opportunity costs. But such an extended profits concept is virtually identical to the benefits measure we advocate. And once one takes the step of relating these extended profits to the opportunity costs of all the factors (including equity capital) one has devised a rate of return which is tantamount to net benefits as a fraction of costs (using our definitions of benefits and of costs).

F. CAPITAL-OUTPUT RATIOS

Economists concerned with industrial development have given considerable attention to the concept and the measurement of capital-output ratios. While such ratios may be extremely useful in estimating the various possible consequences of any given-size investment, the capital-output ratio concept ignores factors of production other than capital.

If one were to endeavor to include all factors within the ratio, the measure would become a resources-output (or an output-resources) ratio. The attempt to calculate such a ratio would encounter the problem of assigning capital values to human resources--the same problem met in trying to arrive at a rate of return on a combined factor package. Because of this problem the effort to generalize the capital-output ratio into a resources-output ratio appears to us not to be worthwhile.

V. PRICE ADJUSTMENTS

It might be contended that almost the whole of the social or national calculus considered in this paper is the process of adjusting or converting the prices used by private parties into those pertinent for the social or national evaluation of a project. This chapter is concerned with mentioning some of the

Chapter IV, in erecting an accounting frame for the calculus of social or national benefits and costs, gave consideration to the impact of governmental fiscal operations, such as taxes and subsidies, on prices. That chapter noted also the need to use present consumer prices in calculating benefits rather than those to be charged to consumers of the project's output.

In this chapter we are concerned with pointing out some of the respects in which market prices, particularly of factor services, can be arbitrary and thus misleading as guides to the most beneficial allocations of resources.

A. "EQUILIBRIUM" PRICES?

First we shall want to take note of the suggestion sometimes made that the objective in making price adjustments is to find and use "equilibrium" prices that accurately reflect supply of and demand for the good or service moving through the market. It can be argued in support of the suggestion that beneficial projects are those which are consistent with or conducive to equilibrium and that the use of disequilibrating prices in an evaluative calculus can easily result in socially or nationally disadvantageous determinations.

While this suggestion is attractive, and in certain respects it can be said that we go along with it, on the whole it has to be rejected. We live in a grievously disequilibrating world. The fact of underdevelopment is itself an outstanding instance of disequilibrium. The patterns of prices that are appropriate guides toward more equilibrating resource allocations are not the patterns that would prevail if equilibrium were ever achieved. It can be asserted that in a disequilibrating economy the concept of equilibrium prices, if not meaningless, is irrelevant.

Considering any individual market in which the going price appears disequilibrating because quantities supplied and demanded are not equal, a shift in the price in an equilibrating direction engenders shifts in all related markets and activities--the analyst in search of equilibrium prices is doomed to frustration.

But this is not to say that any going market price is the most appropriate price for purposes of evaluating projects.

B. WAGES VS. INTEREST

Perhaps the most conspicuous, and the most pertinent, instance in which arbitrary prices can mislead the evaluator of industrial projects in developing countries involves rates of return on capital and wages. If prevailing interest rates, representative of the price of capital, are too high or too low relative to wage rates, factor proportions in a project are likely to be wrongly chosen.

All too typically in developing countries, interest rates are held by government, both by law and by central bank instruments, at inordinately low levels. At the same time government endeavors to lift wages, usually in the attempt to raise levels of living for workers, particularly for those at the low end of the wage scale. One consequence of such policies is that projects tend to be more capital intensive than is warranted by resource availabilities.

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In nations where such interest rate-wage patterns exist, unemployment is rife as would-be wage earners leave the villages in search for the higher income held out by going wage levels in urban centers; the number of applicants far outruns the number of available jobs. On the other hand, banks face queues of would-be borrowers who are anxious to take advantage of low interest rates.

The industrial economist charged with evaluating projects needs, then, to estimate the "shadow" wage that would somewhat more accurately reflect the oversupply of labor, especially of unskilled labor. He also needs to utilize "shadow" interest rates that are more nearly consistent with underlying scarcities of capital. Only as such price adjustments are made is the national economy protected from the tendency to choose industries that are capital intensive, and the tendency, in any given project, to choose the production techniques that economize on labor and rely heavily upon capital equipment.

The need for price adjustments of this kind was at least in part anticipated by the recommendation that in estimating the social or national costs of a project factors be priced at their current earnings. Thus, insofar as the workers to be hired for a project are unemployed, the average wage entered on the costs side of the benefits-costs calculus is appropriately lower than the market wage. Similarly, capital costs reflect the earnings actually being enjoyed on capital rather than listed interest rates.

By this device, the benefits-costs ratios associated with the various combinations of capital and labor that might be allocated to a given project can provide a satisfactory indication of the combination that is most economic in terms of the relative scarcities of the two factors. Once this has been done for each of two or more projects, these projects may be compared with far greater assurance than if factor prices had not been so adjusted. It will then become government's responsibility for any approved project to encourage, if not require, by appropriate instruments that factors be employed in the economic proportion considering that market prices of factors would lead profits-oriented management to do otherwise.

Similar price adjustments on the benefits side of the picture are not needed if the factor prices on the costs side are proportionate to those the projected enterprise will have to pay. If they are not proportionate, the evaluator will need to study market prices to be paid by the enterprise in order to determine how much incentive, if any, government will need to provide in order to assure optimum resource allocation.

C. PROJECTS OTHER THAN IMPORT SUBSIDIZATION

The example given in the preceding chapter was of an import-substitution project. While projects which are not competitive with imports may be handled in exactly the same format and in accordance with the same principles, an observation or so on pricing in such cases may be useful.

The calculus of the national economic benefits of a project to manufacture goods for export is relatively neat as the price of the goods is regularly taken to be the f.o.b. export price.¹ The benefits to the exporting

¹ If the producing nation also transports the goods overseas or insures them while in transport, the pertinent value of the goods is enhanced by those increments.

nation will differ from the value added in the country and culminating in this price only by the payments to foreign factor suppliers exclusive of net taxes received from them ¹

A more difficult product value to estimate is that of a good for local consumption which has not been imported or produced before. If, for example, a nation's government is considering a project for the manufacture of a new fortified food to counteract dietary deficiencies typical in the country, and it is recognized that the food must be heavily subsidized if it is to be marketed successfully, how should the value be computed? The price received plus the subsidy will, of course, equal the amount to be paid to resources to attract them from present uses; value is at least that high--but it may be placed higher, indicating that factor payments should be higher than those needed to attract resources to the project. The evaluator cannot avoid the necessity of selecting, somewhat arbitrarily, a price.

D. ADJUSTMENT OF INTERNATIONAL PRICES

From a national point of view, the market prices paid on or received from goods and services, including factorial services, purchased or sold abroad, may be taken as given for purposes of evaluation.

From a social point of view, however, price adjustments may be needed to effect an evaluation much like the adjustment of wages and capital earnings in a single nation mentioned earlier. If, for example, nation A is prepared to advance funds to an industrial project in developing nation X on soft terms as to interest, grace periods, etc., each nation in its own national evaluation may wish to take the price of capital at its face value. An evaluation from a social viewpoint, however, may wish to call the capital price into question for the same reason as in the capital earnings vs. wages instance above, i.e., the arbitrarily generous terms on which capital is supplied may lead to a far less labor-intensive project than relative factor availabilities warrant.

Society's interest may suggest that steps be taken to assure a more economic resource package.²

The international price adjustment that is most frequently considered for purposes of project evaluation is that of the exchange rate.³

¹ It may be asserted that what should be measured is the value to the nation of the goods that will be imported with the exchange earnings of the exports produced by the project, but information to allow this estimate is regularly not to be had.

² The suggestion is not that nation X be denied access to capital on such favorable terms, nor that the international distribution of factor income be modified, but merely that market prices not dictate wrong resource allocations.

³ The question of the appropriate exchange rate to use in evaluating the benefits and costs of a project is entirely separate from the discussion of the foreign exchange or balance of payments effects of a project which are considered in Chapter VII.

It is frequently, if not regularly, asserted that if a country's exchange rate is patently disequilibrating, benefits and costs which reflect foreign prices should, in the process of project evaluation, be recalculated in terms of an exchange rate thought to be consistent with equilibrium. In support of this assertion it may be argued that a project which would be ruled non-viable if existing exchange rates were utilized, might well be shown to be viable and desirable under more nearly equilibrating rates. For example, if nation X's currency is over-valued, both import-competing and export industries will appear less advantageous than if the currency is available at an equilibrating price.

From the viewpoint of society's industrial economist the argument can be well taken. An over- or under-valued currency can occasion resource allocations that would not appear warranted if the exchange were correctly valued. And society, if it has an appropriate instrument, may want to encourage the more economic pattern of resource allocation that would tend to be effected were the currency correctly valued. But the choosing of an appropriate rate is beset with all the problems mentioned above respecting the ideal of equilibrium prices. The attempt to do so is not recommended.

Moreover, exchange rates like other international prices are taken as they stand by an economist evaluating the national benefits and costs of a project.¹

E. EXPECTED FUTURE PRICES

Thus far in the paper we have deliberately avoided the question of future price movements. The focus has been on current prices both on the costs side and on the benefits side of the calculus. But certainly any factor owner in studying possible ways to commit his resources will endeavor to forecast price changes as they may affect any project over its lifetime. And the course of prices in the future is every bit as relevant from a social or national standpoint as it is from a private point of view.

Accordingly, the values added or contributed on the benefits side each year during the life of the project--values which can be "homogenized" to arrive at a representative annual magnitude component in the calculus--should be computed using the prices which are expected to prevail during that year.

Although expected future prices belong in the benefits calculus, the costs of a project must remain as the present value produced by the resources scheduled for the project. Present costs provide a relatively firm and objective reference point for use in comparing alternative allocations. These virtues would be dissipated by any attempt to, say, estimate the probable future earnings of factors were they to remain in their present employments and to regard these as the costs of a project.²

¹ If a nation employs a system of multiple exchange rates incorporating purchases and sales in patterns that subsidize some transactions and tax rates, such fiscal operations affecting any project should be included in the calculus along with other indirect taxes and subsidies.

² The rationale of our calculus suggests that any estimate of future earnings in an unchanged allocation be treated as a project itself, the future earnings be regarded as the benefits of leaving any given resource package in its

In summary, the calculus should incorporate the best available estimates of the future prices affecting the benefits of a project while the analysis of costs should be in terms of present prices only.

VI. INCORPORATING INDIRECT EFFECTS INTO THE CALCULUS

The calculus to this point has been concerned with measuring the changes (benefits and costs) in social or national product that may be regarded as direct effects of the project. These have included the primary effects from the project itself and the secondary effects as competing factors are reallocated and as consumers of products now produced by the scheduled factors enlist other resources to satisfy their demands.

All other economic effects of the project may be classified as indirect. No attempt will be made due to provide categories into which indirect effects may be placed. Our concern is only to suggest those that affect material income or product and are of sufficient measurability and magnitude that their incorporation into the benefits-costs calculus may be worthwhile.

Although in a formal sense some of the indirect effects may merit treatment as both benefits and costs, typically indirect effects are calculated as net benefits (usually positive, but conceivably negative) which are then entered on the benefits side of the main benefits-costs tabulation.

A. INCOME MULTIPLIER

The well-known income multiplier is the quantitative measure of the total change in income which can be expected over time as recipients of the direct income increment generated by the product spend a portion of it for consumption and thereby give another fillip to national production. This is the first step in an unending but dwindling chain which, as a geometric progression, adds up to a finite amount. If the recipients of additional income tend to spend, say 80% of the increment on consumption, the total increase in income will be five times the direct (initiating) increment; if the "marginal propensity to consume" is, on the other hand, as low as 40%, the multiplier is only 1.2/3.¹ The economist evaluating any project for a nation will need to estimate the applicable income multiplier and increase the numerators in the benefits-costs ratio accordingly.

Since the multiplier process takes time--a span of time that the evaluator may want to estimate--the multiplier increment applicable to the life of the project will be less than the increment implied by the full multiplier.

B. ACCELERATION PRINCIPLE

The enlargement to income occasioned by the investment in capital facilities needed to provide plant, machinery, furniture, supplies, etc. for the project has come to be called acceleration.

Acceleration is regularly a far more important process in industrialized countries than in developing countries where the projects are sited. In the latter, acceleration appears usually in the building of the infrastructure--

¹ The multiplier = $\frac{1}{1 - C}$, where C is the marginal propensity to consume.

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public utilities, roads, etc.--that may be necessary if the project is to be fully executed. Insofar as such infra-projects can be traced to any industrial project being evaluated, a quantifiable net benefit can be entered for that project.

C. EMPLOYEE TRAINING

An indirect benefit of a quite different order, employee training, is almost always cited as a virtue of any industrial project. The value of the training can occasion an enlargement of the benefits already calculated only as trained employees leave the projected enterprise; the increment to value added by the project made possible by the training provided by the enterprise has already been entered into the calculation.

As trained personnel leave the enterprise and take new jobs elsewhere their newly acquired skills can be trained into higher productivity; such increases in annual earnings can be entered into the compilation of indirect benefits of the project. But considering that the high labor turnover that can produce such indirect benefits means lower direct benefits, employee training should not properly be regarded as a benefit in addition to those already discussed.

The value of employee training to the economy of a developing country is not being belittled by these observations. We are only concerned that the benefits not be counted twice.

The consideration given in this chapter to the multiplier, the accelerator and employee training, is only suggestive. Much more would need to be written if these effects were to be given as much attention as has been focused on the calculus of the direct effects.

VII. BALANCE OF PAYMENTS EFFECTS

The effects of a project upon the balance of payments, or the foreign exchange position, of any nation party to the project is regularly stressed in project evaluations. Pertinent as these effects are, we believe, as will be explained shortly, that their importance is regularly overstressed.

Balance of payments effects deserve attention in this paper largely to show their noncomparability to the change-in-social-or-national-product calculus. Formally, the balance of international payments is an account within the national (or social) accounting system. The balance of payments is an organized summary statement of the international transactions of a nation over a time. When arranged as a balance of payments on income account it shows the component of national output that has been exported and the share of national income that has been spent for imports. It is only in this respect that the balance of payments effects of a project can be said to be related to the national income or product effects.

A detail: the decision, in connection with the measurement of benefits and costs from national standpoints, to redefine the national accounts of a nation as comprising nationals rather than residents, does not carry over into the balance of payments accounts. The conventional conceptualization in terms of transactions between residents of a nation and residents of the rest of the world is exactly suited to the problem of analyzing the balance of payments consequences of a project. Residents of a nation, whether nationals or

aliens, are within the currency jurisdiction of that nation's government. Payments to alien residents do not require foreign currency--they impose no strain on the balance of payments.

The balance of payments as an account also shows, or can show, changes in a nation's reserves of foreign currencies and monetary gold. It is the expected impact of a project upon the size of these international monetary reserves that is referred to as the balance of payments effects of a project.

Such effects have come to bulk large in the thinking of many persons concerned with economic development because--and, properly, only because--most developing nations are beset with chronic balance of payments deficits entailing continuing pressure, if not prolonged drains, upon exchange reserves. It thus appears entirely understandable that nations experiencing such pressures regard projects as particularly meritorious if they promise to enlarge exports and/or reduce imports and thereby to lessen the threat to the country's international reserves.

It should not be supposed that a developing country prefers, or should prefer, even balance in the current account section of its total balance of payments, i.e., an equilibrium in which imports of goods and current services match, and thus pay for, exports of goods and current services. Rather a developing country, almost by definition, is a capital importing country, which means that imports will exceed exports (a current account deficit). But as long as that deficit is covered by an inflow of long-term investment capital, all is well. The problem is the all too common situation in which the import balance is not fully covered by normal capital inflows with the resultant short-term debt to the outside world. Assuredly, then, any country suffering from balance of payments deficits can rightly welcome projects which augur to ease the payments pressure.

To evaluate the balance of payments impact of a project, the industrial economist needs to prepare a schedule showing annual receipts and payments of foreign exchange occasioned by the implementation of the project. The schedule should be complete, including capital flows and all international trade in commodities and services whether or not they occasion any foreign exchange transactions.

Examples of the kinds of items that belong in the schedule deserve mention. If expatriate personnel to be employed by the projected enterprise are to be paid in local currency, provision must be made for the foreign remittances they will wish to make; if they are paid in foreign currencies abroad, conversions to cover local expenditures can be anticipated. Expected remittances of profits should be detailed as well as the servicing and amortization of foreign-held debts.

The schedule needs to conclude with the net outpayment or inpayment that is expected during each year, if not each quarter, in the life of the project.

The magnitude of the net flow becomes the measure of balance of payments effects. No helpful ratios can be calculated and there is no way to combine (or otherwise relate) a benefits-costs ratio with an exchange savings magnitude.

Most deserving of stress is the fundamental difference between improvement in the national product as an objective and improvement in the balance of payments as an objective. The simple truth is that as a long-term matter balance of payments effects are inconsequential in comparison with national income or product effects. In terms of economics, the ranking of projects by benefits-costs ratio criteria should not be overridden by balance of payments considerations. Just as preoccupation with employment benefits can lead to a misallocation of resources by undue emphasis upon labor-intensive industries, concentration upon foreign exchange savings can lead to a misallocation of resources which will have "favorable" international payments consequences. A country's foreign exchange reserves deserve to be protected by instruments that do not entail the sacrifice of growth in national product. Observed in perspective, the execution of those projects which promise to contribute most to national product will, over time, provide basic insurance against balance of payments difficulties.

After all, a developing nation can utilize only so much improvement in its balance of payments--surpluses are as unwise as deficits, though for different reasons but there can never be enough improvement in national product.

VIII. LIMITATIONS OF THE CALCULUS

Comprehensive as we intend the benefits-costs calculus to be, there are many economic effects of industrial projects that cannot be incorporated into it. And, of course, the whole of the noneconomic benefits and costs of any project lie clearly and irretrievably beyond its reach.

Generally, the geographic and personal distribution of the economic effects of a project cannot be encompassed in the estimations of benefits and the costs. These distributional effects are on the whole not even quantifiable.

For example, a given project may in order to maximize the benefits-costs ratio utilize a far smaller labor force than would be technically possible. In countries where unemployment is a serious problem, not only in terms of the need for income but also in terms of morale and social stability, projects may be wanted that will maximize employment even at the expense of measurable net economic benefits. Similarly projects may be needed which will provide employment and income to certain occupational or cultural groups, employment that is needed to assure social order and tranquility.

Just as nations often desire industrial development in order to achieve greater economic diversification than would otherwise be achieved so also may particular geographic areas within countries be desirous of attracting industrial projects. The economic and noneconomic merits of selecting sites in those areas are not readily entered into the calculus although in some instances the eagerness of certain localities to attract industry may be recorded by the evaluator of projects in the form of low shadow prices on the land, labor, etc., that the community is anxious to allocate to an industrial project. Such prices may well be needed in view of the tendency for the entrepreneurs of new projects to find localities where industry is already established to be economically more attractive than less developed communities. If geographic dispersal is meritorious, for whatever reasons, the evaluator should

The benefits-costs calculus does not easily encompass such economic considerations as working conditions, health and safety practices, and other elements contributing to the psychic income of factory personnel. The air and water pollution consequences of a project are often not quantified although here again the economist should endeavor to attach prices in order to be able to make appropriate deductions from project benefits.

The kinds of effects just mentioned have been close to the borderline of economics; their inclusion in the calculus should be seriously attempted.

But other consequences are clearly beyond the reach of quantitative economic measurement. We mention them only in recognition of the difficult task facing those persons who must evaluate the noneconomic as against the economic merits of a project. Projects can carry political and prestige virtues that are important to a nation or a community. The economist has professional biases that incline him to disparage these virtues and to defer to economic goals. Such judgments are not for him, qua economist, to make. But it is often his responsibility to study the economic benefits and costs of projects he knows will prove to carry benefits-costs ratios that may appear intolerably low, often lower than unity. Only as he fully evaluates the economics of such projects can those persons who espouse them for their noneconomic qualities learn the extent of the economic sacrifice that implementation will exact.

IX. CONCLUSIONS

The principal purpose of the social or national economic benefits-costs calculus--or of any alternative calculus--is to enable governmental bodies to identify those industrial projects which promise the greatest economic gain to the body politic.¹ The relevant measure of the size of the economic gain is the ratio of benefits to costs. By economic gain criteria the projects most deserving of implementation are those carrying the highest benefits-costs ratios. Evaluators are sometimes tempted to favor those projects which show the greatest net benefit (benefits minus costs) at the expense of other projects which indicate a higher benefits-costs ratio. The temptation is understandable--certainly the measure of achieved development is the amount of net benefit. But once resources have been committed to (costs incurred in) one project, they are not available to another. The route to assuming that as all resources become committed, the amount of social or national benefit is maximized, is the route of selecting from alternative projects those that promise the highest ratio of benefits to costs. Although the amount of the net benefit of each project is pertinent and indicates the magnitude of the increment to social or national economic product that can be expected, the need is to maximize the value product per "unit" of resources.

There are, of course, the various economic consequences of a project which cannot be integrated into the benefits-costs calculus--and these must be given whatever weight the industrial economist believes to be appropriate. He is professionally more competent to assign such weights than is any nonspecialist decision-maker whose responsibility is to make the value judgments that

¹ Although the calculus outlined in this paper is here accommodated to manufacturing enterprises, it can be applied without modification to other enterprises which sell their output, and with elaboration to those undertakings, including infrastructure projects, the output of which provides little or no

allow the reconciliation of economic and noneconomic considerations. All too commonly the decision-maker has been presented by his economic and technical advisers with an apparent conglomeration of findings as to the economic merits of a project. He has then, often with ample justification, inferred that since any given project seems always to have good and bad economic features that cannot be reconciled, the decision may well be taken on noneconomic considerations.

It is, no doubt, the intention of industrial economists everywhere who evaluate the economics of projects that economists be in a position to give firm recommendations as to the economically most desirable projects. We hope that that intention can be served by the elaboration and the refinement of the benefits-costs calculus.

Not only should the decision-maker be able easily to know which projects by economic criteria merit his approval; he should also be able readily to grasp from the economist's evaluation, the precise economic penalties of executing any project which fails the economic test but may merit approval because of its noneconomic virtues. It is well for him to realize, for example, that a given project can be implemented only as the nation is prepared to grant the enterprise an annual subsidy of a known amount.

A. INDUCEMENTS AND DETERRENTS

Once the decision has been made that any given project deserves implementation, the project needs to be returned to the economist for a determination of the governmental measures required if the projected enterprise is to be given life and prosperity. If, despite the combined economic and noneconomic gains anticipated, the project is insufficiently attractive to prospective investors or other private factor suppliers, subsidies or other inducements may be in order, as prescribed by the evaluating economist.

The economist must also be alert to recommend appropriate action on projects labelled undeserving which, nevertheless, are sufficiently attractive to entrepreneurs that the enterprise is likely to be launched unless appropriate deterrents, such as taxes or even prohibitions, are imposed. It may occasionally be appropriate in the case of a favored project to reduce incentives or apply curbs in order to prevent excessive returns to any of the factor owners involved in a project. Occasionally government measures are needed to assure that the size of a favored enterprise is consistent with the maximization of relative gains as determined within government.

It should be remembered that any fiscal inducements or deterrents brought into action by government do not affect benefits-costs ratios; the calculus subtracts at one level whatever is added at another. The consequence of government intervention is to alter the distribution of gains, not their total amount.

B. INTERNATIONAL COOPERATION

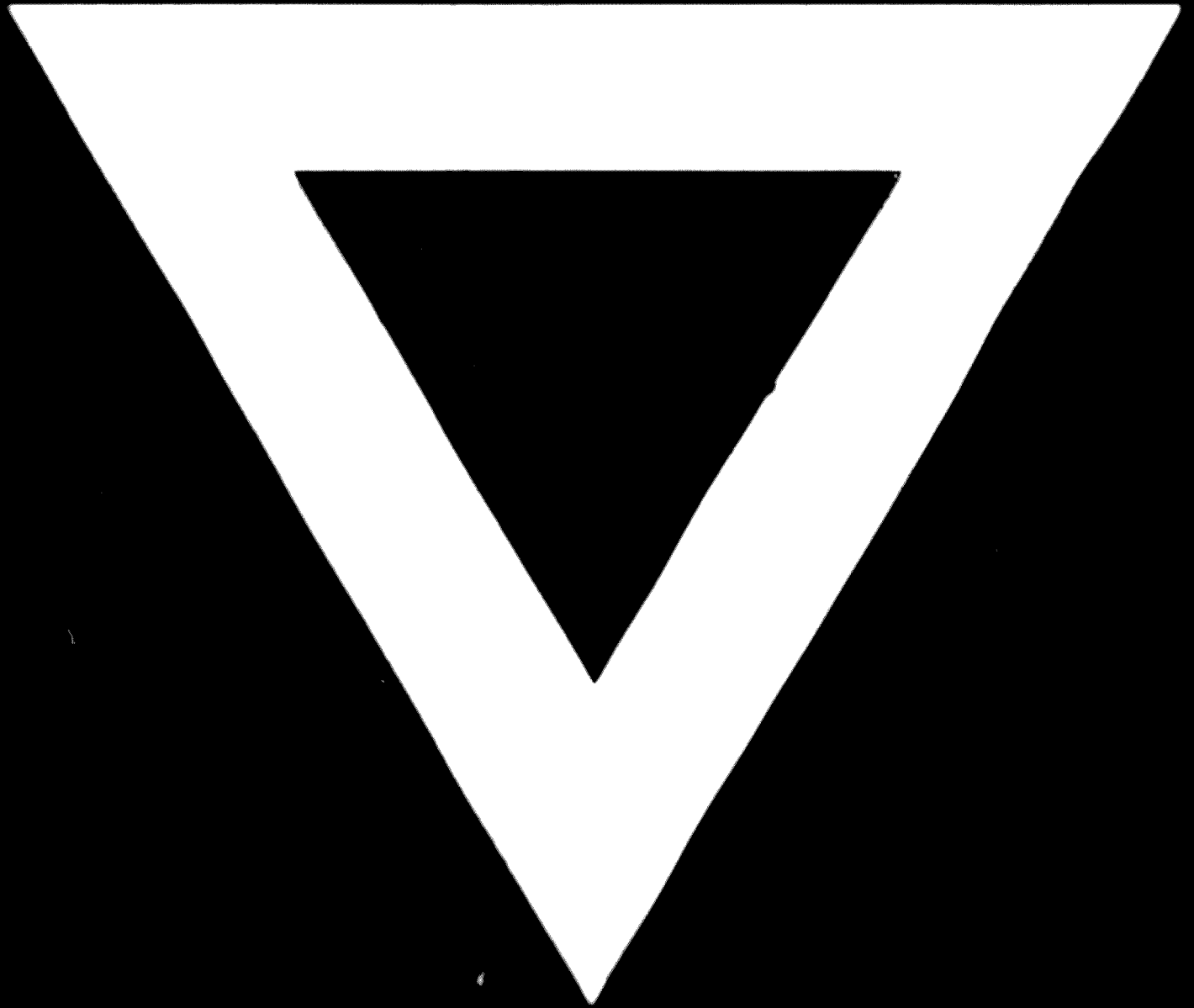
Frequently deserving projects incorporating factors from two or more nations can be executed only as governments agree upon an appropriate structure of net inducements. It is in such instances that the calculus of benefits and costs to each nation as well as to society becomes especially pertinent. Decisions will need to be taken that affect the international division of net economic benefits from the project. International cooperation in the encouragement

of industrial development can be achieved with greater assurance by all parties if decisions are made in the light of a relatively few key gauges of national and social economic welfare.

It is to be hoped that this purpose can be advanced by the suggestions tendered in this paper looking toward greater reliance upon the benefits-costs calculus of economic gains.

We regret that some of the pages in the microfiche copy of this report may not be up to the proper legibility standards, even though the best possible copy was used for preparing the master fiche

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