The Economic Journal of Nepal Vol. 7 No. 2, Issue 26, April-June 1984

A Note on Cost Benefit Analysis

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Introduction

Public spending is becoming increasingly important in both the developed and developing world. The involvement of the government is called for national defence, manpower training, technology, assessment and transfer, etc. in developed world whereas in the less developed areas the key to development is being realised by developing 'social infra-structures' such as communication and transportation system, pools of skilled labor, education and cultural facilities, etc. These justify the need and urgency for public spending.

As resource scarcity becomes severe, governments are compelled to make intelligent choices in the projects they wish to undertake. As public projects are commonly large scale in nature and frequently have irreversible consequences, the need for careful analysis is apparent. Thus cost-benefit analysis is the process by which acceptable public projects can be identified. In other words, a cost--benefit analysis is 'an estimation and evaluation of net benefits associated with alternatives for achieving defined public goals' (**Sassone and Schaffer, 1978:3**). Cost-benefit analysis leads to a statement assesing costs and benefits relevant to project alternatives.

Origins and Concepts of CBA

HISTORICAL BACKGROUND

The Flood Control Act of 1936 in United States established the principle of comparing benefits to whomsoever they may accrue with the estimated costs, indi-

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cating social nature of the public investment decision. 1950s can be considered the period of academic interest. However, the break-even point came in 1958 with the contemporary publications of 'Water Resource Development' (**Eckstein, 1958**)., 'Efficiency in Government through Systems Analysis' (**Mckean, 1958**), and 'Multiple Purpose River Development' (**Krutilla and Eckstein, 1958**). These publications attempted to formalise public investment criteria in relation to the established criteria of welfare economics. In other worlds, benefits were related back to the consumer's surplus criterion developed by French engineer economist Jules Dupuit in 1344 and ranking in terms of net social benefits was justified in terms of Pareto criteria for welfare maximization.

In United Kingdom the benefit application of cost-benefit analysis was to the M1 motorway carried out by the Road Research Laboratory. Their applications are generally found to have been confined to transport projects (**Pearce, 1971:15**).

In most of the developing economies Cost-benefit analysis are found to have been widely used for the appraisal of hydro electricity schemes, irrigation and general water supply programs and for transport investments.

ECONOMIC CONCEPTS

1. CONSUMER'S SURPLUS

Consumer's surplus is the most crucial concept in the measurement of social benefits in any social cost-benefit calculation To put it in Marshallian version we can say: the maximum sum of money a consumer would be willing to pay for a given amount of the good; less the amount he actually pays. In other words, if a man is ready to pay as much as $5 for a shirt, it may be inferred that it is (in his own estimation) worth to him no less than $5. If the shirt is priced at $2, the purchase of the shirt provides with a consumer's surplus of $3 (i. e., $5 less $2).

2. OPPORTUNITY COST

Generally speaking, the opportunity cost of the current use of some good or of some input is its worth in some alternative use. However, in the situation where there is more than one alternative use, the important thing that has to be considered is the alternative which has the highest value for the individual. Examining the investment projects, the economist addresses himself to the question of whether its introduction will affect a "potential Pareto improvement" as compared with the existing situation (**Mishan, 1976:65**).

3. SHADOW PRICING

In evaluating any project, the economist may effectively 'correct' a number of market prices and, also, attribute prices to unpriced gains and loss that it is expected to generate. In other words, a shadow price is the value associated with a unit of some good which indicates how much some specified index of performance can be increased (or decreased) by the use (or loss) of the marginal unit of that commodity. Shadow prices are thus the social values of goods created, used up, or other wise affected by a project.

4. THE PROBLEM OF SECOND BEST

The problem posed by the theory of second best is what rule to employ when the familar optimum conditions are not met in the rest of the economy. Considering this theory, decision has to be made carefully on investment projects because cost—benefit analysis is specifically concerned with the pricing of factors, which prices enter into the costs of the projects. The second best theorem explains the fact that, the necessary conditions for a maximum are different from the usual ones when one or more additional constraints are imposed on the welfare function.

Investment Decision Criteria

There are many criteria developed by the economists to evaluate the alternative investment projects. Some of them are :

1. Cutoff Period :

It suggests to choose a specific time in the future and thereby decide to accept it or not depending if it covers all its costs by that time or not. This method is not recommended for the evaluation of public projects

2. Pay--Back Period:

This criteria considers that project best which recovers its cost in the shortest period of time. It can be shown with the help of following example;

Projects	Co	B1—C1	B2—C2
X	200	210	1
Y	200	0	2000

The initial outlay for both the projects (X and Y) is same. Both last two years. From the table it can be seen that project Y returns nothing after one year but X

has 210 indicating this project being superior to Y. But if we consider second year, this method is found faulty immediately.

3. Internal Rate of Return (IRR):

This method goes with the name of J. M. Keynes. The IRR is that rate of discounting the future that equates the initial cost and the sum of the future discounted net benefits. The IRR is some r such that

$$C0 = \frac{B1-C1}{(1+r)} + \frac{B2-C2}{(1+r)^2} + \ldots\ldots\ldots\ldots + \frac{Bn-Cn}{(1+r)^n}$$

This method dominated the thinking of many evaluation experts for long time but after the origin of Net Present Value (NPV) this method was considered inferior.

4. Net Present Value:

This method reduces a stream of costs and benefits to a single number in which projected costs or benefits for the future are discounted. For instance, if a project is expected to yield a benefit worth $200 next year, we might value that $200 next year, as $190 today. NPV can be written as;

$$NPV = \frac{B0-C0}{(1+d)^0} + \frac{B1-C1}{(1+d)} + \ldots\ldots\ldots\ldots + \frac{Bt-Ct}{(1+d)^t} + \frac{Bn-Cn}{(1+d)^n}$$

Where, Ct is the dollar value of costs incurred at time t, Bt is the dollor value of benefits incurred at time t, d the discount rate, and n the life of the project, in years. The higher its NPV, the better is a project.

Decision Problems

While initiating a discussion of social benefis of investment project over some period of time in future, one important thing to be considered is that there is a distinct time profile of benefits and costs corresponding to each of the investment projects under consideration. Two economists **(Sassone and Schaffer, 1978:25)** have considered three related questions about such projects;

1. One project is to be accepted or rejected
2. One of several candidate projects is to be accepted
3. Several of many candidate projects are to be accepted

First two forms are quite simple to make decision. Thus considering the first two, last form had some special aspects. So it is important to determine whether the projects are independent or dependent and whether there is an effective capital constraint limiting the sum of initial expenditures on the group of selected projects.

The initial outlay required as the expenditure in highway construction is clearly cost. The anticipated outlays at future periods of time for maintenanc etc. are normally smaller than the initial outlays. Benfiets, in most comprehensive sense include all additions to social welfare that can be brought into relation with the measuring rod of money.

Evaluating cost benefit of certain project a distinction is made between capital costs needed to build the project etc. and operating costs disbursed at regular intervals so as to maintain the flow of products or services. The realistic way, for simplicity, would be to include all payments as costs and all receipts as benefits. Thus by subtracting, in each period, all the costs from all the benefits, we and up with a succession of net benefits to which we can conviniently apply any adopted investment criteria.

Performing a Cost-Benefit Analysis

While performing a CBA recognition should be given to all resource inputs and final outputs of the projects together with the calender time in which they will occur.

Every project has an alternative so a technical description and detailed scenario of the alternative projects should be constructed.

When there is spillover benefit, all benefits ought to be counted. For example, a trained manpower if migrates out of that State, it is to be assumed that benefits will accrue to both residents and nonresidents of the State. Thus when spillover is apperent, the analyst should point it out to the decision maker.

To decide the exclusion of alternative projects a number of constraints must be chosen while performing cost-benefit analysis. For example,

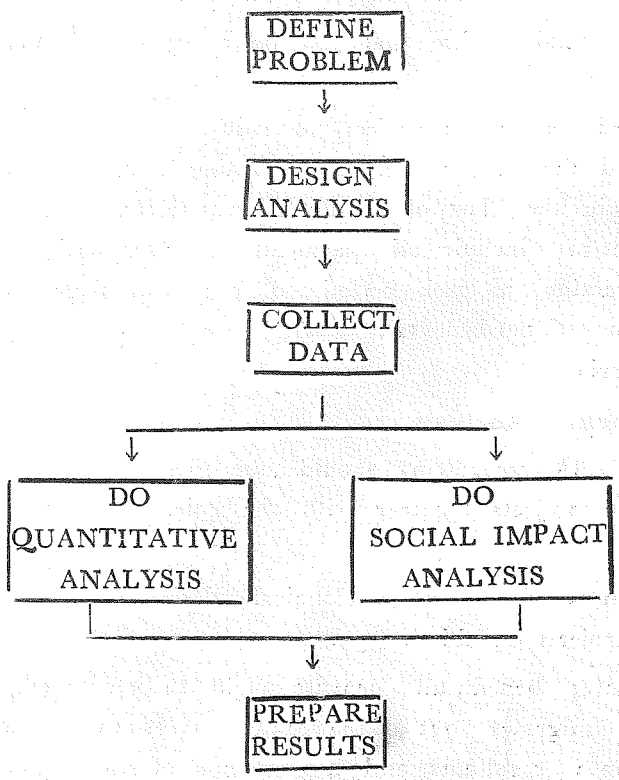
1. Budgetary constraint (i. e. the initial cost of the project cannot exceed $X and annual operating costs cannot exceed $Y)

2. Legal constraint (i. e. pollution by the project cannot exceed some set standards).

3. Social constraint (i. e. benefits and costs of the project cannot be divided along racial lines).

4. Political constraint (i. e. benefits and costs of the project cannot be inequitably divided among different political jurisdictions, for example, States).

P.G Sassone and W. A. Schaffer (Ibid:157) have depicted the logical steps for conducting cost-benefit analysis in the flow diagram which could be worthwhile showing regarding the analytical pattern of the present paper.



Conclusion

These brief discussions of the concepts and methods of performing cost-benefit analysis show that CBA depends on the proper identification and measurement of all project effects. Furthermore, incommensurables and intangibles must be acknowledged and displaced in any kind of cost-benefit analysis as accurately as possible. In short cost-benefit analysis, ultimately, is an aid to the decision maker.

Other equally important aspects that CBA accounting scheme should consider

are anaiysis of project impacts on regional development, income redistributio namong income classes, the environment and social values in general.

The decision rule of CBA requires that benefits and costs be expressed in monetary units for each period of time over the economic life of the project, and that these values be discounted by some chosen SDR to obtain a net present value of social benefits (**Niskanen, 1972:225**). For the maximization of social welfare, prices attached to the physical benefits and costs should reflect society's valuations of the final goods and resources involved.

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Book Review

Pant, Y. P: *Population Growth and Employment Opportunities in Nepal*, New Delhi: Oxford and IBH Publishing Co., 1983, pp. 131, IRS. 50/—

The monograph under review is devoted to the relationship between the popualtion growth and employment opportunities in Nepal, examined from the positions of development economics. The author demonstrates a thorough knowledge of the problems under study and the complicated problems which Nepal is facing from the higher rate of growth of population.

The book has been divided into six sections, with a short introduction on theoretical aspects of population and employment issues. The author discusses at length a whole range of problems connected with population and employment policies: the trend of population change in Nepal from 1911 to 1981; the population policies adopted by HMG from the first to the sixth plan period, the relation between population and development, institutes dealing with population; status of uhemployment and underemployment in Nepal, growth of labour force; employment policies of HMG/N during various plan periods, and the employment prospects in Nepal.

The first four chapters or sections of the book have presented the backgro und materials relating to population growth and status of employment. However, the author's analysis is concentrated in subsequent two chapters of the book, which deserves review. While analysing the employment prospects in Chapter 5, the author has tried to analyse the prospects of employment in rural and urban areas. The author feels that the following areas exist for creating employment in rural areas: (a) Infrastructure development programme, (b) Resettlement programme, (c) Integrated Rural development programme, (d) Food for work programmes and (e) Programmes for increasing agricultural productivity.

The author seems very optimistic about the potentialities of the above mentioned areas for creating employment in the rural areas. However he has not analysed the impact of the existing projects in creating employment opportunities in rural areas. He has a strong opinion that the development of infrastructure viz; road, irrigation, health, education, electricity creates employment opportunities. Ho-

wever the author himself has questioned the potentiality of employment for Nepali citizens in the context of the present setup. Little more elaboration on this issue would have enhanced the study. This point has been clearly depicted by the author, and he writes that the "Immigrants from India have increasingly occupied the agricultural and modern sectors. Contrcators on construction sites prefer non—Nepalese workers" (p. 100). Furthermore, the author forsees that, resettlement also helps to promote more employment opportunities, however, the clearing of more land for resettlement seems limited. Integrated rural development programme, as visualised by the author, may help to create more employment opportunities in the hilly region. But the food for work programme helps to provide short term employment opportunities, as compared to other areas such as forestry, fishery, livestock development and cottage and small scale industries. The study would have had more analytical perspective, if the author had touched upon the limitation in the development of forest and livestock as the source of more employment opportunities.

The author while trying to suggest strategy for opening employment opportunities in the rural areas, suggests, on the one hand, for enhancing role of voluntary labour, streamlining local level capabilities, and modernising self-help organisation and encouraging the participation of lower income groups, on the other hand he further advocates for the mobilization of local level resources, through the revival of Panchayat Development and Land Tax (PDLT) with its improved version. Y. P. Pant's approach is more for the intensification of rural development programme, by integrating various activities of rural areas.

While showing the employment prospects in the urban areas, the author mentions that the paucity of data on the status of unemployment in the urban areas, has not helped to forecast the prospects of employment in such areas. However the authour has emphasised on the need for the development of a concrete employment plan for each area of urban economic activities.

The auther has tried to present a review of the employment agencies, related to employment. He has taken into consideration the organisation of the government, some public undertakings, industrial estates as the agencies influencing the employment structure. However, the auther has not taken into consideration the role of private organisations in creating employment.

In the last chapter of the book, the author has tried to repudiate the maxim "more population means more wealth" on the ground that in the modern world the intensive use of skilled labour with shophisticated technology, the swarm of unskilled labour becomes expensive. On this ground, he argues for the control of population in Nepal, and suggests various means to tackle the population problems. In his suggestions, Dr. Pant is very critical on the approaches of the government and has written emphathetically that mere "speaches with empty words have led to animosity and abhorrence from the people."

Dr. Pant has tried to give prescription to the ailing issue of unemployment existing in agricultural, industrial, and urban sectors of Nepalese economy. His suggestions are of emence value, and the issues which he has touched require creative analysis. Nevertheless the facts and ideas that have been posed, serve as a reference point for further investigations. This is certainly to the author's credit.

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