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Secondary Effects and Project Appraisal

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This paper presents a general classification of secondary effects, after reviewing the confusion surrounding their definition in the literature, their relevance in various circumstances, and their neglect in four common appraisal methods.

To overcome these shortcomings, the author advocates that more use should be made in project appraisal of shadow prices, multiplier analysis, objective functions, sectoral or national income models, measures of consumers' surplus, and sensitivity analysis.

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## INTRODUCTION

1. When a Frenchman claims that France's force de frappe is justified by the technological spillover it brings regardless of the lack of political justification, he is arguing the importance of so-called secondary effects. In this context, secondary effects mean results that satisfy an objective other than the primary objective of the investment. When it is argued that the government should take steps to prevent excessive air pollution from automobile exhaust, it is thereby understood that **automobile usage generates** secondary costs borne only partially by the responsible driver. The driver does not include them when he computes the cost of driving his car, nor do car manufacturers include them when computing cost-benefit ratios or profits. In this case, the definition of secondary implied is an effect not borne by the primary users of the goods or services.

2. Secondary effects, of which these are but two examples, are becoming increasingly important in economic life, even in monetary terms. Chapter I of this paper deals with the definitional confusion created by the use of the word secondary to cover many different effects. In Chapter II, the main assumptions of some existing appraisal methods and the secondary effects omitted from appraisal results because of these assumptions are discussed. In Chapter III, an attempt is made to classify these effects in such a way that each class can be evaluated by a single method.

3. Proposals are made in Chapter III for the inclusion of methodology-classified benefits in Bank appraisal work, either by changing the assumptions of

present methods and introducing new approaches, or by modifying or adding to the framework of existing appraisal methods. The suggestions for improvement which the paper offers are only a starting point. More specifically applicable methods could be developed in ways which the paper indicates to enable the Bank to better respond to the increasing complexities of financing development.

I. THE IMPORTANCE OF SECONDARY EFFECTS AND THEIR DEFINITION IN THE LITERATURE

A. The Importance of Secondary Effects

4. Recent awareness in the Bank of secondary costs and benefits is a natural consequence of the increasing complexity of Bank investment.<sup>1/</sup>

In earlier lending years, the Bank could fulfill its dual aim--promoting overall development of the borrowing country, and making financially sound investments--by using relatively simple methods to size up benefits and costs. Investment opportunities were often scarce and projects were limited to, for example, providing vital roads or essential electric power facilities. Complex appraisal methods might not have been able to improve decisions based on engineering and common sense.

5. Now, more sophisticated appraisal tools are needed. The number of projects has increased. The Bank is dealing with a larger variety of investment fields, including education, irrigation, public health, tourism, and population control. In some of these fields, little investment experience has been accumulated. Investments in all of these fields have important many-sided effects which cannot always be measured by the methods currently in use. This group of secondary or indirect costs and benefits covers many phenomena; it includes, for example, the benefits of technological spillover and the dis-benefits of air pollution.

6. For similar kinds of reasons, concern with secondary costs and benefits is increasing in the economic literature, and in practice outside the Bank: in

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<sup>1/</sup> Here, the terms secondary and indirect are used generally and loosely. More precise definitions will be presented later.

the United States, the computation of a set of secondary effects has become customary in the analysis of domestic water resources investments. In a number of these latter studies, these effects have been found to have a larger monetary impact than the effects usually taken into account.

7. In practical terms, recognition of the need to reassess appraisal methods in the Bank is shown by efforts to go beyond the computation of costs and benefits in terms of the growth of national income over time, the traditional criterion. In Bank appraisal reports, passing references have been made to the value of health effects of water supply investments, income distribution effects of irrigation projects, and the employment effects of industrial investments. Economics Department papers present suggestions for taking secondary benefits into consideration in specific areas.<sup>1/</sup> In a number of recent Bank appraisal reports, shadow prices for labor and foreign exchange are evaluated.<sup>2/</sup>

8. But while the importance of dealing with secondary costs and benefits is increasingly recognized, there is disagreement about how to define, classify and measure them, and about when they should be considered relevant. The latter difficulty arises because the conditions for general equilibrium theory are often assumed in the appraisal methods now in use. If in fact these conditions always obtained, many secondary benefits would become unimportant.

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<sup>1/</sup> For example, "Cost-Benefit Analysis in Education, a Case Study on Kenya", H. Thias and M. Carnoy, EC-173; "The Use of Risk Analysis in Project Appraisal", L. Pouliquen, Working Paper No. 39; "Performance Evaluation of Eight Ongoing Irrigation Projects", A. Otten and S. Reutlinger, Working Paper No. 40; "Shadow Prices for Project Evaluation in Less Developed Countries", R. S. Weckstein, Working Paper No. 47.

<sup>2/</sup> See: Sea Defence, TO-678 Guyana; Water Supply, TO-694 Ceylon; Beef Cattle Development, TO-684A Madagascar.

However, since more often than not, especially in developing countries, general equilibrium conditions do not obtain, it is an oversimplification to minimize or leave aside investment effects due to or made possible by the "imperfections" of the real world. Such simplification has definite advantages, but only when the accompanying sacrifice in accuracy has been examined and justified.

## B. Review and Critique of the Definitions in the Literature

### 1. Confusion in the Literature

9. Clearing up the confusion about definitions and categories of benefits is the first step towards rational treatment of investment costs and benefits. The usual categories of costs and benefits mentioned in the literature are: primary and secondary, direct and **indirect**, tangible and intangible, commensurable and incommensurable, private and social, financial and economic. There is much overlapping among these various categories and there is no unanimity in the literature on their definition.

10. The term benefit itself is the subject of various definitions and interpretations. One of the most commonly used concepts of benefit stems from the classical theory of consumption. The benefit of a project to an individual is taken to be that amount of money which the individual is willing to pay for the services of the project.<sup>1/</sup> This definition, however, implies that the value of the benefit is not made equal to the price the consumer is paying

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<sup>1/</sup> A definition found, e.g., in O. Eckstein, Water Resource Development: The Economics of Project Evaluation, Cambridge: Harvard University Press, 1958.

for it (marginal utility<sup>1/</sup>), but rather to that price which he would be willing to pay for it (total utility), which includes the consumers' surplus.

11. According to a U.S. Department of Transportation study,<sup>2/</sup> the criterion to use in determining whether a particular item should be counted as a benefit is whether it contributes to raising the value of the economy's output. The measurement implied in this definition is the national income value and therefore the value added. This neglects completely the elements of consumers' or producers' surplus which may be involved in buying or selling an item, as well as any non-economic effect.

12. A welfare definition of benefit would be, "that which pushes outward the utility frontier", while a more restricted Pareto optimum definition would be, "that which increases one person's welfare without decreasing anyone else's", and conversely a cost would be defined as "that which decreases any person's welfare".

a. Primary vs. Secondary and Direct vs. Indirect Effects

13. Some authors equate primary and secondary effects with direct and indirect effects. For instance, Burt Long gives the following definitions.

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<sup>1/</sup> The terms "marginal" and "total" are usually employed to indicate the utility of one unit of a good to a consumer. However, in the absence of better terms, "marginal" and "total" have sometimes been used in this text to mean the "marginal" or "total" utility of all the marketed units of a certain good.

<sup>2/</sup> Clell G. Harral, Preparation and Appraisal of Transport Projects, Washington, D.C.: U.S. Department of Transportation, 1968, p. 41.

"Primary (direct) benefit is defined as the value of the immediate product or service resulting from project investment...

"Indirect (secondary) benefits are defined as the values added by incurring secondary costs in activities stemming from or induced by the project." 1/

Benefits stemming from the project are then defined as "those that accrue from increased processing of goods produced by or for the project", while benefits induced by the project are defined as "those resulting from added purchases by producers". 2/ A number of limitations are implied by this definition. Firstly, it seems to confine itself to the consideration of one objective, namely the production, or growth of national income objective. Secondly, the link between the secondary costs incurred and indirect benefits implies that there are no indirect or secondary benefits unless secondary costs are incurred.

14. In the Department of Transportation study, it is found that

"...Although there was no consensus as to what indirect benefits actually were, most of the studies treated them according to one of two definitions: (1) Indirect benefits are those "intangible" non-marketed, and non-quantifiable benefits or a social, political or military character. (2) Indirect benefits are those which accrue to other than users of the project." 3/

Here, contrary to earlier definition, no mention is made of any link with the

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1/ Burl Long, "Concepts and Theoretical Basis for Evaluation of Secondary Impacts", Washington, D. C.: U.S. Department of Agriculture (Special Paper), 1968, p. 3.

2/ Idem.

3/ Op. cit.

secondary costs incurred. Also, the first of these definitions implies that all the benefits coming from a project and having an effect on national income are primary, while all benefits which serve other objectives than the increase in the national income are indirect. The second definition, on the other hand, is merely a definition according to beneficiaries, whatever the objective that is being fulfilled.

15. According to the Green Book, secondary benefits are

"...the values added over and above the value of the immediate products or services of the project as a result of activities stemming from or induced by the project."<sup>1/</sup>

The secondary effects, according to this definition, would be:

- (i) the economic consequences for those who supply raw materials to those immediately affected by the investment, and
- (ii) the effects on those who consume the wares produced by those primarily affected by the investment.

These categories of effects are interrelated by production functions; the secondary effects are functionally related to the primary effects.

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<sup>1/</sup> "Proposed Practices for Economic Analysis of River Basin Project", Report to the Inter-Agency Committee on Water Resources, prepared by the Subcommittee on Evaluation Standards, Washington, D. C.: Government Printing Office, 1958.

16. However, intangible effects like the beauty of sites, recreation value, flood control, or accident reduction, which are usually included as secondary effects, are not related to the primary effects by any kind of production function. The Green Book definition is thus narrower than most others, since it takes into account only the production effects.

17. In contrast to the above definition, Weinberger defines secondary effects as impacts which

"...may increase employment and income, redistribute income, reduce welfare payments, or enhance environmental quality." <sup>1/</sup>

This kind of definition is not at all conceived in terms of production, but rather in terms of objectives: effects related to the national income objective are primary, while effects related to other objectives are secondary.

18. According to Hufschmidt,

"...Secondary benefits play two special roles in the analysis of water resources development projects. They are a mechanism by which some agencies hope to evaluate gains in national income not expressed in the willingness to pay; and they are a mechanism by which some Government goals, other than that of increased national income, may be evaluated... Much of the debate concerning secondary benefits stems from a confusion of these two roles and from confusion about the range of goals to be achieved by the projects." <sup>2/</sup>

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<sup>1/</sup> M. L. Weinberger, "Concepts and Objectives Underlying the Evaluation of Secondary Effects of Natural Resource Development", Washington, D.C., U.S. Department of Agriculture Special Paper, 1968.

<sup>2/</sup> M. M. Hufschmidt, "Standards and Criteria for Formulating and Evaluating Federal Water Resources Development", Washington, D.C.: Report of Panel of Consultants to the Bureau of the Budget, 1961, p. 25.

19. Indirect secondary benefits are also sometimes referred to as external economies and diseconomies. According to Kneese<sup>1/</sup>, there are three types of secondary benefits: (i) effects due to external economies, (ii) dynamic secondary effects, and (iii) effects stemming from and induced by the project. The first two types would appear to be closely related conceptually. In fact, it could be argued that this distinction only specifies the necessary conditions for secondary benefits, that is, all secondary benefits are dynamic and external in some sense and either stem from or are induced by some stimulus.

b. Tangible vs. Intangible, Commensurable vs. Incommensurable.  
Private vs. Social, and Economic vs. Financial Effects.

20. The confusion extends to the categories of tangible and intangible, and commensurable and incommensurable. The usual definition of tangible is a benefit that can be seen or touched or evaluated. Intangible benefits are sometimes defined as non-economic benefits, or benefits which satisfy legitimate social objectives such as reductions in injury and death. Such a description overlaps definitions of other benefits. For instance, an intangible benefit might also be a primary benefit: a reduction in injury to drivers through a road improvement will accrue to the users of the road, for example. Yet since the definition does not specify the economic objective, this reduction in injury might be described as a secondary benefit in another context because it contributes to an objective other than increased national income.

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<sup>1/</sup> A. V. Kneese, Water Resources: Development and Use, Kansas City, Kansas: Federal Reserve Bank of Kansas City, 1959, p. 25.

21. A commensurable benefit is one that can be quantified; which benefits are commensurable and which are not, depends on the sophistication of methods of measurement and is thus not a fundamental distinction.

22. The distinction between private and social effects is usually clearer. The private effects are those enjoyed by the individual who is immediately interested in the investment, while social effects include economies and diseconomies which are external to the individual concerned, but internal to society.

23. The distinction between financial and economic benefits is the distinction between partial monetary benefits and total social benefits. Briefly, financial benefits are those which have monetary value and which a banker or accountant would consider when investigating a loan. The economic benefits include not only benefits which have a monetary value, or which are taken into account in the balance sheet, but all the other benefits, tangible or intangible, primary or secondary, which have an economic effect on society as a whole. Financial appraisal may well lead to a misallocation of scarce resources, since it takes into account only those benefits which have a monetary value and which accrue to the promoters of the project as a financial return on, or net cash flow due to, the project.

## 2. Criticism of Definitions

24. Many of these definitions do not make it clear which elements are specific to each category of benefits or effects. For instance, according to which author defines it, a primary benefit may or may not include initial benefits accruing to non-users of the project facility.

25. More specifically, the criteria on which the definitions are based are not clearly specified. For instance, it is not clear according to which objective an effect of an investment is judged to be a benefit. For example, an investment may awaken part of the population to the desire for manufactured goods, and at the same time lower the supply curve of truckers. Whether either or both of these effects is a benefit depends on the criterion used. Some authors, for instance, take social and political stability to be one criterion; others use the growth of national income as the only criterion.

26. Furthermore, the definition of the term benefit depends on the economic assumptions made. For instance, to define a benefit as the amount of money a customer is willing to pay is to accept the assumptions of the classical theory of consumption, which include the notion of consumers' surplus. To define as a benefit that which raises the output of the economy is to take the growth of national income as the unique objective and to exclude consumers' surpluses and effects on other objectives. On the other hand, to use the global welfare assumptions implies that a benefit is that which pushes outward the utility frontier.

27. Thus, to be useful, definitions of different effects should specify benefit criteria and underlying economic assumptions. Before proposing a set of definitions which satisfy this criticism, the paper reviews present treatment of secondary effects.

II. THE TREATMENT OF SECONDARY EFFECTS IN  
PRESENT APPRAISAL METHODS

A. The Limitations of the Customary Assumptions

28. Different appraisal methods operate under different assumptions.

In the following, the most common assumptions are abstracted and the consequences they entail for the evaluation of secondary benefits are examined.

1. Assumption: Economically Quantifiable Effects Only

29. The most usual assumption is that the economist's role is limited to the identification and measurement of the project effects on the economic objective, i.e., that the objective function is limited to the economic objective. Thus, all effects on other objectives, such as better health or increased political stability, are excluded, unless the economist can quantify them in monetary terms. Non-economic effects are excluded from the appraisal analysis.

30. Furthermore, other effects whose initial impact is on non-economic objectives but which also produce long-term economic feedback (e.g., changes in attitudes, "shock" and demonstration effects) are ignored. Such effects, which above were called indirect, are thus excluded from appraisal analysis.

2. Assumption: Markets in Perfect Competitive Equilibrium

31. The equilibrium assumption has an effect on the economic price assigned to inputs and outputs. The equilibrium assumption implies that inputs are bought and factors of production hired at prices corresponding to their marginal

productivities. This is certainly not the case in the developing countries; for instance, the wage paid to workers may be out of proportion to the marginal opportunity cost or marginal productivity because of government interference, featherbedding, union pressure, or other factors.

32. In order to correctly analyze an investment project, the input markets must be examined to see whether prices truly reflect opportunity costs. If they do not, shadow prices reflecting the real economic scarcity of the inputs must be used.

33. On the output side, the equilibrium assumption has analogous consequences. Prices are presumed to reflect real economic scarcities, since the true strength of demand and costs of production are supposed to be expressed in perfectly equilibrated markets. If the assumption of equilibrium in output markets is not verified, then shadow prices for outputs must also be used.

34. The equilibrium assumption has further important effects on secondary costs and benefits, which in this context can be divided into the broad categories of secondary income and secondary production effects. The secondary effects of an increase in income are expressed by the income multiplier. For example, part of a company's income increment is passed on to the merchant from which the company buys. The merchant in turn passes on a part of his income increment to his supplier, and so forth. Thus, the addition to total income is greater than the initial increase in income experienced by the company. To obtain the total increment, one must add those parts of income increases which are passed on. The ratio of the total increase to the original

increase experienced by the first company is the income multiplier.<sup>1/</sup>

35. The multiplier phenomenon is meaningful in real income terms only if the increments in income do not result in higher prices, but rather in expanded supply. If prices increase, the increase in national income is nominal, and there is no increase in real product; in other words, there is inflation. In order for the increment in income to have any real effect at all, the real supply of goods and services must increase, and therefore at least some factors of production must attain a higher level of marginal productivity. This can happen if some factors are idle or underemployed, but such conditions are clearly inconsistent with the equilibrium assumption. General equilibrium models therefore usually exclude secondary costs and benefits, because these effects do not exist given the assumption of the models.<sup>2/</sup> Without the equilibrium assumption, secondary costs and benefits should be taken into consideration by introducing shadow prices to reflect the true economic scarcity of inputs and outputs.

36. On the production side, assuming the absence of equilibrium and the presence of unemployed or underemployed factors of production, an investment will generate real changes in production and in methods of production. The

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<sup>1/</sup> There are many kinds of multipliers besides the income multiplier. For instance, when part of the increase in income is saved and invested by each of those in the chain, there will be an investment multiplier, which is the converse of the income multiplier. An initial increase in income may also produce increased demand and in turn increased employment, followed by successive rounds of further increased demand and increased employment; the ratio of the total to the initial increase in employment is called the employment multiplier.

<sup>2/</sup> Unless secondary effects are defined as any effects which do not satisfy the economic objective.

increase in demand for the final product will produce a much larger increase in overall demand because of the income multiplier effect, and because of the increase in demand for intermediate and capital goods.

37. Therefore, in order to be able to estimate the ultimate effect of an investment on national income, it is important to know the input-output relationships, the elasticity of the supply curve, the nature and degree of unemployment and underemployment and the mobility of factors of production, the potential bottlenecks and time lags, and the price effects of increases in demand. In particular, to estimate the amount of complementary investment needed to meet increased demand, the level of capacity utilization in the affected industries must be known. If unused capacity is very great, the marginal capital-output ratio will be very low and the capital cost of supplying an increase in demand also low. If, on the other hand, there are economies of scale in the production of the demanded goods, then the marginal unit cost may be very small and the value added (or increase in national income) very high. Furthermore, if changes in relative factor prices or in technology permit a transition to a much more profitable input-mix then the economy will benefit. To determine these secondary production effects for any investment project, the circumstances of production must be examined: data on factors of production and input-output relationships have to be assembled.

3. Assumption: Consumers' Surplus Measures Difference Between Partial and Total Utility

38. It is frequently assumed in cost-savings models that a difference exists between the utility derived by a consumer from a good, as indicated by what he would be willing to pay for it, and the utility represented by the good's actual price (total vs. marginal utility). The sum of these differences for all the marketed units of a good is usually called the consumers' surplus. It gives a monetary measure of the difference between the total and marginal utilities of the good to the consumers at a point in time.

39. For example, in the case of a road project appraisal, the consumers' surplus is a monetary measure of the time and extra money that road users would expend if the investment were not realized, minus that which they actually expend if the project is implemented. The utility of the sum saved is represented by the utility of the goods which it will buy.

40. How does the users' increase in utility or welfare relate to the utility of the investment to the whole economy? If the issues of interpersonal comparisons and envy are avoided, the increase in the users' welfare raises the sum of all persons' utilities. An economist might say that the social welfare function has been pushed outward or that the value of the objective function has been increased by an amount equivalent to the users' surplus utility.

41. However, one important assumption needed if the consumers' surplus is to represent total benefits is that there are no multipliers, i.e., that marginal productivity of all factors of production is equal throughout the system.

Consequently, an increase in demand for one product, resulting in a transfer of factors of production from elsewhere and in an increase in the supply of the product, is assumed to create a proportionate decrease in the supply of some other product. This assumption might hold if the changes occurred on a very small scale; however, the impacts of Bank investments are seldom so limited.

42. Thus, while inclusion of consumers' surplus in evaluating investment costs and benefits does add an important benefit not covered by national income figures, consumers' surplus fails to represent the dynamic effects of the project.

B. The Shortcomings of Four Appraisal Methods in Application

43. For a comparative view of four commonly used methods, each is applied below to a hypothetical water supply project.

1. Minimum-Cost Method

44. After the various components of demand for water have been projected over the next eight years, for example, the conclusion is reached that the capacity of the present water supply system will be exceeded by demand two years from now. The decision is made to build an addition to cope with the forecast demand. There are two sets of alternatives to be decided: whether to build a new dam, build up an old one, or use underground waters, and whether cast iron pipes or cement pipes are better. In both cases, given the prices of inputs, the least costly method is chosen.

45. In the way it is usually applied, this method is open to the following criticisms.

- (i) The input prices used to obtain the least-cost alternative are usually market prices, which may not reflect economic scarcity.
- (ii) Even with corrected prices, the project's real worth remains unknown; no estimate of the benefits is given. Since it is assumed that demand must be met,<sup>1/</sup> the costs of not supplying demand cannot be compared with the costs incurred in implementing the project.
- (iii) The method provides no information about the income multiplier or inflationary effects of the initial investment, nor about more permanent employment or income effects.
- (iv) The method does not deal with consequent changes in the availability and/or cost of water, nor on the effects of such changes on production functions. Such changes would be an especially important factor in textile manufacture, for example. In the long run, they might affect housing patterns, industrial prices and profits, and location of plants, for example.

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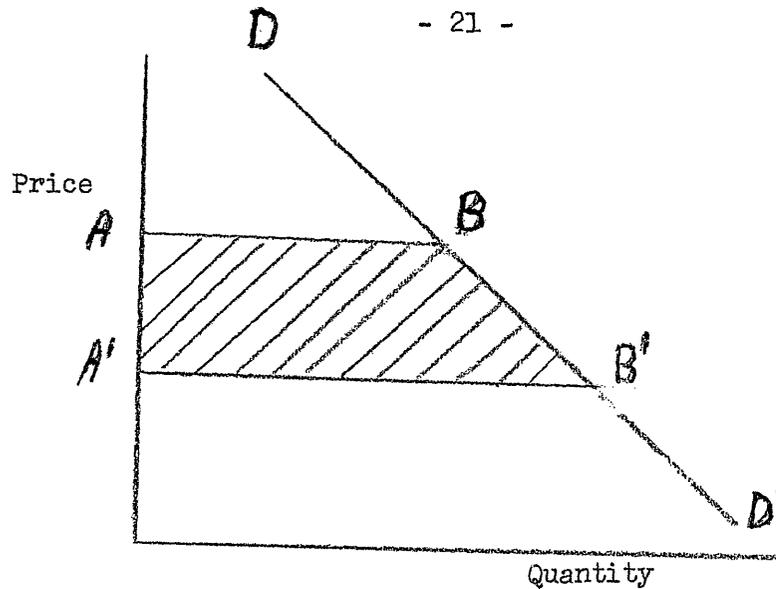
<sup>1/</sup> This assumption would be correct only if the demand curve were assumed perfectly inelastic. If in fact the demand curve is shown to be perfectly inelastic over the relevant range, then this appraisal method is valid. A perfectly inelastic demand curve would imply (i) that the benefits (in the form of consumers surplus) are infinite and therefore the costs incurred in implementing the project are justified (cf. (ii) in para. 45); and (ii) that the difference between the marginal and the total utility of the project is infinite; therefore the project has an infinite worth and an absolute claim on scarce investment resources (cf. para. 46).

- (v) There may be a great difference between the marginal utility of the water to consumers, as shown by the price they are ready to pay, and its total utility. Furthermore, if the demand curve for water is markedly inelastic compared to other demand curves, this difference--the consumers' surplus--would be even greater, and it would be worthwhile, from a welfare point of view, to build water supply facilities rather than invest in other areas, even if the financial return on other projects were much higher.
- (vi) The method does not account for a number of factors that are either non-economic, or that are not fully valued by individuals (external economies), such as improved health conditions and lower fire hazards.

46. ... A sensitivity analysis would serve to determine the relative importance of each of these six factors in any given case. The central point is that minimum-cost analysis gives no indication of the worth of the project, or of its prior claim on scarce investment funds. The main advantage of the method is the relatively small amount of information it requires.

## 2. Cost-Savings Method - Consumers' Surplus

47. Assume that the hypothetical water supply project, once implemented, diminishes the real cost of supplying one unit of water, by tapping a lower cost source, for example. In terms of the following diagram, the cost line moves from AB to A'B'. The "cost savings" would be measured by the area ABB'A'.



DD' = demand curve for water  
A = per unit cost of water before project  
A' = per unit cost of water after project

48. This method is open to the following criticisms.
- (i) Though it gives the increase in consumers' surplus created by the project, it does not consider the effects on any demand or supply curve in the rest of the economy.
  - (ii) It has the defects described in (iii), (iv), and (vi) above (paragraph 45).

The great advantage of a consumers' surplus method is that it measures total, not just marginal, utility. It partially bridges the gap between the national income measure and the total utility measure. Also, it requires information about only one demand and two cost curves.

### 3. Induced Output Method

49. Assuming that the only purpose of the water supply project is to provide irrigation water for an area, the induced output method calculates the gross yearly value of the crop made possible by the provision of irrigation water, deducts the annual investment and maintenance costs of the water supply facilities and the costs of growing the crop, and provides the present net yearly value added of the project.

50. The main criticism of this method is that it evaluates only the primary production effects. All other effects are ignored; thus it shares, in particular, defects (iii) and (vi) (paragraph 45). It shares defect (iv) insofar as effects on intermediate goods and other production functions are neglected.

#### 4. National Income Methods

51. This method takes as given a set of equations representing the main relationships in the economy, able to predict over time the evolution of national income. This set of equations includes an input-output model linking final demand and production which includes some production functions in which water enters as an intermediate good. Income increases stemming from the investment are evaluated by the multiplier. When the investment is completed, more water is consumed, both as an intermediate and a final good, and consumption patterns and the input-output table have been altered. Real output and national income have increased. A comparison over time of the results of the two sets of equations, one with and one without the project, should yield the net present value of the investment.

52. The three main criticisms of this type of method are that

- (i) national income measures costs and benefits imperfectly; a total utility measure is more desirable;
- (ii) non-economic and some indirect effects are neglected (cf. (vi), paragraph 45);
- (iii) it requires an enormous amount of information, usually not available in developing countries.

III. PROPOSED CLASSIFICATION TO AID IN TREATMENT OF SECONDARY EFFECTS

53. In order to reduce the confusion surrounding the definition and classification of secondary effects, a set of definitions is proposed in this chapter. It is hoped that such a clarification will promote both the understanding and the treatment of secondary effects.

54. Four major pairs of definitions are proposed, each associated with a possible technique for identification and measurement (see figure on following page). In principle, no category includes or overlaps any other, and only opposites in each pair are mutually exclusive. As a consequence, each of the effects of a real or hypothetical project can be typified by four of the eight categories, one from each pair; an effect is either economic or non-economic, it is either direct or indirect, etc.

55. Which effects are relevant to the investor or appraiser depends on how he has defined his own objective and on the nature of the project, and the choice is constrained by the availability of data.

56. In discussing the categories of benefits, the economic/non-economic distinction comes first, because, as is implied by the methodology required, these two categories have to do with basic investment goals. If the basic investment goal is to increase the sum of satisfactions or utility derived from the production and exchange of goods and services in the economy, then the investment has an economic objective. The definition of an economic effect is, then, that which increases or decreases the amount of economic welfare, and the objective function of the investor (i.e., the weighted list of his goals) includes the economic objective only.

57. The non-economic objectives in the function may be social, psychological, political, etc. What they are, and how important they are, is not strictly the province of the economist; his role is to price other objectives in terms of the economic objective, to present a set of alternatives and the tradeoffs involved. For instance, regional redistribution of wealth may well be a paramount objective in the minds of the political decision-makers. The role of the economist is to indicate to the decision-makers the price, in terms of the economic objective, of realizing this other objective.

58. Some economic effects may themselves create effects which contribute to the fulfillment of some non-economic objectives. For instance, assuming that expenditure on a road increases the incomes of some workers, if the money is spent in an economy with unemployed factors of production, the initial stream of expenditures may well lead to further employment in the economy. Since employment in itself is not an economic objective, an economic benefit would have produced indirectly a non-economic benefit: the increase in employment is an indirect benefit, the original payroll increase a direct benefit.

59. In the same way, forced increase of employment as a social objective certainly has economic consequences, such as an increase of income and expenditure in the economy and probably a decrease in profits; these effects would then be defined as indirect. To carry the argument even further, an economic benefit (e.g., an increase in income) may have non-economic benefits (e.g., an increase in employment) which might result in fewer riots and less police expenditure, again contributing to the economic objective.

A CLASSIFICATION OF SECONDARY EFFECTS

<u>Type of Effect</u>	<u>Criteria of Identification</u>	<u>Methodology Required</u>
1. Non-economic	Goods and services which are not exchanged on the market are taken into account.	Objective function
Economic	Only goods or services which are exchanged on the market are considered.	National income Consumers' surplus
2. Direct	The benefit or cost accrues to the objective primarily intended by the investor.	Programming matrix under the objective function
Indirect	The benefit or cost accrues without any additional cost to the investor to an objective outside of or secondary to his initial purpose.	
3. Private (financial)	The individual or firm bears the costs and receives the benefits of the investment.	Financial analysis
Social	The society's point of view is taken in evaluating the costs and benefits.	Shadow pricing
4. Primary	Only the immediate or first-round effects are taken into account.	Partial equilibrium analysis; comparative statics.
Secondary	The benefit produces a second round of benefits accruing to the same objective.	Multiplier analysis, Input-output table, Production functions.

60. Direct economic benefits are, thus, benefits which contribute, as the first-round manifestation or effect of an investment, to the economic objective. Indirect economic benefits are those which contribute to the economic objective as a consequence of the fulfillment of some non-economic objective. An increase in consumption or cost savings to users of a new road would be direct economic benefits, since these are the first manifestation of the investment and contribute directly to the economic objective. On the other hand, a decrease in health expenditures, resulting from the clearing of a marsh for social or political reasons, for instance, would be an indirect economic benefit.

61. The importance of the distinction is that the economist is competent to determine or evaluate the first causality link between the investment and the economic objective, but is usually not in a position to evaluate the relationship between the non-economic and the economic objectives. Once the economic effect of non-economic factors (e.g., changes in attitudes, political stability) have been determined by specialists of one of the other social sciences, it will become easier for the economist to incorporate the influence of the investment on non-economic objectives into his appraisal analysis.

62. The determination of these relationships between objectives (i.e., of the parameters in the programming matrix under the objective function) is a major task. Some results along these lines are being achieved, however. For instance,

in a book by Adelman and Morris<sup>1/</sup> the relative influences of economic and non-economic factors on a country's economic growth are statistically evaluated.

63. It is also possible for an initial effect to result in a second, similar effect on the same objective. For instance, the first expenditure round due to the investment goes into consumers' hands; when they spend it, it is transferred to others, and the income multiplier phenomenon is observed. Whenever one effect on the economic objective produces secondary effects on the same objective, a distinction between primary and secondary benefits or costs will become useful. This distinction naturally also applies to effects on non-economic objectives.

64. For the economist, it makes good sense to trace effects that have the same kind of content, act on the same objectives, and follow logically from one to the other. But before doing so, he should decide in which system he is operating, under what assumptions, and whether these assumptions are realized in the particular case with which he is occupied. For example, there will be no secondary effects unless a dynamic system with some unemployed factors of production is postulated.

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<sup>1/</sup> I. Adelman and C. T. Morris, Society, Politics, and Economic Development: A Quantitative Approach, Baltimore: Johns Hopkins Press, 1967.

65. The distinction between private and social effects, in theory, does not present special difficulties. When, in practice, it is desired to take all economic effects into account, then the social effects are to be preferred, since private effects exclude some consequences of the investment that affect society but not the individual concerned, and are therefore insufficient for the Bank's appraisal purposes.

66. The same reasoning, when applied to the distinction between financial and economic costs and benefits, implies that financial effects will be taken into account only as partial economic effects. The financial accounts are only one part of the economic balance sheet and do not include all the effects on national income or economic welfare. To determine the full, rather than simply the financial, costs and benefits of a project, local economic conditions should be surveyed and shadow prices for inputs and outputs determined.

67. The separation of tangible from intangible and commensurable from incommensurable benefits does not seem to be based on logical distinctions but rather on the extent or degree to which some effects (benefits or costs) are thought to be measurable. For measurement purposes, it may be desirable to distinguish between effects which can and cannot be valued. From the point of view of the classification of benefits, however, these categories are not very useful. Measurement techniques may vary among kinds of benefits, but the distinctions are based only on the state of the art and may change when new tools of measurement are discovered.

IV. SUMMARY

68. Interest in the possible importance of the secondary effects of investment projects is growing in the Bank. There is a need for a closer and more careful look at the classes of benefits and costs.

69. The definitions and classification of various types of secondary effects in the existing literature are confusing (Chapter I). However, it seems possible to establish a pragmatic link between a type of benefit and a method for its evaluation. On this basis, a classification of secondary effects is proposed (Chapter III).

70. The usual assumptions on which present appraisal methods are based often hinder adequate inclusion of secondary effects in appraisal work. The extent of this shortcoming varies with the circumstances and with the method used (Chapter II).

71. To evaluate secondary effects, greater use would have to be made of a number of analytical tools, in addition to or substitution for those normally used. The most appropriate technique depends on the particular case considered, but the following six are thought to be often useful:

- (i) Shadow prices, based on equilibrium prices in markets for factors of production, would serve to bridge the gap between private and social costs and benefits.
- (ii) Income and other multipliers, determined on the basis of consumer surveys and input-output tables, would make it possible to quantify the non-primary effects of investments.
- (iii) In cases where non-economic and indirect effects are deemed to be important, an objective function would have to be identified and relative weights for the various objectives determined.

- (iv) When interdependence within or among sectors is significant, sectoral or national income models would have to be substituted for the usual appraisal-in-isolation methods.
- (v) Consumers' surplus models might sometimes be used to approximate differences in total utility among projects.
- (vi) The sensitivity of the assumptions made because of imperfect information would have to be assessed, and probability analyses made when uncertainty exists.