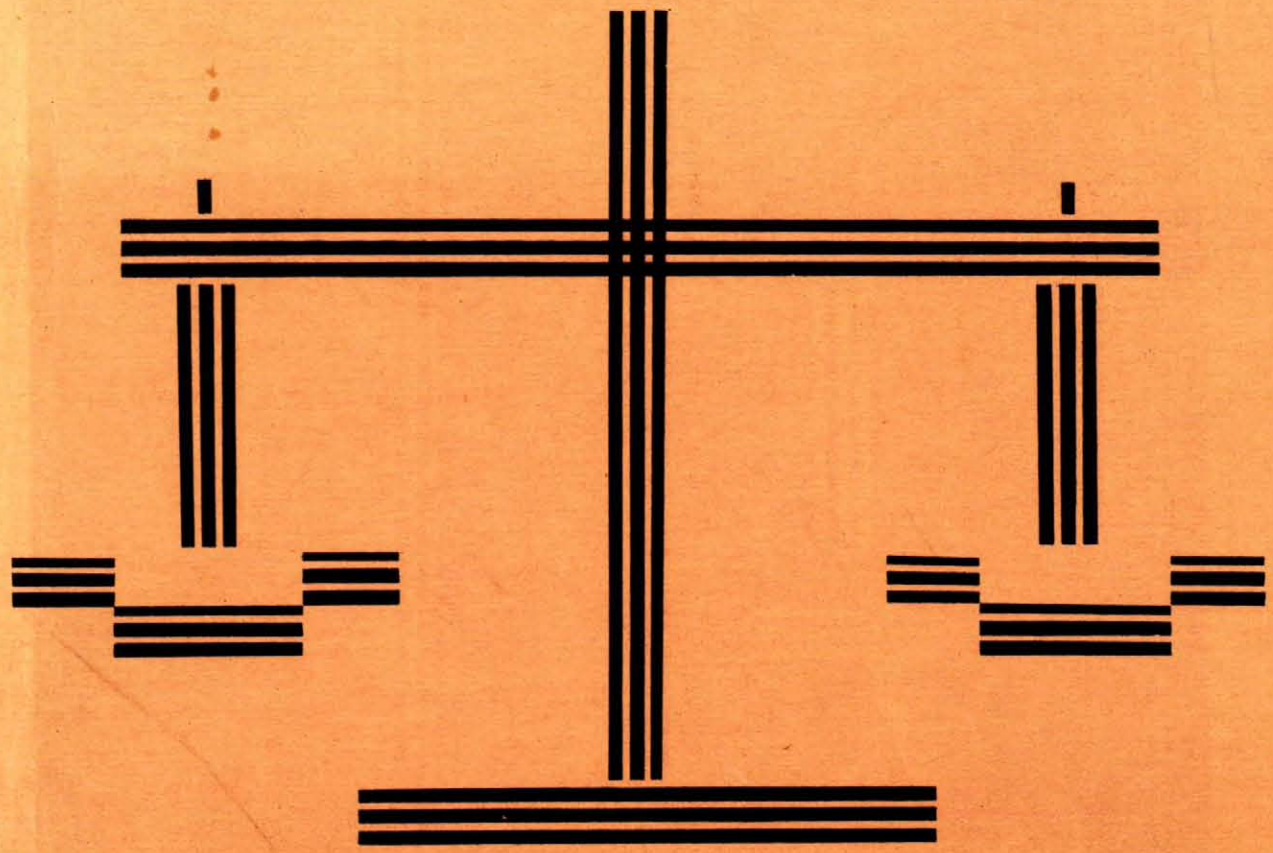

BENEFIT-COST ANALYSIS

It's Application to RDIA Projects

Government of Canada / Gouvernement du Canada

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ATLANTIC REGION

BENEFIT-COST ANALYSIS

ITS APPLICATION TO RDIA PROJECTS

Department of Regional Economic
Expansion
Moncton, N.B.

Ram K. Sharma
Economic Analysis
Planning Division

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INTRODUCTION

Increasingly more use is being made of benefit-cost analysis (BCA, for brevity) as an appropriate technique for selecting investment projects either for direct government investment or for providing government assistance to private investment projects. While there is no one correct method of evaluating projects, a growing concensus on many major aspects of BCA is being achieved.

This paper has two main purposes: (1) to apprise the analysts of this emerging concensus in order to achieve some degree of uniformity in the application of the technique and thus to ensure comparability of the results when the analysis is carried out by different practitioners of the art; and (2) to describe briefly the underlying theoretical constructs and conceptual foundations of BCA. It is important to realize that this tool of project appraisal does not rest upon a set of arbitrary rules but on a well developed economic theory. It is an application of the theory of resource allocation which in turn forms a prominent part of welfare economics. An understanding of the underlying analytical frame work will help the analysts become aware of both the strengths and weaknesses of the technique and thus assist in improving the quality of analysis and policy decisions that may follow from this analysis.

1. BENEFIT-COST ANALYSIS: A GENERAL BACKGROUND

Before we set out the factors that must be taken into account in calculating the benefits and costs of a project, a general background of BCA is in order.

Benefit Cost Analysis is a technique of investigating the desirability of projects or programs taking into account both different kinds of side effects and future repercussions. In other words, it implies the enumeration and calculation of all the relevant costs and benefits of an investment program in order to evaluate its desirability according to some accepted criterion.[1]

1.1 Benefit-Cost Analysis and Economic Efficiency

The objective of applying benefit-cost analysis to public project appraisals is to increase social welfare in some broad sense.

It is generally agreed that social welfare or changes in social welfare are a function of a number of variables such as economic efficiency, personal distribution of national income and

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1. See, for example, A.R. Prest and R. Turvey, "Cost-Benefit Analysis: A Survey" in Surveys of Economic Theory, Vol. 3 (Toronto: MacMillan, 1966), p. 155.

regional development, etc. Ideally, an analyst should define a social welfare function based on some relevant variables and appraise public investment projects on the basis of their impact on this function. In practice, however, this is not possible and the analyst may not be able to do more than present to the decision maker the effects of a proposed investment project on several important variables and let him decide what effects are to be given more or less importance (i.e., how to weigh these effects) in deciding whether the project should be undertaken or not.

However, there may be cases where the decision can be taken on the basis of some criterion of economic efficiency alone. Such seems to be the situation when it is to be decided whether or not a project should get financial help under the Regional Development Incentives Act (RDIA) program. Under this program any proposed project in the private sector, which is economically efficient, will qualify for financial assistance provided it satisfies certain stipulated conditions, e.g., it has to in a designated area and in some specified manufacturing and/or processing industries. For all intents and purposes the program is an open ended one, i.e., there are no budgetary restraints or "capital rationing". No project has ever been refused assistance because of the limited availability of funds.

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The most celebrated criterion of economic efficiency is that of Pareto optimality which is defined as a situation where no one can be made better-off by re-allocation of resources without making someone worse-off, i.e.; any change which harms no one but makes some people better-off (in their own estimation) must be considered an improvement and hence desirable.* While this is certainly a very persuasive proposition, it fails to cover most of the real world public policy decisions which benefit some people while making others (at least one person) inevitably worse-off. Public expenditure programs change resource allocation in a society and simultaneously give rise to both benefits (i.e., favourable effects for some people) and costs (i.e., adverse effects for others).

Recognizing this fact, economists have attempted to develop more refined criteria of economic efficiency which will have wider applicability than the Pareto criterion. In the literature on BCA these days the most commonly used criterion of economic efficiency is the Kaldor-Hicks criterion.

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* Public Investment projects can be examined on the basis of this criterion. A project can be defined as a change in an existing situation. Public investment changes the current pattern of resource allocation, We compare the situation without the project with the one that will prevail after the project has been undertaken.

According to this criterion, any change in the allocation of resources is efficient and hence desirable if it either satisfies the Pareto optimality conditions or if the gainers from the changed allocation of resources could compensate the losers (so as to leave the latter at least as well-off as they were before the reallocation of resources) and still be left with some benefits.[2] Note that under the Kaldor-Hicks criterion losers do not have to be actually compensated. It merely requires that the gainers are potentially able to make this compensation out of their gain and still be left with some advantage. In other words, a change in the allocation of resources is deemed to be efficient (and hence an improvement upon the previous one) if those who gain evaluate their gains at a higher figure than the value placed by losers on their losses, i.e., a project will be efficient and hence desirable if its aggregate benefits are greater than its aggregate costs.

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[2] For details, see N. Kaldor, "Welfare Propositions of Economics and Interpersonal comparisions of Utility", Economic Journal, 49 (Sept, 1939); J.R. Hicks, "The Foundations of Welfare Economics", Economic Journal, 49 (Dec., 1939). It may be noted that T. Scitovsky has pointed out that the Kaldor-Hicks criterion in some cases can result into inconsistent evaluation of the situation. He proposed a stricter criterion. See, Tibor Scitovsky, "A note on Welfare Propositions in Economics", Review of Economic Studies, 9 (Nov., 1941). However, this criterion is not studied here as it does not change the nature of Kaldor-Hicks criterion, but only makes it more stringent.

This criterion of project selection does not mean that every one in the society would become better off but only that theoretically it is possible (by re-distribution of net gains) to make every one better-off. Thus Kaldor-Hicks criterion (the basis of BCA) is what Mishan calls a "potential" Pareto improvement criterion; a "diluted" version of the original.[3] Whereas the Pareto improvement criterion requires that no one should become worse-off when some people are made better-off, the "potential" Pareto optimality conditions are consistent with many people actually becoming worse-off.

The potential Pareto improvement criterion thus defines efficiency in terms of net additions to national income, i.e., a project is efficient if it adds to national output. It is widely believed that there should be a strong positive correlation between real national output and social welfare (i.e., greater production should move the society towards a higher standard of living) and thus a project selected on the basis of efficiency alone is presumed to add to social welfare.* However, we cannot state with certainty

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[3] E.J. Mishan, Cost-Benefit Analysis (New York: Praeger Publishers, 1971), pp. 316-318.

* An increase in national output may lead to increased social welfare. However, national income cannot be taken as an adequate index of social welfare. For a detailed discussion on this point see Paul A. Samuelson, "Evaluation of Real National Income", in Kenneth J. Arrow and Tibor Scitovsky (eds), Readings in Welfare Economics (Homewood, Ill.: Richard D. Irwin, Inc., 1969).

that social welfare will increase as the increased national income may not be distributed in accordance with the society's preferences.

1.2 Benefit-Cost Analysis and Equity

Benefit-Cost Analysis based on the Kaldor-Hicks Criterion, it is clear from above, ignores the resulting change in the distribution of income and hence the equity aspect of welfare economics. It is obvious that income in the community will be redistributed, if the losers are not actually compensated. It, therefore, is sometimes argued that redistributional effects of public investment should be integrated in some fashion into a criterion of social improvement. In other words, the suggestion is to add income distribution, in addition to efficiency objective, as a variable in the objective function which is to be maximized in order to achieve maximum social welfare.[4] This could be done by assigning value weights to particular distributional outcomes. The required weights could be based on the value judgement of the decision maker. Such an approach, it can be argued, is not very satisfactory because the objective is to achieve a

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[4] See, for example, Otto Eckstein, "A Survey of the Theory of Public Expenditure Criteria" in James M. Buchanan (ed.), Public Finances: Needs, Sources and Utilization (Princeton: Princeton University Press, 1961); Stephen A. Marglin, Public Investment Criteria (London: George Allen and Unwin Ltd., 1967).

kind of distribution that society considers to be optimal and not the one that the decision maker favours. Moreover, the decision maker (most often a bureaucrat in government) in all probability will not have the fairly complex information required for weighting and his judgement, therefore, will have to be qualitative.

Alternatively, it has been suggested, the required weights could be arrived at by political process by assuming that the past policy actions of parliament did reflect the social welfare function. One notable example of this approach, among others, is the weight inference model suggested by Weisbrod.[5] However, Weisbrod's approach has been criticized on many grounds.[6] Weights implicit in the past government decisions may be no more than accidental; they may not be based upon any considerations of society's preferred distributional scheme. Similar criticisms can be levelled against Haveman's suggestion that distributional weights can be derived by assuming that the marginal income tax rates for people at different income levels reflect legislators'

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[5] Burton A. Weisbrod, "Income Redistribution Effects and Benefit-Cost Analysis" in Samuel B. Chase (ed.), Problems in Public Expenditure Analysis (Washington: Brookings Institution, 1968).

[6] See Comments on Weisbrod's paper by R. Haveman and Ruth P. Mack and also Chase's summary of the discussion on this paper in Samuel B. Chase (ed.), Problems in Public Expenditure Analysis.

perceptions regarding the marginal utility of income to different income groups.[7] The marginal income tax rates may have been influenced by many other (in addition to distributional intentions of the legislators) politico-social factors. Actually, there is no concensus in the profession as to how distributional impacts should be integrated with efficiency objectives. There is no obvious solution to this problem.

It is suggested that it will be better to keep allocation and distribution separate as much as possible.[8] Income redistribution in itself is a very important problem faced by every modern society. It may be in the best interest of society to make the most efficient use of its resources and to achieve objectives like equity in the distribution of income by fiscal and other policies such as minimum wage legislation, etc. Such a policy would enable society to redistribute a large aggregate product.

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[7] Robert H. Haveman, Water Resource Investment and the Public Interest (Nashville, Tenn.: Vanderbilt University Press, 1965).

[8] For justification and elaboration of this approach see Richard A. Musgrave, "Cost-Benefit Analysis and the Theory of Public Finance", Journal of Economic Literature, 7 (Sept., 1969), pp. 803-805. Harberger also has urged the economic profession to accept the allocative efficiency basis of BCA and to exclude distributional impacts from consideration. See his article, "Three Basic Postulates for Applied Welfare Economics: An Interpretive Essay" Journal of Economic Literature, 9 (Sept., 1971), pp. 785-797.

Moreover, it has been argued in the literature that the redistributional consequences of investments normally subjected to BCA are not very significant and, for all practical purposes, can be ignored.[9] This argument applies with added emphasis to projects which are submitted to DREE for RDIA grants. Most of these projects are either small or medium scale.

However, this argument does not mean that BCA is free of distributional value judgements. The very process of applying BCA to a project implies that the existing distribution of income is considered to be socially the most preferred one. Efficiency (changes in real national product) is measured by using market prices which in turn are influenced by the existing income distribution.*

The upshot of the above discussion is that BCA usually is used to evaluate public investment projects and/or programs in order to ensure that the resources are used efficiently i.e., the proposed project/program, if undertaken,

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[9] See, for example, Otto Eckstein, Water Resource Development: The Economics of Project Evaluation (Cambridge, Mass.: Harvard University Press, 1958); J. Krutilla, "Welfare Aspects of Benefit-Cost Analysis", Journal of Political Economy, 69 (june, 1961).

* Prices are determined by supply and demand. By demand is meant not only the desire for a commodity but also the willingness and ability to pay for it. The latter factors are determined by the distribution of income and wealth in society.

will increase the value of total product in the economy (the national income). In addition, if we are to select a project out of many, the project that contributes the maximum to the national income will be undertaken.

1.2.1 National Efficiency Versus Regional Equity

So far we have discussed only inter-personal distribution of income and recommended that it should be achieved by policies other than project selection. The latter, it is argued, should be based on national efficiency considerations only. What about the regional distribution of income? It could be as important an objective of national policy as the efficient allocation of resources. Actually, as we know, the main purpose of the RDIA grants program is to attract manufacturing industries to the lagging regions in order to create improved opportunities for productive employment. However, the basic point of reference for analysis should remain the economy as a whole as the government assistance is contributed by all parts of the economy (through the tax mechanism) and likewise the advantages from a project flow to all parts of the country.* Moreover, if Canada is to develop as one social

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* It is reasonable to assume that because of the regional pattern of industrial capacity, Atlantic Region, the lowest income region in the nation, retains only a small part of the income and employment generated by material demand from projects constructed within the region.

and political system, all its regions have to grow not in isolation but within the overall framework of the national economy. Individual regions cannot be allowed to compete relentlessly with each other for industry. This practice, if allowed, will be expensive and self-defeating. Developers will play off one region against another.

The twin objectives of national efficiency and regional development, however, can be incorporated into a measure of project viability by assigning shadow prices to factors of production and by calculating the secondary (or multiplier) effects of a project on the regional economy. For example, one of the objectives of the RDIA program is to improve job opportunities in the designated areas. As unemployment exists in these areas, shadow price of labour for increased employment should be used even though the market wages are paid. Similarly, secondary benefits of the project to a region should be calculated even if there is full employment of resources in the national economy as a whole. More will be said on these points later in this paper.

1.3 Benefit-Cost Analysis and Private Sector Profitability Analysis

Benefit-Cost analysis is different from, though very similar to, profitability analysis in the private sector. The

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basic difference between the two types of analysis is the identity of the group from whose perspective the analysis is done. Profitability analysis is conducted from the perspective of a firm whose responsibility is to its shareholders who, in turn, are mainly interested in profits. Benefit-Cost Analysis is undertaken from the point of view of society as a whole and, therefore, is concerned with social welfare. In other words, whereas the private sector is interested in the commercial viability of a project, the public sector appraises its economic viability (i.e., its net social value).

It has been shown in the literature that given a system of laissez-faire capitalism with perfect competition, no externalities and no taxes, revenues of a firm from a project measure its social benefits also and the firm's costs represent the total costs of the project to society. Under this system, it is clear, private profits of a project will represent its gains to society as well. However, if any one of the above assumptions is violated there arise discrepancies between the social and private benefits on the one side and the social and private costs on the other. The commercial analysis, therefore, has to be modified in order to convert the private revenues and costs of a project into its social benefits and costs. One example of the required modifications is the adjustment of the market prices that are used to determine

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the social value of the inputs and outputs of a project. Sometimes an analyst has to impute prices where no market prices exist; for example, in the case of goods and services which are provided by the government free of any direct charge to the consumer. We will have more to say on these matters later in this paper.

1.4 A Word on Commercial Viability Analysis

For deciding whether or not RDIA grants should be given to a project, it is useful to conduct its economic viability study or BCA in two distinct steps rather than in one, i.e., first to carry out a commercial viability study and then to convert it into an economic viability analysis. In the absence of this two step procedure, grants may be awarded to such projects as are not commercially viable at all (and, therefore, would not survive without continuous government aid) or are so viable that they do not need any financial assistance from government. In either case, there will be an inefficient use of resources.

Various algorithms of private project evaluation have been suggested and used by analysts. However, the method of discounted cash flow to total capital (commonly known as the DCF method) could be described as the heart of the private sector's approach to project appraisal. The other

methods like the "payback period", "proceeds per dollar of outlay" and "the average income on the book value of investment", etc., though sometime used by businessmen, should not be applied.[10] One significant drawback common to all these methods is that they fail to take proper account of the timing of the revenues and costs of a project. And yet timing is very important because a dollar received or spent today is worth more than a dollar gained or spent a year or two years in the future.[11] In measuring a project's profitability, the costs incurred on this project over its lifetime and the revenues generated in this period are to be compared. These streams of revenues (benefits) and costs can be made commensurable by discounting them to the present or to some other common point in time.

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[10] Various techniques of project evaluation have been discussed in detail by many authors, including Harold Bierman Jr. and Seymour Smidt, The Capital Budgeting Decision (2nd edition; New York: The MacMillan Company, 1968); Development Centre of the OECD, Manual of Industrial Project Analysis in Developing Countries (2 Vols.; Paris: OECD, 1968), Vol. I. pp. 109-142; Friedrich and Vera Lutz, The Theory of Investment of the Firm (Princeton: Princeton University Press, 1951), pp. 16-48; P. Massé, Optimal Investment Decisions (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1962), Chapter 1; and Roland N. Mckean, Efficiency in Government Through Systems Analysis (New York: John Wiley and Sons, 1958), pp. 25-150.

[11] The reasons for this are well explained in the literature. See Ibid.

In the DCF method, the annual constant dollar (net of inflation) net cash flow (i.e., the expected yearly revenues from the project over its lifetime minus its annual costs) from a project is estimated. In calculating this net cash flow, taxes (e.g., corporation income tax and mining taxes on mining projects) are deducted from cash inflows or revenues but depreciation and finance charges are excluded.*

The annual constant dollar (net of inflation) net cash flow is then discounted back to the present by an appropriate private discount rate to determine the net present value (NPV) of the project. The discount rate normally used for this purpose is a rate that measures the time value of money to private investors.

If the NPV of the project is ≥ 0, the project is deemed to be commercially viable. The private investor earns at least the normal real rate of return, i.e. the average rate of return in the economy. If the NPV < 0, the project is not commercially worthwhile and should not be undertaken. If the private entrepreneur carries it out, he will earn less profit than if the money had been invested somewhere else in the economy.

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* If these items are included in the net cash inflow calculations, double counting will result. For details, see Michael Roemer and Joseph J. Stern, The Appraisal of Development Projects (New York: Praeger Publishers, 1975) pp. 25-27.

1.5 The Public Sector Project Evaluation Methods

The private sector criterion of project appraisal described above is also used to evaluate public investment projects except that, as mentioned before, the calculations of the NPV have to be modified, the private costs and revenues have to be converted into social costs and social benefits, and the social discount rate has to be used in place of the private one. By this criterion, if the NPV of the project ≥ 0, the project will be considered economically viable i.e., this project makes profitable use of resources from the society's point of view. On the other hand if its NPV < 0, the project is not economically viable. If this project is undertaken, an inefficient allocation of resources will result as the country can gain more benefits by using these resources somewhere else.

The other criteria frequently used for project evaluation in the public sector are (1) the benefit-cost ratio and (2) the internal rate of return.* However, recently their

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* The mathematical formulas for the three criteria are as follows:

1. $NPV = \sum_{t=o}^{T} \frac{B_t - C_t}{(1+i)^t}$

Where:

NPV = Net present value of the project;

(Continued)

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* (Con't)

B_t = Benefits from the project in time t;
C_t = Costs of the project in time t;
i = An appropriate discount rate;
T = Life time of the project
t=o indicates the present time or that common point in time to which the benefits and costs are to be discounted.

2. $$\frac{B}{C} = \sum_{t=o}^{T} \frac{B_t}{(1+i)^t} \div \sum_{t=o}^{T} \frac{C_t}{(1+i)^t}$$

Where:

$\frac{B}{C}$ = Benefit-cost ratio of the project concerned and all other variables are the same as defined above.

In this case, a project is efficient if its $\frac{B}{C} > 1$.

3. Average (or internal) rate of return is that rate of discount which makes the NPV of a project = 0. In other words, it is that rate of discount which satisfies the following equation:

$$\sum_{t=o}^{T} \frac{B_t}{(1+r)^t} = \sum_{t=o}^{T} \frac{C_t}{(1+r)^t}$$

Where:

r = Internal rate of return and all other variables are the same as defined above.

According to this criterion, a project is viable if r is higher than a certain minimum acceptable rate of discount (usually called the cut-off rate).

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use has fallen out of favour because of their inherent limitations and shortcomings.[12]

However, it should not be concluded that the NPV criterion is without any limitations. This criterion is preferrable only if there are no budgetary constraints and, therefore, no ranking of projects is involved; a condition under which RDIA grant applications are evaluated. If there has to be a ranking of projects, the NPV criterion "has an inherent bias in favour of large projects which could lead to a less than optimal mix of investment opportunities."[13]

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12 For a detailed discussion of these criteria see Roland N. McKean, op.cit.; United Nations Research Institute for Social Development Cost-Benefit Analysis of Social Projects: Report of a Meeting of Experts (Geneva: April 1966); J. Hirshleifer, "On the Theory of Optimal Investment Decision," Journal of Political Economy, 66 (August, 1958), 329-352; Arnold C. Harberger, "Survey of Literature on Cost-Benefit Analysis for Industrial Project Evaluation" in his Project Evaluation: Collected Papers (Toronto: The MacMillan Press Ltd., 1972).

13 Jesse Burkhead and Jerry Miner, Public Expenditure (Chicago: Aldine. Atherton, 1971), p. 220. See also Ram K. Sharma, "Benefit-Cost Analysis and Public Health: A Case Study of the Tuberculosis Control Program in Ontario, 1948-1966", Unpublished Ph.D. dissertation, University of Western Ontario (London, Ont., 1973), pp. 53-57.

Under such circumstances, the social marginal product (SMP) of capital criterion or the benefit-cost ratio (B/C) method will be preferable to the NPV criterion depending upon the nature of the budgetary constraint.[14] The SMP of a project is the rate of present value of net benefits per dollar of capital cost. It can be used where capital (or investment costs) is a constraining factor on a budget. However, if the budget constraint is applicable to total cost budget (i.e., investment costs plus operating costs), the B/C criterion or the NPV per dollar cost criterion should be used*. The latter two will give equivalent ranking for the projects.** The B/C criterion is specially useful when cost-effectiveness analysis is required rather than BCA. The latter puts dollar values on both the benefits and costs, the former, however, measures costs in dollar terms but expresses outputs (benefits) in kind (e.g., deaths prevented, years added to life, children educated and the like).[15]

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[14] See R. K. Sharma, Ibid. For a discussion of the SMP criterion see H.B. Chenery, "The Application of Investment criteria", Quarterly Journal of Economics, 67 (February, 1953), 76-96.

* In the case of B/C or the NPV per dollar cost, all costs (capital as well as operating) are covered. The SMP criterion takes account of only the capital costs.

** It can be proven that NPV per dollar cost = B/C - 1.

[15] For a discussion of cost-effectiveness analysis see Harold A. Hovey, The Planning-Programming-Budgeting Approach to Government Decision Making (New York: Frederick A. Praeger, 1968), pp. 45-46 & 55-56; William A. Niskanen, "Measures of Effectiveness", in Thomas A. Goldman (ed.), Cost-Effectiveness Analysis (New York: Frederick A. Praeger, 1967).

The RDIA grants program, however, for all practical purposes, has no budget constraints. Moreover, it is applicable to industrial projects only where the value of the outputs (and hence the benefits of the projects) can be measured in monetary terms. In this case, therefore, the NPV method of project appraisal will be better than any other criterion suggested in the literature.

2. BENEFIT-COST ANALYSIS: SOME ISSUES OF IMPORTANCE

It has been mentioned earlier that in BCA we are concerned with the welfare of society as a whole and, therefore, adjustments have to be made to the profit and loss calculus of a project if it is to be appraised from the perspective of the economy as a whole. This section deals with some of these adjustments; the most important ones.

2.1 Social Discount Rate

What social discount rate (SDR) should be used in calculating the NPV of a project is one of the most contentious issues in BCA. There is no universally accepted view with respect to either its conceptual foundations or its magnitude (size). The controversy is mainly between two schools of thought; one believes that an appropriate SDR is represented by the social time preference (STP) while the other thinks that it should reflect the social opportunity cost of capital (SOC).[16]

2.1.1 Social Time Preference Rate

Social time preference expresses society's marginal rate of substitution between consumption now and consumption

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[16] For a brief summary of the literature on the SDR see Ram K. Sharma, op.cit., Appendix to Chapter 4, pp. 181-207.

in the future. In other words, it is the premium that society is willing to pay for extra consumption now relative to that in the future.

The proponents of the STP rate believe that this rate will be lower than the pure market rate of interest which in turn is supposed to reflect the private time preference (i.e., a risk free rate at which individuals are willing to borrow and lend money).[17] The pure market rate of interest is usually supposed to be given by an average of long term government bond rates. The arguments in favour of the STP rate have been criticized on various accounts; the main criticism being that its use as a discounting factor for calculating the NPV of social projects will lead to an inefficient transfer of resources from the private to the public sector as the former will use discount rates higher than the STP rate.[18]

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17 The philosophical reasoning behind this line of thinking was first developed by A.C. Pigou, see his, The Economics of Welfare (Fourth Edition, London: MacMillan and Co., 1932), pp. 23-30. The later sources include, among others, M.N. Dobb, Economic Theory and Socialism (New York: International Publishers, 1955), pp. 70-74; Stephen A. Marglin. "The Social Rate of Discount and the Optimal Rate of Investment," Quarterly Journal of Economics, 77 (February, 1963); A. K. Sen, "On Optimizing the Rate of Saving", Economic Journal, (Sept., 1961).

18 See, for example, William J. Baumol, "On the Appropriate Discount Rate for Evaluation of Public Projects", in Harley Heinrich and Graeme M. Taylor (eds.), Program Budgeting and Benefit-Cost Analysis: Cases, Text and Readings (Pacific Palisade, Cal.: Goodyear Publishing Co., 1969); Gordon Tullock, "The Socail Rate of Discount and Optimal Rate of Investment: Comment", Quarterly Journal of Economics, 78 (May, 1964); E. J. Mishan, "Criteria for Public Investment: Some Simplifying Suggestions", Journal of Political Economy, 75 (April, 1967).

The proponents of the STP rate agree with this argument. They have suggested an STP cum shadow price of capital approach to the SDR to take care of this argument.[19]

The new approach suggested by the STP school has also been criticized severely. However, the most decisive argument against using the STP rate is that it cannot be derived empirically by any simple process from any set of market rates which may be taken as the representatives of the private time preference. In practice, it will have to be determined by political process and hence, for all practical purposes, by government.[20]

2.1.2 Social Opportunity Cost of Capital Rate

The second major school of thought on the SDR believes that it should represent the social opportunity cost of capital

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19 See, for example, Stephan A. Marglin, "The Opportunity Cost of Public Investment", Quarterly Journal of Economics, 77 (May, 1963); Martin S. Feldstein, "Net Social Benefit Calculation and the Public Investment Decision", Oxford Economic Papers, (March, 1964).

20 The reasons for this problem are well explained by Marglin in his February, 1963 article, (footnote 17).

(SOC) which can be defined as the value to society of the production (or consumption) that the capital used in a project would generate in its next best use.[21] The SOC thus can be estimated by taking a weighted average of the social real rates of return earned in the various sectors of the economy from which government derives the necessary funds, the weights being the proportion of funds procured from each sector.[22] The application of such a rate as a discounting factor ensures that the use of public funds is deemed efficient only if they earn a return at least equal to what they would have earned, on an average, elsewhere in the economy.

It has been estimated that the real SOC in Canada is about 10 per cent whereas the real private rate of return (or private opportunity cost of capital) is about 6 per cent.[23]

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[21] See, for example, William J. Baumol, "On the Social Rate of Discount", American Economic Review, 58 (Sept., 1968); A.C. Harberger, "Survey of Literature on Cost-Benefit Analysis for Industrial Project Evaluation in his Project Evaluation: Collected Papers. (Toronto: MacMillan, 1972).

[22] A.C. Harberger, "On Measuring the Social Opportunity Cost of Public Funds", in his, Project Evaluation: Collected Papers

[23] Glenn P. Jenkins, "Analysis of Rates of Return from Capital in Canada", Unpublished Ph.D. dissertation, University of Chicago (Chicago: 1972); "Capital in Canada: Its Social and Private Performance 1965-1974, Discussion Paper No. 98 (Ottawa: Economic Council of Canada, 1977) and "The Measurement of Rates of Return and Taxation from Public Capital in Canada", in W. Niskanen et.al. (eds.), Benefit-Cost Analysis and Policy Analysis (Chicago: Aldine, 1972).

These are the most commonly used figures for the social and private discount rates in Canada these days. The divergence between the two is explained largely by the existence of corporation income tax and subsidies to private investment. To the extent that these have the net effect of lowering the private rate of return on investment, the SOC will exceed the private rate of return.

2.1.3 Real Versus Nominal Rate of Interest

The rates of discount suggested above are the real rates as opposed to the nominal (or financial) rates. A real rate of interest (or discount rate) is approximately equal to the nominal interest rate minus the expected rate of inflation.* The reason for using a real rate as a discounting factor is that if a financial rate is used many economically efficient projects may be rejected because the financial rates of interest generally contain a premium for the expected rate of inflation, but, as the normal practice goes, the dollar value of the future benefits and costs of a project is estimated

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* To be more exact, the real rate of interest (r) is given by the following equation:

$$(1 + r) = \frac{(1 + i)}{(1 + P)}$$

Where i = nominal rate of interest
p = expected rate of inflation

by using the current (referring to the time when the analysis of a project is undertaken) market prices or their administrative equivalents. In other words, the constant (present) prices are used without any adjustment for the expected inflation whereas the interest rates (financial) already have "inflationary discount" built into them.

Alternatively, the wages and prices used for calculating the benefits and costs of a project could be adjusted upwards by the expected rate of inflation.[24] However, using a real discount rate appears to be a better method as it requires less computational work and uses the more familiar method of calculating the benefits and costs of a project. On the whole it has been demonstrated that both methods yield roughtly the same results.[25]

2.1.4 Adjustments for Risk

It has been suggested often that the interest rate used for discounting should be adjusted upwards to account for

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[24] Otto Eckstein favours this method. See his testimony before the Joint Economic Committee of the United States Congress in Hearings, July 30, 31 and August 1, 1968: Document 98-940 (Washington, D.C.: Government Printing Office, 1968), p. 71

[25] G.L. Rueber and R.J. Wonnacott, The Cost of Capital in Canada: With Special Reference to Public Development of the Columbia River (Washington: Resources for the Future, Inc., 1961), pp. 10-11.

the risks involved in a project.* A higher discount rate, it is argued, will discount remote benefits progressively more heavily and thus reduce the weights given to the more distant benefits and costs; their outcome is usually quite uncertain because of errors in forecasting the remote future. Seagraves favours adding a risk premium of the order of 2 to 4 per cent.[26]

However, it can be rightly argued that risk premium is not necessary. Government in any country invests in a large number of projects and its investment is highly diversified. Therefore, under the law of large numbers the outcome becomes pretty much certain and the marginal risk of any one project to government is so small that it can be ignored easily.[27]

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* The other methods to take care of the phenomenon of risk suggested in the literature are to make contingency allowances for costs or to shorten the economic life of the project. See, for example, Otto Eckstein, "A Survey of the Theory of Public Expenditure" and A.R. Prest and R. Turvey, "Cost-Benefit Analysis: A Survey".

26 J. A. Seagraves, "More on the Social Rate of Discount", Quarterly Journal of Economics, 84 (August, 1970).

27 Paul A. Samuelson, "Principles of Efficiency: Discussion", American Economic Association Proceedings, May 1964, pp. 93-96 and K.J. Arrow, "Discounting and Public Investment Criteria", in A.V. Kneese and S.C. Smith (eds.), Water Research (Baltimore: The John Hopkins Press, 1966), p. 28.

2.2 Shadow or Accounting Prices

The efficiency basis of BCA requires that a project/program should be undertaken only if it makes a net addition to the national income, i.e., if the value of its social benefits is greater than the value of its social costs. Social benefits can be valued in terms of what the people are willing to pay for the output of this project rather than go without it.* Social costs, on the other hand, are measured by the opportunity cost of resources used in this project, i.e., the benefits forgone if the resources had been used in their next best use.

It can be shown that in a perfectly competitive economy** which works without any distortions, most of the

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* In principle, the consumers will be willing to pay a sum equal to the area under the demand curve for a commodity rather than go without it, i.e., willingness to pay is equal to effective payment made for the commodity (the product of the price of the commodity and its quantity purchased) plus the consumers' surplus. If there are reasonably good alternatives available for this commodity, its demand curve will be highly elastic and the difference between the effective payment made and the amount that the consumers are willing to pay will be negligible and hence the consumers surplus can be ignored.

**Perfect competition is said to exist when: (1) there are a large number of buyers (consumers) and sellers (producers) so that no individual could influence the market conditions; (2) there is free entry to and exit from the market; (3) information regarding any aspect of the market is readily available to all, though not necessarily without cost; and, (4) factors of production are perfectly mobile and the technology allows for substitution among these factors.

time the ruling market price appropriately represents the amount which the consumers are willing to pay per unit of an output.[28]

Moreover, in a fully employed and perfectly competitive economy without any externalities and taxation, the cost to an industry of a factor of production is given by the market price of that factor which in turn, in overall equilibrium, is supposed to represent the marginal opportunity cost of that factor.

As a matter of fact one of the fundamental theorems of modern welfare economics states that the market prices under equilibrium conditions in a perfectly competitive economy without any distortions (e.g., taxation and externalities or spillover effects, etc.) take the economic system as a whole (if consumers try to maximize their utility and producers seek to maximize profits) to Pareto efficiency (a state which BCA attempts to achieve). It, therefore, follows that if there are no market distortions, a benefit-cost analyst can use the market prices of goods and factors of production as a true

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[28] The proof of this proposition may be found at several places in the economics literature. See, for example, A.K. Dasgupta and D.W. Pearce, Cost-Benefit Analysis: Theory and Practice (London: MacMillan, 1972), pp. 44-46.

measure of social benefits per unit of output and social costs per unit of input, respectively. In a perfectly competitive economy, the market price of an output is equal to its marginal cost of production and the market price of an input is given by the value of its marginal product. It can be proven that this marginal cost pricing principle results in maximizing the difference between the benefits and costs as measured by the willingness of people to pay for the flow of goods and services from the project.[29]

However, the modern economic system does not work under the above stated stringent conditions and, therefore, very often a benefit-cost analyst has to adjust the market prices so that they will reflect the social prices. These adjusted market prices are called the "shadow" or "accounting" prices*; the term shadow is used because these prices often

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[29] Ibid. pp. 98-108

* Sometimes these prices are also called the "planning prices". The term shadow price is also used for the price which an analyst may attribute to an unpriced good or unpriced gains and losses. Shadow prices are used sometimes also to incorporate the political and social objectives into the valuation process. For a detailed discussion on shadow prices see Ronald N. McKean, "The use of Shadow Prices", in Samuel B. Chase Jr. (ed.), Problems in Public Expenditure Analysis and Julius Margolis, "Shadow Prices for Incorrect or Non existent Market Values", in R.H. Haveman and Julius Margolis (eds.), Public Expenditure and Policy Analysis (2nd. Edition, Chicago: Rand McNally College Publishing Company, 1977).

are not observed. The only prices that we can observe are the market prices which may normally serve as the starting point for calculating the shadow prices.

The divergence between the market prices and the social prices may be caused because the market prices may not be equal to marginal costs and/or marginal costs may not reflect the true social cost of resources. The first phenomenon may arise due to imperfections in the market (e.g., presence of monopoly elements, government intervention in the form of price controls, taxes and subsidies, etc.). The second phenomenon may be caused by externalities and unemployment of resources.

2.2.1 Taxes and Subsidies

One example of the necessity of constructing the shadow prices due to market imperfections is found in the fact that the observed market prices have to be adjusted for taxes and subsidies in order that they may reflect the social values.

Indirect taxes (e.g., sales and excise tax) and subsidies create divergence between the prices which the consumers pay and the prices that the producers receive. Which one out of these two sets of prices (i.e., prices gross of taxes and net of subsidies, or prices net of taxes and gross

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of subsidies) should be used by the benefit-cost analyst? The answer depends whether he is measuring the benefits or costs of a project.

The benefits, as mentioned above, are calculated in terms of what the consumers are willing to pay for the outputs of a project. Hence, the market prices including all indirect taxes and excluding subsidies should be used to evaluate the social benefits.

In evaluating social costs, however, there is no clear cut answer. In general, the value of goods and services used in the production of a commodity is given by the producer's price (i.e., price net of indirect taxes plus subsidies, if any). Indirect taxes, though they increase the prices of intermediate goods to users, do not entail an extra use of real economic resources and thus do not form a part of the opportunity cost of production. Subsidies, on the other hand, do imply an extra use of real resources and should be counted as a part of the opportunity cost. However, there are some significant exceptions to this general rule. For example, if the resources are to be bid away from other potential users because of shortages (e.g., in the case of imported goods subject to strict quotas where the elasticity of supply is zero), the prices which these potential users are prepared to pay for

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these resources (i.e., the market price including taxes and excluding subsidies) become the opportunity cost of production and hence the social cost. Again, some indirect taxes (called user taxes) are collected as payments for goods and services supplied by government. For example, a part of property tax may be a payment for the provision of public services, e.g., building sidewalks, providing improved roads, education, and sewage facilities, etc. This part of the property tax does entail a real cost to society and should form a part of the social cost of production. However, it may be difficult to find out what part of property tax (and for that matter what tax, e.g., highway tax or tax on gasoline) can really be considered a user tax. Unless an analyst is certain that a specific tax or a certain proportion of a given tax can be treated as a user tax, it may be better to omit that tax from social cost calculations.

Direct taxes on the producers (e.g., provincial and federal corporation income tax) also should be excluded from social cost calculations. To a private entrepreneur (or firm), these taxes do represent a real cost and must be excluded from the sales revenue to arrive at his profits. From the point of view of society, however, they are merely transfers, through government, from the producers to the rest of society. They reduce private but not social benefits. The

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effect of these taxes on social benefits is that they are spread out or redistributed. The personal distribution of income (i.e., the equity considerations), though important in itself, does not form an integral part of the benefit-cost analysis approach suggested in this paper.

In the two steps procedure of doing a benefit-cost analysis of a project, recommended in this paper (p. 27), the private financial cash flows will have to be adjusted. For example, all direct taxes such as corporation taxe generated by the project must be added back to the net private financial cash flows as benefits to society and all subsidies (if any) provided to the firm must be substracted as costs.*

There are two more aspects of taxes which should be considered here. Firstly, it could be argued that the subsidies granted to the industries under the RDIA program will produce higher incomes and hence increased taxes (income and corporation profit taxes). These increased taxes, it could be further added,

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* If a project is established in a foreign country, all taxes levied by the foreign government on the proceeds of this project should be excluded from social benefit calculations. The taxes paid to the foreign government represent a transfer of benefits to foreigners and BCA, being national in scope, calculates only those benefits which are available to the home country. For a detailed discussion of this issue see E.J. Mishan, Cost-Benefit Analysis: An Introduction (New York: Praeger Publishers, 1971), pp. 69-70.

should be counted as a part of the social benefits. However, the increased incomes (gross of taxes) are taken into account when calculating the direct and indirect effects of the subsidised project on incomes and outputs. Now to add the increased income taxes (due to increased incomes) to social benefits would result into double counting. Direct taxes, as pointed out earlier, are transfer payments and do not represent any real output advantages.

Secondly, a grant given under the RDIA is taxed and, therefore, the actual value of the grant is less than its nominal value. The relevant regulation of the Department of National Revenue requires that the firms should decrease their depreciable capital by the amount of the grant. Since a reduction in the depreciable capital would result into increased tax payments, the grant is effectively taxed and the actual cost of the grant should be taken net of taxes.

2.2.2 The Shadow Price of Unemployed Labour

In general, the cost of labour hired by public expenditure should be measured by its opportunity cost, i.e., what it can earn in its next best use. In a fully employed economy working under perfect competition, it will be given by the market rate. However, some of the labour hired on

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the project may come from a pool of unemployed workers.* In a depressed or slow-growth region having widespread, persistent and significantly high unemployment, quite a large proportion of workers is likely to come from the unemployed in that region. For example, a survey (conducted in 1963) of 33 new plants, that were induced to locate in eligible areas by the Area Development Act loans in the U.S.A., has shown that half of the respondents (1262 in total) were unemployed at the time they were hired by one of these new plants.[30]

It is sometimes suggested that the opportunity cost of the workers hired from the ranks of the unemployed should be taken as zero because the only alternative open to them is idleness and when they are hired by public expenditure, society does not lose anything in terms of forgone output.

However, the fact that the marginal product of the unemployed labour is nil does not necessarily mean that it should be costed nil in the evaluation of a project. The

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* Even under conditions of relative full unemployment, some of the workers hired on a new project may have been unemployed in its absence. This happens because even when the aggregate unemployment rate is low, some of the industries and occupations may suffer from high unemployment.

[30] William H. Miernyk, "Local Labor Market Effects of New Plant Locations", in J.F. Kain & J.R. Meyer (eds.), Essays in Regional Economics (Cambridge, Mass.: Harvard University Press, 1977).

opportunity cost of an unemployed worker will be zero only if he is indifferent between being employed and being unemployed. If he attaches some positive value to being unemployed, as is normally the case, he must be paid some minimum sum to give up his unemployment activities and move to some specific employment opportunity. The value of this sum can be a small or large fraction of the market wage depending upon the value he attaches to his idleness. Thus the opportunity cost of an unemployed worker will be given by the supply price at which he is prepared to offer his services. That an unemployed individual places a positive value on his idleness is clear from the fact that he is not normally prepared to accept a job that pays him no more than what he gets in unemployment insurance benefits (UIB). In his idle time, he not only enjoys leisure but also can engage himself in some non-pecuniary (or non-market) activities (e.g., painting his house or even constructing one for himself). Moreover, the unemployed workers are usually engaged, at least partially, in job hunting.

Given that an unemployed worker has a positive worth of his idle time, he will offer his services to a project only if he is not worse-off by doing so. In other words, the opportunity cost of an unemployed worker, in accordance with potential Pareto Optimality (the guiding principle of BCA), will be given by his compensating variation (i.e., the minimum

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sum he will accept to give up his idleness). This minimum sum (or compensating variation) will be measured by the minimum value that he attaches to his idleness. This sum can be calculated by using the following relationship:

$$W\ (1-t_w) = V + U\ (1-t_u) \qquad (1)$$

where:

W = Minimum average weekly wage which a worker must get in order to move from the ranks of the unemployed into a job

t_w = Average tax rate on wages

V = Value of idle time

U = Expected unemployment insurance benefits per week

t_u = Average tax rate on u where $t_u < t_w$.

(1) can be re-written as:

$$V = W\ (1-t_w) - U\ (1-t_u) \qquad (2)$$

This relationship must hold because his unemployment benefits are contingent upon his remaining unemployed. If he accepts a job, he will be as well-off as before only if his excess earnings from the job (i.e., the wages offered minus the unemployment benefits) at least match the value which he

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attaches to his leisure time*. The tax adjustments are necessary because when an unemployed worker becomes employed, his monetary income will be higher than the unemployment benefits he received and his income tax rate becomes higher than that applicable to the unemployment benefits. In deciding whether to accept a job or remain unemployed, he will compare his net of tax wages with his unemployment benefits after tax plus the non-monetary value of his leisure time.

It should be noted that as long as there is wide spread unemployment, the employers can hire the required number of workers at W, the minimum average weekly wage offered to the unemployed (see equation 1). The firms will have no incentive to pay wages higher than W. If they paid less, they would not get workers. In other words, W becomes the prevailing market wage rate in a competitive economy.

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* It should be noted that the unemplomeent insurance benefits paid to the worker when he is unemployed are to be treated as a transfer payment; a transfer from the employed members of the society to the unemployed. There is no current production of goods and services in exchange for this payment and it should not be treated as a part of an unemployed worker's opportunity cost of being employed on the project. This is true and the unemployment benefit payment by itself is not a part of his opportunity cost. However, the level of unemployment benefits does effect the value that an unemployed worker puts on his idle time and hence his opportunity cost. It, therefore, has to be taken into account in calculating the value of V.

In a recent Department of Finance report, it has been suggested that the reasonable values for several variables in equation 2 may be as follows: $t_w = 0.15$; $t_u = 0.10$ and $U = 0.5W$. If we solve equation 2 for these values, V turns out to be 40 per cent of the wage rate gross of taxes.

However, W in equation 1 is the market clearing wage rate under perfect competition. In practice, the actual wage rate in the market will be higher. This will be due to the institutional factors (that make the market imperfect) such as the collective bargaining and minimum wage laws. This will probably lower the value which an unemployed worker attaches to his leisure time, i.e., the value of V will become less than the difference between the after tax wages that he could earn by working and his unemployment insurance benefits net of taxes that he will receive if he remains unemployed. If B denotes the ratio of the actual wage rate (determined by collective bargaining and minimum wage law, etc.) to the competitive wage rate, equation 1 would become:

$$W\ (1-t_w) = B\ [V + U\ (1-t_u)] \qquad (3)$$

Where B is greater than 1 in an imperfect market but = 1 in a perfectly competitive market. Equation 3 can be re-written as

$$V = \frac{W\ (1-t_w) - B\ [U\ (1-t_u)]}{B} \qquad (4)$$

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Glen and Kuo have estimated that the actual wage rate in the Cape Breton Island was about 33 per cent higher than the market clearing wage rate (i.e., W in equation 1).* In other words, the value of B for Cape Breton was 1.33. If we assume that this value of B holds for the Atlantic Region and the value of other variables remain the same as in equation 2, the value of V from equation 4 will be = 0.189. We, therefore, could say that the value of an unemployed worker's idle time and hence his opportunity cost is about 20 per cent of the actual market wage rate. In other words, if the total labour force employed by the project were hired from the pool of unemployed workers who will remain idle for the whole year in the absence of this project, the value of labour externality** will be about 80 per cent of the total wage bill. However, if only 50 per cent of the new jobs are filled by the unemployed (see p. 37), the size of the labour externality will be reduced to 40 per cent of the wage bill and the social opportunity cost of labour or the shadow price of labour will become 60 per cent of the actual annual wage bill. In the absence of any information as to what proportion of the new jobs created in the Atlantic Region

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* See G. P. Jenkins and C.Y. Kuo, "On Measuring the Social Opportunity Cost of Permanent and Temporary Employment", Canadian Journal of Economics, 11 (May, 1978), pp. 220-239.

**The present value of the difference between the actual wage bill and the social opportunity cost of labour (or its shadow price) could be termed as the labour externality.

will be taken up by the unemployed, we will assume the above 50 per cent figure to be a reasonable one for this region. Thus the social opportunity cost of labour in the Atlantic Region could be taken as 60 per cent of the total wage bill per year.

In an economic appraisal of a project under consideration for an RDIA grant, the present value of the labour externality could either be added to the value of social benefits of the project or it could be substracted from the social costs. In the case of the NPV criterion of project selection, that has been recommended in this paper, it does not really matter how it is done. But the method of accommodating this labour externality in the benefit-cost calculations can profoundly effect the benefit-cost ratio of the project. This is one of the reasons why the NPV method should be used, as far as possible, in preference to other methods.

One suggestion which is sometimes made in the literature on BCA should be considered here before we proceed any further. It is sometimes argued that in areas which suffer from wide-spread and prolonged unemployment, all the new jobs resulting from the establishment of a project in that area should be considered to have been filled by the unemployed, i.e., there is a one-to-one relationship between

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the number of new jobs created by a project and the reduction of unemployment in the area. The implication of this argument is that the shadow price of labour (or its social opportunity cost) in this region will be 20 per cent of the wage bill. In other words, the value of labour externality should be taken as 80 per cent and not 40 per cent of the total wage bill.

The above argument is based upon what has come to be known as the "chain-reaction" or "trickle-down principle". This principle in essence states that some of the new jobs will be filled directly by the unemployed but even those jobs which are taken up by the already employed will be filled indirectly by the people who are out of work. The argument goes like this; when a formerly employed worker is hired on the project, he leaves behind a vacancy which is filled by either an unemployed worker or an already employed person. In the latter case, however, a further vacancy is created which must be filled. This chain of vacancies, it is argued, will stop ultimately when the vacated job is given to an unemployed worker.

The "trickle-down" principle, however, will work only if we make very simplifying assumptions and ignore several aspects of the labour market behaviour. For example,

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there may not be one-to-one relationship between quits and vacancies. Once a person quits, the firm may decide not to fill that job. Instead it may change its technique of production in order to eliminate that job or may even decide to reduce its output for the time being. Secondly, the vacancy created may be for a highly skilled person and the firm may not find a person of the required skills out of the unemployed people in the region. It may have to bring such a person from outside the region or even, in some extreme cases, from abroad.

There are many other types of objections raised against the 'chain-reaction' argument.[31] But the above critical appraisal of the principle is sufficient to suggest that it is too much simplified and too far removed from reality. Consequently, our suggestion that the value of the labour externality in the Atlantic Region should be put at 40 per cent of the wage bill still holds.

The important question now is whether the social opportunity cost of labour will continue to be less than

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[31] For a detailed discussion of the shortcomings of this principle see Treasury Board Secretariat, Benefit-Cost Analysis Guide (Ottawa: Information Canada, 1976), pp. 19-20.

the market wage rate for the project's lifetime. The answer depends on the size of the unemployment pool in the local labour market area* or even in the province as a whole where the project is located. If this pool is large, the project could be considered to always hire a part of its labour force from this pool in the sense that in the absence of the project, these labour units will probably join this pool.

The size of this pool of unused labour will depend largely on the rate of unemployment and the life style practised by the labour force.** Now that there is no social stigma attached to being unemployed and drawing UIB and because of the fact that a person is eligible for UIB even if he leaves the job himself, a part of the labour force in this country is said to practise a life style where it works part of the year and collects UIB for the rest of the time.

However, the more important factor that determines the size of the idle labour force pool seems to be the rate of

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* The local labour market area could be defined as a circle with a radius of 20 miles.

**In areas where the labour force participation rates are low, the creation of new jobs in itself may increase the size of unemployment as the secondary workers (mostly women) now join the labour force in the hope of finding employment.

unemployment. It has been argued in the literature that the probability of incremental demands for labour being satisfied from the otherwise unused labour force is positively related to the rate of unemployment. It is suggested that if the unemployment rate is around 4 per cent (i.e., the frictional unemployment rate), an increase in demand for labour will merely shift the workers among different jobs without reducing the unemployment rate below its frictional minimum. On the other hand, if the rate of unemployment is around 25 per cent (the estimated unemployment rate in the U.S.A. at the height of the depression of the thirties), increased demand for labour created by the project could be considered to be met wholly from the unused labour force.[32]

Based upon the above reasoning, it can be concluded safely that our assumption that in the Atlantic Region about 50 per cent of the new jobs created by a project will be taken

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[32] R.H. Haveman, "Evaluating Public Expenditures under conditions of unemployment", in Haveman and Margolis (eds.) Public Expenditure and Public Policy; Robert Haveman and John Krutilla, "Unemployment, Excess Capacity, and Benefit-Cost Investment Criteria", Review of Economics and Statistics, 49 (August, 1967); R. H. Haveman and J.V. Krutilla, Unemployment, Idle Capacity and the Evaluation of Public Expenditures, (Baltimore: John Hopkins Press, 1968). The above relationships have also been derived, though based on a somewhat different reasoning, by E.J. Mishan in his, Elements of Cost-Benefit Analysis (London: George Allen and Unwin Ltd., 1972), pp. 53-59.

up by the unemployed workers is not unreasonable. The above suggested value of the labour externality (i.e., 40 per cent of the wage bill) could be expected to continue up to the mid-80's, say 1985. After that it is expected that Canada will have a shortage of labour and the part of the labour force that the new project could expect to attract from the otherwise idle resources will decline and the social opportunity cost of labour employed by the project will increase.

The basic merit of the above proposed method of calculating the social opportunity cost (SOC) of the unemployed labour lies in its simplicity and the ease with which it can be calculated. Another simple method has been suggested by Harberger. He argues that, if the unprotected-sector (non-unionised) could be distinguished from the protected-sector (unionised) in the market, wages in the unprotected-sector could be used generally as a good proxy for the minimum supply price of labour as the workers have a tendency to move from the unprotected-sector to the protected-sector when the demand for labour in the latter category increases.[33]

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[33] A.C. Harberger, "On Measuring the Social Opportunity Cost of Labour", in his Project Evaluation: Collected Papers, pp. 157-182.

A more sophisticated model has been developed by Jenkins and Kuo.[34] But its data requirements are such that it cannot be duplicated easily for every local labour market where the new project may be located. Haveman and Krutilla's contribution lies in the development of a methodology by which one can estimate the proportion of the labour demand by occupation (generated by the new project) that will be satisfied by the unused labour resources by occupation. They consider the on-site demand for labour as well as the one caused by material inputs in the project. Once this proportion of the labour attracted from the idle pool in each occupation, industry and region is determined, it is multiplied by the monetary cost of labour in each category in order to determine the excess of monetary cost of labour over its SOC in that category.[35] It is obvious that this procedure assigns zero SOC to the unemployed worker. However, we have argued above that this assumption (i.e., the social opportunity cost of the unemployed labour is zero), which is made quite frequently, is not warranted.

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[34] G. P. Jenkins and C.Y. Kuo, op. cit.

[35] See, for example, Haveman, op. cit., p. 231.

2.2.3 The Shadow Price of Foreign Exchange

Some of the outputs of the project may be exported and some inputs may have to be imported, giving rise to receipts and expenditures of foreign exchange. To make these foreign exchange earnings and expenses commensurable with other receipts and expenditures they are to be converted into domestic currency. At what rate should they be converted?

Under a system of free trade, this conversion could be done by multiplying the world market prices (usually expressed in the U.S. dollars) of imports and exports by the exchange rate determined by the free play of supply and demand. However, the supply and demand situation for foreign exchange is usually distorted by foreign trade restrictions which normally make the social value of foreign exchange higher than that determined by the market forces of supply and demand. For example, tariffs on imported goods make the social value of these goods higher than their foreign exchange cost. Similarly, the existence of export subsidies make the social cost of exports higher than their foreign exchange earnings. This could be better explained with the help of a diagram.

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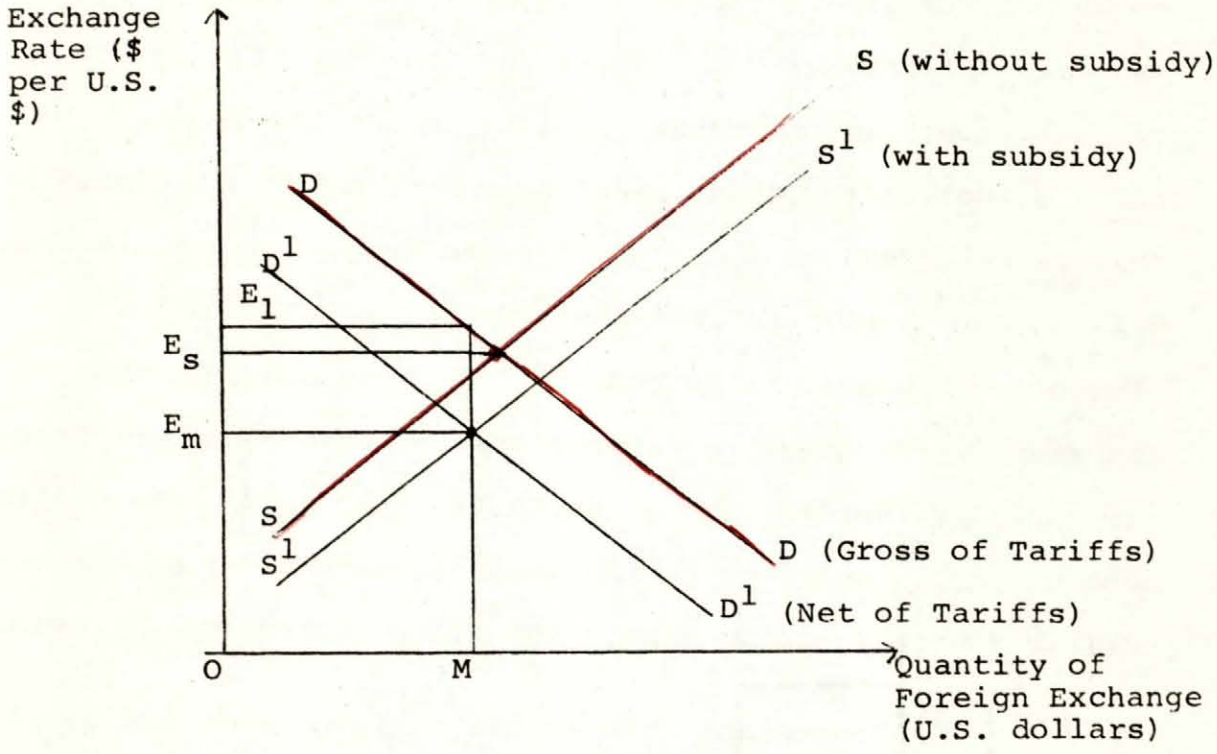
Diagram I is the familiar price-quantity diagram; in this case the price is the foreign exchange rate* and the quantity is the total volume of foreign exchange.

Diagram I



D^1D^1 is the demand curve for foreign exchange when a country requiring imports charges an average ad. valorem tax of say t% on the c.i.f. value** of the imported goods. It represents the

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* Canadian exchange rate in this diagram is expressed as the domestic currency units per U.S. dollar.

**c.i.f. stands for cost insurance and freight.

relationship between the exchange rate and the demand for foreign exchange on the part of the importers and other users of foreign exchange (e.g., the tourists and students studying abroad), importers being by far its largest users. Suppose Canada imports goods worth OM in terms of foreign exchange calculated at their c.i.f. value. For these imports, importers pay E_m Canadian dollars per U.S. dollar and then pay t% duty to the customs, i.e., importers are willing to pay OE_1 Canadian dollars per U.S. dollar for goods worth OM. And in BCA, it should be pointed out event at the risk of repetition, it is the consumer's willingness to pay that measures the social value of a commodity. Thus it is DD and not D^1D^1 that measures the importers willingness to pay for the imported goods and hence the social value of these goods.* In other words, the willingness to pay is measured by the domestic market prices, including tariffs and/or scarcity premia for goods controlled by quota.

S^1S^1 represents the relationship between the supply of foreign exchange (generated by exports) and the exchange

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* The net of tariffs demand curve D^1D^1 shifts upward to DD due to import duty because now for any given quantity of foreign exchange required for imports an importer must pay more Canadian dollars per unit of foreign exchange.

rate when the exporters are paid an average ad. valorem subsidy of say n per cent on the f.o.b. value* of exports. To generate OM foreign exchange in order to pay for the imports, the exchange rate has to be E_m. This, however, does not represent the social or the opportunity cost of exports. And it is the opportunity-cost that is relevant for BCA. It is given by the actual resource cost of producing these goods. In Diagram I it is depicted by the curve SS which represents the relationship between supply of foreign exchange and the exchange rate when there is no export subsidy.**

The social value of foreign exchange (or its shadow price) is determined by the social value of the imported goods (at their tariff distorted domestic prices) and the actual resource cost (excluding export subsidies) of producing the exported goods. In Diagram I, therefore, the social exchange rate is given by the intersection of DD and SS. The market exchange rate, on the other hand, is determined by the intersection of D^1D^1 and S^1S^1. Accordingly, the shadow exchange

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* f.o.b. stands for free on board.

**The supply curve S^1S^1 (with subsidy) shifts upward to the left because in the absence of a subsidy, for any given quantity of foreign exchange generated by exports, an exporter must get more Canadian dollars per unit of foreign exchange in order to cover his actual resource cost of production.

rate (SER) is represented by E_s and the market exchange rate by E_m. The former is greater than the latter* and hence a premium should be put on the net foreign exchange earnings generated by a project.

The above approach to shadow pricing the foreign exchange is based on the assumption that import taxes, quotas and other foreign trade distortions are part of the economic structure and will continue for the life time of the project under evaluation. The implementation of a project will usually affect both the exports and the imports. The SER, therefore, will be given by the weighted average of the importers willingness to pay and the exporters actual cost of production for each unit of foreign exchange. The required weights are determined by the marginal changes in the imports and exports induced by the project.

That the implementation of a project influences both the imports and exports can be demonstrated with the help of Diagram 2. Suppose the project through exports generates net positive earnings such that the supply curve for foreign exchange

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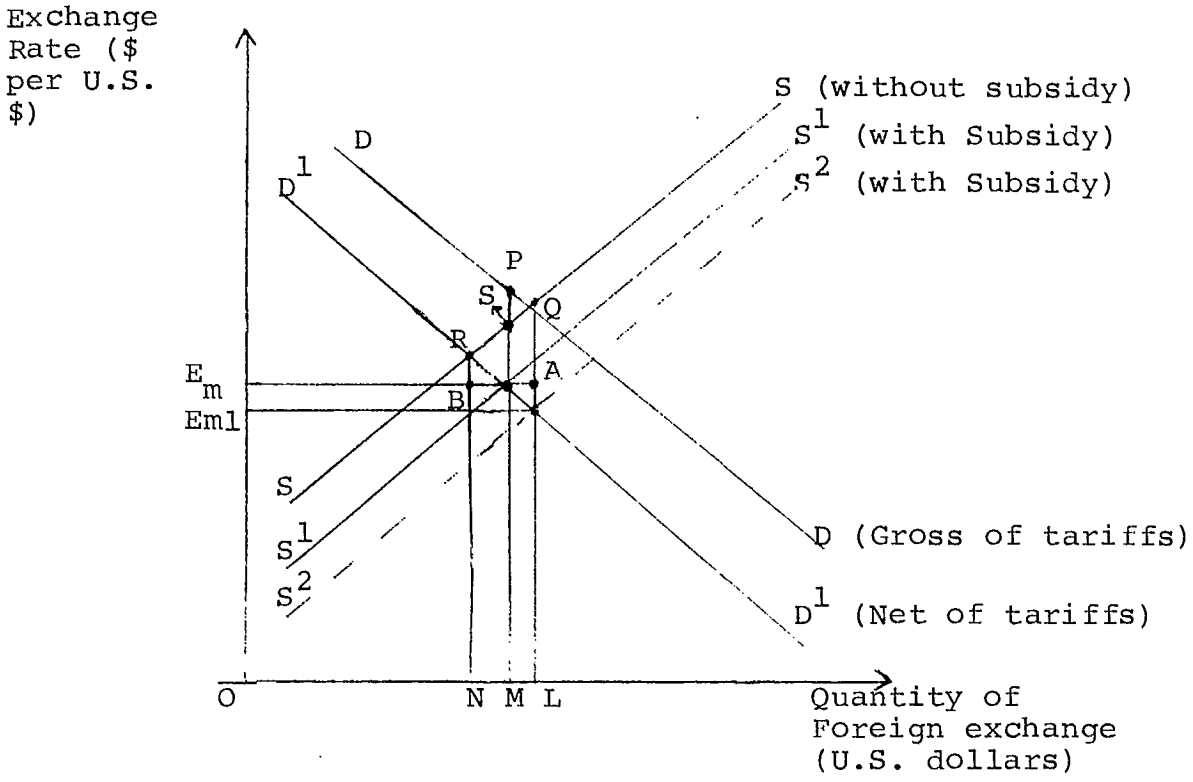
**In addition to trade-distortions, the difference between the market (or the prevailing) exchange rate and the SER may be caused by the fact that a country may suffer from a chronic imbalance in its balance of payments situation under fixed exchange rate system. Under these circumstances the country in question may impose not only trade restrictions but also foreign exchange controls. Such is the situation faced by many developing countries. These considerations, however, are not applicable to Canada.

shifts to S^2S^2. The market rate of exchange declines to Em_1. At this new rate, as the Canadian currency appreciates, the quantity of foreign exchange demanded for imports increases by ML and that supplied by exports (other than the project's output) decreases by NM. The social value of the increased imports is represented by the area MLQP and the social value of the resources released by the decreased exports is given by the area NMSR. The total value that the society attaches to this incremental loss in foreign exchange (NL), given by the addition of the two areas, is clearly greater than its market

Diagram II



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value (E_m x NL or the area NBAL), measured at the initial exchange rate. The difference between the two valuations (i.e., the social and market) is measured by the increased tariff revenues and the reduced export subsidies that have to be provided. In other words the difference is determined by the extent of the market distortions and the marginal changes in the quantity of foreign exchange demanded and supplied.

The approach to shadow pricing of foreign exchange outlined here is one of the several suggested in the literature on project evaluation methodology. It has been adopted by Harberger and Schydlowsky.[36] A somewhat similar approach has been suggested in the UNIDO Guidelines.[37] The authors of these guidelines consider it unlikely that the increased foreign exchange made available by the project will lead to a decrease in exports. They believe further that the incremental foreign exchange will be spent on consumer goods and the intermediate goods used in their production. Capital goods

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[36] A. C. Harberger, "Survey of Literature on Cost-Benefit Analysis for Industrial Project Evaluation" in his Project Evaluation: Collected Papers (Toronto: The Macmillan Press Ltd., 1972); D.M. Schydlowsky, On the Choice of Shadow Price for Foreign Exchange: Economic Development Report No. 108 (Cambridge, Mass.: Harvard University Development Advisory Service, 1968).

[37] P. Dasgupta, S. Marglin and A. Sen, Guidelines for Project Evaluation (New York: United Nations Industrial Development Organization, 1972).

are excluded from their method of calculating the SER. This approach has been criticized on several grounds.[38]

As opposed to the above (i.e. Harberger, Schydlowsky and UNIDO Guidelines approach) an entirely different approach to determining the SER is favoured by Bela Balassa and Bacha and Taylor.[39] They assume that all trade restrictions will be removed by the time the project is implemented and, therefore, the appropriate SER is the equilibrium exchange rate that would prevail under free trade. The SER determined on the basis of this assumption would be different than that calculated by the approach described earlier.

Which one of these two sets of assumptions (i.e., the continuation or the elimination of the present trade distortions) is realistic and hence which type of an SER should be used in evaluating a project? The proponents of the trade restrictions-elimination approach argue that if a project that is not profitable under free trade conditions is implemented, it would create vested interests for perpetuating

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38 See, for example, Bela Balassa, "Estimating the Shadow Price of Foreign Exchange in Project Appraisal", Oxford Economic Papers, 26 (July, 1974).

39 See Bela Balassa, Ibid. and E. Bacha and L. Taylor, "Foreign Exchange Price: A Critical Review of Current Theories", Quarterly Journal of Economics, (May, 1971), pp. 197-224.

trade distortions. Moreover, it is argued that by taking a passive stance, the authority responsible for evaluating the project would forgo an opportunity to affect changes in the trade policies.[40]

However, BCA is to be conducted under such economic policies as are likely to be in effect and not which ought to be effective. It is highly unlikely that in the short or medium period (the period most relevant for the RDIA projects), there will be any substantial progress towards free trade. The slow progress of the multinational trade negotiations bears ample testimony to this. In our opinion, therefore, an SER calculated on the assumption that restrictive trade policies will be maintained throughout the life time of the project will give a more appropriate value of the shadow price (or the social opportunity cost) of foreign exchange.

One such SER for Canada has been calculated by Glenn Jenkins.[41] For this purpose, he uses a general equilibrium model and in addition to the usual trade distortions,

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40 See Bela Balassa, Ibid.

41 Glenn P. Jenkins, "Theory and Estimation of the Social Cost of Foreign Exchange Using a General Equilibrium Model with Distortions in All Markets", Harvard University Discussion Paper (December, 1976).

he considers a wide variety of other domestic market distortions, e.g., differential rates of sales taxes imposed on the domestic consumption of importable, exportable, and non-tradeable goods and the preferential corporation income tax treatment of the mineral industry, etc. His calculations show that the SER for Canada is about 13% to 15% higher than the market rate of exchange. It means that a premium of about 15% should be applied to both the benefits and costs of the project incurred in terms of foreign exchange.

It could be argued that in addition to applying the foreign exchange premium to the direct foreign exchange effects (e.g., the effects arising out of the export sales and purchase of foreign raw materials and foreign-made plant and equipment) of the project under evaluation, it should be applied to its indirect effects too. The indirect foreign exchange effects may arise because the domestic factors used in the project could otherwise be utilized to produce exports or import-replacing goods. Thus the implementation of a project, it is argued, may result in a loss of either the foreign exchange earnings or its savings.

However, it should be pointed out that the basic assumption implicit in the above argument is that there is

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full employment. This assumption is not warranted, especially in the case of the Atlantic Region which suffers from the chronically high unemployment rates. Moreover, the calculation of forgone foreign exchange associated with the use of factors of production in a project, even under full employment, will in itself be a major and quite time consuming task. Even if it could be calculated easily, its value may not be that high as to affect the outcome of project evaluation very substantially. We, therefore, do not recommend that under normal circumstances the possible indirect foreign exchange effects of a project should be considered in its benefit-cost analysis.

It could be pointed out that the SER calculated on the basis of the above recommended approach will impart an upward bias to the net foreign exchange benefits of the project under consideration. This approach to shadow pricing the foreign exchange effects implicitly assumes that all trade restrictions are completely irrational and totally harmful to society. This is an extreme assumption and does not depict the real situation. Some of the trade restrictions may be employed to alter the pattern of consumption and/or to affect the allocation of resources; for example, the government may impose import duties on some items to discourage their consumption or to encourage their production in the country or in certain regions of the country. It can be shown that if tariffs on

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imports and subsidies for exports increase efficiency and social welfare (i.e., government has instituted a fully optimal set of trade restrictions), no adjustment to the market rate of exchange will be required.[42] The truth of the matter is that the trade restrictions will neither be all harmful nor totally beneficial. But it will also be difficult to find out which part of the trade restrictions is harmful and which one is useful.

It, therefore, will be useful to analyze the economic viability of a project with and without a premium for its net foreign exchange benefits.

This eclectic approach to the foreign exchange components of the benefits and costs of a project has the added advantage that we could guard ourselves against giving RDIA grants to such projects that cannot be justified without putting a premium on their net foreign exchange benefits. If we give grants to such projects, we run the risk of provoking a strong reaction from other countries, especially our trading partners. They may impose countervailing duties on the output of such projects.

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[42] See Trent J. Bertrand, "The Shadow Exchange Rate in an Economy with Trade Restrictions", Oxford Economic Papers, 26 (July, 1974), pp. 185-191.

2.3 Secondary Benefits and the Use of Multipliers

The secondary benefits are the indirect beneficial effects of a project and are composed of either the new jobs created or additional income generated in firms which supply (a) supply consumption goods to its employees, (b) supply the inputs required by the project and (c) handle its output before it reaches the consumer (e.g., truckers, railroads, and merchants, etc.).* Economic multipliers have been used occasionally to estimate the secondary benefits. They work themselves out through indirect effects on the household as well as the business sectors of the economy.

First, the households that receive direct and indirect income (e.g., the wages and salaries of the on-site and off-site workers) increase their consumption of goods and services. This increased consumption, in a less than fully employed economy, gives rise to increased income and employment which in turn enhances the household income that is partially spent on consumption and generates more employment

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* The indirect benefits (b) and (c) have at times been categorized in the BCA literature as "Induced Benefits" and "Stemming Benefits", respectively. These concepts are very much akin to the notion of "backward linkages" and "forward linkages" used in development economics.

and income in the economy*. Second, the new project makes purchases of supplies and services from firms and these firms (business sector) in turn make purchases necessary to produce the required goods and services and this results in more employment and income in both the business and household sectors. The increased household income, as explained before, is partially spent on consumption and partially saved. The higher income (i.e., increased profits) of the business is likely to result in increased investment in the economy and generate more income and employment. Similar processes work in the case of the firms which handle the project's output.

Some writers have suggested that the multiplier impacts emanating from the increased income of the unemployed should be taken into account in calculating the social opportunity cost of labour.[43] However, as we are mainly concerned, in this paper, with analysing the economic viability of the RDIA projects, rather than with calculating the social opportunity cost of labour, it does not really matter where (i.e., at what step in the analysis) the multiplier effects generated

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* A part of the increased income of the household sector will always be spent on consumption. The marginal prospensity to consume, though less than one, is always positive.

[43] See, for example, Harberger, "On Measuring the Social Opportunity Cost of Labour", and Jenkins and Kuo, op. cit.

by the increased income of the unemployed are taken into account. Such effects, if already calculated in measuring the SOC of labour should not be estimated here; otherwise there will be double counting. It is easier, though, to measure all the secondary (multiplier) impacts in one step and, therefore, we recommend estimating the multiplier effects of employing the unemployed as a part of calculating the total multiplier effects.

It should be noted that the use of multiplier effects is a controversial area in BCA. For example, the Treasury Board in Canada explicitly discourages the use of multipliers, though the arguments given, as will become clear, are not convincing enough.[44] It is important to remember that most of the economists recommend the use of multipliers in calculating the benefits of public expenditure only when there is less than full employment in the economy. In the full employment context, the employment or output increase will be offset by a decrease somewhere else in the economy,

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[44] Treasury Board Secretariat, Benefit-Cost Analysis Guide (Ottawa: Information Canada, 1976), pp. 1-2 and 23-24; See also P.D. Handerson, "Some Unsettled Issues in Cost-Benefit Analysis", in P. Streetan (ed.), Unfashionable Economics (New York: Beekman Publishing Inc., 1970) and R.N. McKean, Efficiency in Government through Systems Analysis (New York: John Wiley & Sons, Inc., 1958), ch. 8.

i.e., the public expenditure in this case will not result in any net increase in the real output or employment in the economy.

It is pointed out at times that the suggestion to include secondary (multiplier) benefits as a part of the social benefits takes it for granted that under-full employment will continue for the entire project period. The forecasting of employment conditions, it is argued further, is extremely difficult and so hazardous and uncertain that secondary benefits should not be taken into account in benefit-cost analysis of a project.[45] However, as the Canadian economy stands today, it is highly unlikely that full employment will be achieved in the next five years. We, therefore, may be on a safer ground to calculate and count the multiplier impacts as a part of the social benefits for at least the next five years.

It has been argued (for example, the Treasury Board Guide does this) that the multiplier effects should be ignored even when unemployment is expected to prevail because government could take some alternative course of action and have an equivalent impact on employing idle resources. This

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[45] See, for example, McKean, Ibid.

is rather misleading, especially in the context of evaluating the RDIA projects. First, if an RDIA project is not undertaken (though it could have been approved if the multiplier effects had been counted on the benefit side), it is not necessary that another project will take its place or that government will embark upon another course of action which will have an equivalent effect on employing the otherwise idle resources either in this region or in the country. Second, the multiplier coefficient of different actions is different. For example, we know that the expenditure multiplier is greater than the tax multiplier. Even in the case of expenditure multiplier, the total regional impact may vary depending on which project (i.e., in which industry) is subsidized and how important that project and industry is for a given region. For example, it can be expected that any subsidy affecting, say, the shipbuilding industry will have greater impact on the Atlantic Region and Quebec economy than on the economies of either Ontario or the Prairies. This regional aspect of the shipbuilding industry should form a part of any BCA of that industry. This is especially important if one of the objectives of the project is to assist in regional development.

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2.3.1 Multipliers and Regional Development

Actually, if one of the objectives of undertaking a project is to achieve regional redistribution of income and employment, its secondary effects should be counted in its benefit-cost analysis even if there is national full employment. The slow growth area where the project is to be located (especially under the RDIA program) usually suffers from persistent and prolonged unemployment. Under these circumstances there will be a significant disparity between the indirect benefits generated in the region and the indirect benefits forgone elsewhere if the project is implemented. If the former benefits exceed the latter, the difference should be counted as part of the social benefits of the project. If the latter benefits exceed the former, a substraction from social benefits is warranted.

It will not be easy to calculate these net incremental indirect benefits. However, given that these net incremental indirect benefits are the only indirect benefits that accrue to the society as a whole (the normal reference point of benefit-cost anlaysis), it is recommended that secondary (or indirect) benefits of a project should be calculated by using multipliers at about half of their estimated values. Note that this recommendation is also in accord with the fact (reported earlier) that only about half of the new jobs in a slow-growth region are taken up by the unemployed.

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2.3.2 The Size of Multipliers

In any case, we should use extreme caution in using multipliers. Their magnitude should not be exaggerated for several reasons:

(1) In many depressed areas trade and service establishments often operate below capacity and, therefore, when new demands are imposed on their services as a result of the location of new plants in these areas, they are able to handle them without any significant increase in their employment. Miernyk has suggested that this factor explains why early projections of additional employment that public investment was expected to generate in the depressed areas of the U.S.A. did not materialize.[46]

(2) The multiplier effect is generated partially by the increased spending on the part of idle workers when they get employment on the new project. But, it should be remembered, even when they are unemployed, they get UIB and/or other transfer payments and thus are responsible

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[46] William H. Miernyk, op. cit.

for a part of the aggregate demand in the region or the province. Vanderkamp uses this fact to explain that out-migration produces somewhat of a ratchet effect for the labour surplus region, i.e., out-migration caused by unemployment in the region adds to unemployment at the same time as it substracts from it.[47] The net result, however, is a reduction in total unemployment in the region. But because the magnitude of the impact of out-migration is reduced, the mobility policy may solve the unemployment problem in the depressed areas only at a tremendous expense of resources. The creation of subsidised employment may be a better policy than the encouragement of out-migration.

(3) Harberger suggests that the marginal prospensity to consume of the unemployed will not be very high when they find jobs.

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[47] John Vanderkamp. "The effect of Out-Migration on Regional Employment", Canadian Journal of Economics, 3 (Nov., 1970), pp. 541-549. The rachet effect occurs because the out-migrants, even when they are unemployed, take away their expenditure out of the region when they leave it. This reduces the aggregate demand in the region which in turn has an adverse effect on employment.

> While these workers are idle, they deplete their and their relatives' savings and they are likely to make considerable efforts, when they become employed, to replenish the depleted family coffers.[48]

Actually, it is very difficult and very time consuming to calculate reasonably correct magnitudes of regional multipliers (this, perhaps, provides the strongest argument against the inclusion of secondary (or multiplier) effects in measuring the benefits of public expenditure). Economists are still far from being in complete agreement about the meaning and concept of regional multipliers and the multiplicand (i.e., the magnitude to be multiplied).[49]

The most simple and straight forward regional employment multiplier, used in the literature, is derived from the export-base and the related models. It is often defined as the ratio between total (or increase in) employment in

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[48] A.C. Harberger, op. cit., p. 178.

[49] For a good discussion on this issue in the context of an income multiplier see B. H. Archer, "The Anatomy of a Multiplier", Regional Studies, 10 (No. 1, 1976), pp. 71-77.

both the basic and service activities and total (or increase in) employment in the basic sector.[50] Whereas the basic sector industries sell their produce beyond the borders of a region, the non-basic (or service sector) industries produce principally for the local market. The export-base theory creates an artificial dichotomy between export and non-export activities and the value of an export-base multiplier can fall within a vast range of values depending on the way the export-base type study is approached. Such multipliers, therefore, as an explanation of long-term regional growth have been written off as worthless by some economists.[51] In our case, these multipliers suffer from an added shortcoming. They are usually aggregate multipliers. However, in our work on estimating the social benefits and costs of an RDIA project, we will be interested in industry specific multipliers. For our purposes, therefore, regional input-output multipliers, though not without problems of their own, would be better than the export-base theory related multipliers.* Such employment and income multipliers, for Canada as a whole as well as for each of the Atlantic Region provinces, are

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[50] For a detailed description of this type of multiplier and its limitations see Walter Isard, Methods of Regional Analysis: An Introduction to Regional Science (Cambridge, Mass: The M.I.T. Press, 1960), pp. 189-205.

[51] See, for example, H.W. Richarson, Regional Growth Theory (New York: John Wiley and Sons, 1973).

* Multipliers based on case studies probably will be the best. However, the cost of producing these multipliers could be prohibitive.

reported in Table I and II for most of the important Atlantic Region industries. As these multipliers are based on old data, they should be used with caution. For each industry, the Canadian multiplier is greater than the provincial one; the reason being the leakages from a province to the rest of the country. Even these multipliers should be used with caution as for many purposes they are quite aggregated and their values are very much influenced by the quality of the data on which they are based.

Another point which should be noted here is that the full impact of a multiplier may not be felt all at once, say in the first year, because of the time lags involved in the chain of action that generates the multiplier. In the absence of any knowledge about these lags, we would assume that 50 per cent of the impact is felt in the first year, 75 per cent in the second, 95 per cent in the third and 100 per cent in the fourth and fifth year and according to our suggestion, no multiplier effects are to be calculated beyond five years (p. 65).

TABLE I

EMPLOYMENT MULTIPLIERS

INDUSTRY	NFLD		PEI		NS		NB	
	DOM	PROV	DOM	PROV	DOM	PROV	DOM	PROV
Food & Beverages	3.43	2.45	6.22	4.41	4.23	2.90	4.18	2.80
Wood Products	2.72	1.95	2.02	1.52	2.77	2.01	3.44	2.51
Furniture & Fixtures	1.85	1.38	1.61	1.30	2.08	1.52	2.58	1.72
Paper & Allied	4.09	2.90	2.61	1.93	3.88	2.57	5.14	3.44
Printing	2.12	1.54	2.11	1.57	2.38	1.77	2.26	1.74
Metal Fabricating	3.08	1.86	2.77	1.74	2.90	1.84	2.77	1.76
Transport Equip.	2.45	1.62	2.71	1.75	2.93	1.92	2.53	1.74
Misc. Mfg.	2.13	1.52	1.74	1.39	2.46	1.71	2.35	1.68
Construction	3.23	2.03	3.81	2.19	3.25	2.19	3.28	2.20

Note: DOM. stands for Domestic, i.e., for Canada as a whole and PROV stands for provincial.

Source: Department of Regional Economic Expansion, Employment & Occupational Impacts Using the Version III Interprovincial Input-Output Model (Ottawa, May 1977), pp. 26 & 29.

TABLE II

TOTAL INCOME MULTIPLIER

	NFLD		PEI		NS		NB	
	DOM(1)	PROV(2)	DOM(1)	PROV(2)	DOM(1)	PROV(2)	DOM(1)	PROV(2)
Food & Beverage	3.98	2.46	5.86	3.56	4.86	3.06	4.26	2.61
Wood Products	3.94	2.58	2.89	1.87	3.92	2.57	4.36	2.96
Furniture & Fixtures	2.54	1.68	2.53	1.69	3.38	2.07	3.55	2.09
Paper & Allied	3.14	2.31	2.50	1.83	3.16	2.13	3.74	2.56
Printing	2.64	1.78	2.69	1.79	2.68	1.89	2.71	1.99
Metal Fabricating	3.53	1.95	4.78	2.32	3.45	2.03	2.94	1.75
Transport Equipment	3.20	1.89	3.23	1.86	2.97	1.88	2.76	1.79
Misc. Mfg.	2.66	1.74	2.65	1.85	2.81	1.82	2.86	1.78
Construction	3.24	1.97	3.60	1.92	3.24	2.09	3.22	2.09

Note: (1) Total Domestic income induced by a change in output of one dollar in an industry divided by direct primary factor input coefficient of that industry.

(2) Total income in province of impact induced by a change in output of one dollar in an industry divided by direct primary factor input coefficient in that industry.

Source: Based on "An Interprovincial Input-Output Model, Version III, Department of Regional Economic Expansion, Ottawa, May, 1976.

3. A CRITERION FOR GOVERNMENT ASSISTANCE

In this section, we consider what type of projects should receive financial assistance from government under its RDIA program and also what should be the appropriate magnitude of this assistance?

3.1 Types of Projects to be Considered for Grants

The RDIA grants should never be awarded to such projects that are neither commercially nor economically viable. Such projects would prove to be white elephants and would not survive without continuous cost to society in the form of government aid.

All other projects should be considered for grants. These projects could be divided into two broad categories: (1) the projects which are not viable commercially (i.e., are not profitable when only the private revenues and costs are considered) but become viable when evaluated on the basis of social benefits and social costs; and (2) projects which are commercially profitable but would not move to the region unless some financial incentives are provided.

The economic rationale for giving assistance to the first type of projects is that if a project has a positive social NPV, its implementation will increase the well-being of Canadians but a private investor will be unwilling to

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undertake it because it does not give him normal rate of return and he can earn a better return by investing equivalent resources somewhere else in the economy.

The second type of projects are to be assisted because the government is keen to attract investment to slow-growth areas. If a project is undertaken in such areas, it will increase the well-being of Canadians and also many of its net benefits will accrue to the people living and working in these areas; these people, the society has decided (by adopting regional development as one of its objectives), should be given preferred treatment.

3.2 Maximum Magnitude of Grants

The amount of grant to be awarded by the government under its RDIA program should be linked to the size of the net economic externalities generated by the project; it should never be more than the sum of these externalities.

The net economic externalities are defined as the benefits or costs that accrue to the general public other than investors in the project. They are given by the difference between the present value of the net social benefits, discounted at the social discount rate, and the present value of the net private benefits (i.e., the net revenue received by the private investors), discounted at the private rate of discount.

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Only if the net economic externalities are positive, would Canadians (other than the investors in the project) gain more benefits by investing in this project than if the resources were invested somewhere else in the economy. Any amount over and above the sum of the net positive economic externalities, if granted, would generate windfall profits for the private investors without giving any net benefits to the rest of the society.

4. MAIN CONCLUSIONS

This paper has attempted to develop a framework for applying benefit-cost analysis technique to industrial projects in order to assess their suitability for grants under the RDIA grants program.

The main conclusions can be summarized as follows:

1. The main purpose of project evaluation is to ensure that if a project is undertaken, social welfare will increase. Social welfare depends on efficiency as well as equity (in personal income distribution). Project appraisals, it is argued in this paper, should be done on the basis of efficiency alone and equity should be dealt with by other policy instruments (e.g., taxation and minimum wages). Moreover, it is argued further that a decision on the suitability of a project for RDIA grants can be taken effectively on the basis of efficiency alone.

2. Efficiency of a project can be measured roughly by net additions that it may make to the economy (i.e., national income). It, therefore, follows that a project is deemed efficient and hence worth undertaking if its aggregate benefits are greater than its aggregate costs.

3. The main purpose of the RDIA grants program is to attract manufacturing industries to less developed regions. It, therefore, is important that in the case of projects considered for RDIA grants, national efficiency criterion of project appraisal is modified by regional development considerations. For this purpose, it is recommended that (i) in measuring the costs of a project, shadow price of labour be used even though market wages are paid, and (ii) in calculating its benefits, multiplier effects be counted when there is less than full employment of resources in the region.

4. To decide whether a project should be given an RDIA grant, it is useful to conduct its economic viability study (or its benefit-cost analysis) in two distinct steps; first to carry out a commercial viability analysis and then to convert it into an economic viability study.

5. Commercial viability analysis is carried out most of the time by using the DCF (discounted cash flow) method of project evaluation.

6. For economic viability analysis, the streams of benefits and costs are modified to reflect the fact that whereas commercial evaluation of a project is done from the perspective of a firm (which is interested mainly in profits), the benefit-cost analysis (or economic viability analysis) is conducted from the point of society as a

whole and, therefore, is concerned with social welfare. Moreover, the private discount rate (used as a discounting factor) is replaced by social discount rate.

7. It is recommended that the discounted cost and benefit streams should be compared by using the net present value (NPV) criterion of project selection.

8. The paper recommends that a 10 per cent rate be used as the relevant social discount rate. Its counterpart in the private sector is estimated at 6 per cent. Both these rates are to be treated as real rates (net of inflation) of interest as opposed to their nominal (or financial) values. Moreover, it is suggested that no premium be added to these rates to take account of the risks involved in a project.

9. Because of the presence of market distortions, very often the market prices have to be adjusted so that they reflect the true social values of inputs and outputs. These adjusted market prices are called the "shadow" or "accounted" prices.

10. The market prices and the private financial cash flows (calculated for commercial viability analysis) have to be adjusted to account for the presence of taxes and subsidies. For example, the prices used to calculate

social benefits should include sales tax and exclude subsidies. All direct taxes (such as the corporation tax) generated by the project should be added back to the financial cash flows as benefits and all subsidies provided to a firm must be treated as costs.

11. It is argued that the social opportunity cost of the unemployed labour should not be taken as zero. It should be determined by the supply price at which an unemployed worker is prepared to offer his services. The paper after making a few simplifying assumptions, especially that 50 per cent of the new jobs created in the Atlantic Region will be taken up by the unemployed, produces a rule of thumb; the social opportunity cost of labour in this region is given by 60 per cent value of the actual annual wage bill.

12. It is recommended that a 15 per cent premium should be put on the net foreign exchange earnings generated by a project. However, this recommendation is based on the assumptions that the restrictive trade policies will be maintained through out the life of the project and that all trade restrictions are completly irrational and totally harmful to society. The second assumption is not always warranted, some of the restrictions may be imposed to enhance the efficiency and welfare of society. Under

such circumstances no adjustment to the market rate of exchange is required. However, it is difficult to find out which part of the restrictions is harmful and which is useful. It, therefore, is suggested that economic viability analysis of a project should be done with and without placing a premium on its net foreign exchange benefits.

13. The paper argues that multiplier effects of a project should be taken into account in calculating its benefits; especially in selecting and locating industrial plants in regions with lagging economies. It reports some possible multiplier values for most of the important Atlantic Region industries and suggests a rule of thumb; multiplier effects of a project should be measured by using multipliers at about half of their estimated values for at least 5 years assuming that 50 per cent of the total impact is felt in the first year, 75 per cent in the second, 95 per cent in the third and 100 per cent in the fourth and fifth year. No indirect effects may be calculated beyond a 5-year period.

14. The RDIA grants should never be awarded to such projects, as are neither commercially nor economically viable. Projects which are economically but not commercially viable and projects which are commercially profitable

but would not move to a lagging region unless some financial incentives are provided should be considered for grants.

15. The amount of RDIA grant to be awarded by government should be linked to the size of net economic externalities generated by a project. It should never be more than the sum of these externalities. They are defined as the net benefits that accrue to the general public other than investors in the project.

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