OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

D01855

ID

Distr.
GENERAL

ID/CONF.1/4
7 June 1967

ORIGINAL: ENGLISH

United Nations Industrial Development Organization

INTERNATIONAL SYMPOSIUM ON INDUSTRIAL DEVELOPMENT
Athens, 29 November-20 December 1967
Item 3 (b) of the provisional agenda

THE ROLE OF POLICY-MAKERS IN PROJECT FORMULATION AND EVALUATION[1/]

Prepared for the Symposium

by

Professor A.K. Sen
Delhi School of Economics
University of Delhi
Delhi, India

Consultant to UNIDO

1/ The views and opinions expressed in this paper are those of the consultant and do not necessarily reflect the views of the secretariat of UNIDO.

67-13155

Contents

Introduction

1. In many countries there seems to be a gap between the national development planning (including over-all industrial planning) on the one hand and the programming at the project level. The national development plan is usually formulated in terms of objectives involving such considerations as the standard of living, the average rate of growth, the level of employment, the balance of payments position, self-reliance, and distribution of income. In other words, the national plan is formulated in terms of the broad categories of over-all national objectives. Although individual projects are developed within the broad framework of the plan (and sectoral programmes), the gap between the national planning and that at the project level is, in most cases, not bridged. This is so for a variety of reasons; one of them is that typically projects are formulated and evaluated primarily in terms of commercial returns on investment, and this process does not take into account the full range of national objectives.

2. A better alternative is to use the so-called "social benefit-cost analysis", which is essentially a tool to formulate and evaluate projects in terms of the explicit national objectives that underlie development planning for the nation as a whole. The interdependence is mutual and a perfect plan requires feedbacks on either side. The social benefit-cost analysis tackles tactical questions at a project level of the product mix, the size of the plant, its location, the choice of technological processes, the use of different raw materials, factor proportions, the degree of specialization, opportunities for future expansion, time phasing, etc., so that projects are formulated and evaluated in order to fulfil the objectives of the over-all plan, including the sectoral programmes.

3. The contrast between social cost benefit analysis and the traditional commercial profitability analysis of the projects can be looked at from various points of view, which are separate but not independent of each other.

(a) The objective of the commercial profitability analysis is to maximize the nominal profitability of investment while that of the social benefit-cost analysis is to maximize national economic profitability as represented by the appropriately weighted sum of the net benefits accruing to different national objectives embodied in the national plan.

(b) Another way of looking at the contrast is that, while commercial profitability is calculated on the basis of market prices of inputs and outputs, national economic profitability is calculated on the basis of shadow or accounting prices of inputs and outputs reflecting their social scarcity and value in the context of the targets of national development plan.

(c) One consequence of the above is that while commercial profitability analysis ignores the so-called "external effects" working outside the market mechanism, the social benefit-cost analysis takes them into account explicitly.

(d) Finally, future benefits and costs may be reduced to their present value by the use of a given market rate of interest under the commercial profitability analysis, while the present values of future benefits and costs under national economic profitability analysis are calculated by the use of the social rates of discount, reflecting the community's preference between present consumption and future consumption.

4. The determination of national objectives and the relative weights to be attached to them (including the choice of the social rates of discount) fundamentally reflect the value judgements of the community made by the leadership. These are the functions of the policy-makers in a social benefit-cost analysis. However, under the present arrangements these functions are often performed by project technicians, quite unconsciously. This is especially the case under the commercial profitability analysis. The objective of the present paper is to show the links between policy decisions at a general level and the formulation and evaluation of industrial projects, so that we may be able to pinpoint the decisions which have to be made by the policy-makers to help the work of project formulation and evaluation within the framework of the national development plan.

5. The determination of national objectives, the relative weights attached to them and the social rate of discount fundamentally reflect the value judgements of the community made by its highest political and administrative leadership. These are essentially the functions of the policy-makers which are unconsciously and unintentionally performed by technicians under the commercial profitability

analysis. The objective of the present paper is to pinpoint the decisions which have to be made by the policy-makers in project formulation and evaluation within the framework of industrial programming of the national development plan and to show the links between policy decisions at a general level and the formulation and evaluation of industrial projects.

Values, prices and market

6. It is worth distinguishing between three types of wrong decisions that a technician can take. (This is not, of course, an exhaustive classification.) First, he can make an error in his technical estimation and calculations. Second, his own values may differ from that of the community or of the government which he is serving as a technician. Third, his fundamental values may be the same, but he may make an error in the relative weights to be attached to different kinds of benefits and costs in his area of decision, not knowing what is being done in the other areas of decision.

7. The first of these errors (i.e., in technical estimation and calculations) cannot, of course, be avoided by the participation of policy-makers in project selection but, possibly, the other two can be. The third error (in the relative weights attached to different benefits and costs) is an especially fruitful field for help to the project technician who may not have much idea of the rest of the plans of the Government or of the economy, and obviously the relative values of the benefits and costs of his project will depend on those plans. An illustration may make the point clearer. The value to be attached to the cost of labour depends on a number of things. It depends on the alternative avenues of employment (if any), on the social cost of maintaining the unemployed, on the impact of extra employment on consumption and savings, on the relative weights to be attached to the present and the future levels of consumption given the distribution between them, and on other factors.[1/] The project technician may know every technical detail of the entire set of projects from which he has to choose, and may share

1/ A.K. Sen, Choice of Techniques (Oxford, 1962), chapter 5; S.A. Marglin, Industrial Development in the Labour Surplus Economy: an Essay in the Theory of Optimal Growth, mimeographed (January 1966).

every fundamental value of the policy-makers, but he may still not know the proper social cost for labour in his calculations until he knows the answer to the above questions.

8. This seems such an obvious point that one may wonder how it is so often overlooked. The answer is that it is really not so obvious, for we have yet to consider whether the basic features of the relevant information are not reflected to the project selectors in the form of the market prices of the inputs and outputs. Not only do the technicians have all the technical details of the projects in question, but they can also find out all the relevant market prices.[2/] In practice, no doubt, the engineers do take the market prices into account, including the market wage rates and the market interest rates. These data are in fact quite commonly used by the engineers to choose between one variant and another of a project.

9. The trouble is that the market prices have a number of built-in biases. Our example of the cost of labour was deliberately chosen to illustrate such a point. The cost of labour may well be substantially overstated by the market wage rates in an economy with surplus labour. Similarly with respect to benefits, the market prices do not reflect anything other than what is sometimes called the "national income benefit".[3/] It does not, for example, take into account distribution considerations, attaching greater weight to the consumption of the poorer classes or the poorer regions.

10. There are also other well-known deficiencies. The market prices do not reflect the "external effects".[4/] For example, skill formation of labour

---

2/ This is not strictly true, for the future prices may not yet be known and will involve some guess-work. On the inoptimality of decision-taking arising from this, see J. de v. Graaff, Theoretical Welfare Economics, Cambridge (1957), chapter VI.

3/ See Marglin, Public Investment Criteria: Benefit Cost Analysis for Planned Economic Growth, United Nations (CID/IPE/B.36), to be published by Allen and Unwin.

4/ A.C. Pigou, Economics of Welfare (London, 1932); T. Scitovsky, "Two Concepts of External Economies", in his Welfare and Growth, Stanford (1964); F. Bator, "The Anatomy of Market Failure", Quarterly Journal of Economics (August 1958).

generated by industrial undertakings is not fully reflected in the value of the output, and the community gains more than the market value of the output would suggest.

11. Similarly, in the case of the so-called "public goods", the inefficiency of the market mechanism is also well known.[5/] These are goods where the consumption of one person may not conflict with that of another, e.g., enjoyment of the defence services, or the benefits of an outdoor circus. Once again, the market prices will not reflect the value of the goods to the community. The technician has to go beyond the market prices, and this is where the policy-makers have a crucial role to play.

12. Thus, neither the engineers' technical information alone nor the technical data in conjunction with the market prices provide a sufficient basis for project selection. The participation of the policy-makers is the sine qua non for a proper selection of projects. This participation may take a very direct and active form or it may take the form simply of indicating to the project technicians which market prices should be corrected, and how. In either case, the role of the policy-makers will be crucial in project selection.

Technical efficiency and dominance

13. Sometimes, in appreciating the role of a certain factor, it is useful to ask under what conditions it will be nil or minimal, and then to work backwards to cases away from those special circumstances. We outline below two such cases where the role of the policy-makers will be very minor, and the technicians can be expected to do the work more or less completely on their own.

14. The engineer may find that a number of alternative projects are possible in fulfilling a requirement specified by the Government, e.g.:

(a) x units per year are produced of commodity X;

(b) One project, say A, produces this output requirement with no more input of any kind and less input of some kind, compared with any other alternatives;

5/ P.A. Samuelson, "The Pure Theory of Public Expenditure", The Review of Economics and Statistics, XXXVI (November 1954); idem, "Diagrammatic Exposition of a Theory of Public Expenditure", The Review of Economics and Statistics, XXXVII (November 1955).

(c) If there are multiple products, the condition referred to will be one where A requires no more input of any kind and produces no less output of any kind, and either requires less of some input or produces more of some output.6/

Here A is simply more efficient technically than its alternatives are.

15. It seems to make economic sense to suggest that under these circumstances, A should be chosen without much ado. Two classifications should be made, however, to prevent misunderstanding. First, the implicit assumption in all this is that it is always better to have more output and to use less input. This may not always be so. It is conceivable to argue, and indeed such an argument has been heard, that more employment is a virtue in itself. Given this judgement, presumably related to an economy in an acute stage of unemployment, it is possible to prefer a certain project B when it requires the same amount of all inputs as A does and more of labour.7/ Thus, A may be technically more efficient, but B may be preferable. Given this judgement about employment, a greater use of labour is a boon and not a sacrifice.

16. This particular case is, in some respects, a somewhat unconvincing one for a variety of reasons, but the general point about the arbitrariness of what is regarded as a benefit-creating output and what is considered a cost-inducing input is valid. Some products (e.g., some types of petroleum by-products which are apparently used sometimes as a source of food adulteration in poor economies)

6/ For a discussion of technical and economic efficiency, see T.C. Koopmans, Three Essays on the Study of Economic Science, New York (1957), Essay I. There are a number of crucial assumptions for the relevance of this approach, e.g., non-satiety, which are also discussed in the reference cited.

7/ A, being superior from the point of view of efficiency than B, requires the satisfaction of the condition that the gap between the value of outputs and the value of inputs is at least as high for A as for B for every set of non-negative prices of outputs and inputs. The problem referred to above is one where the implied price of labour is negative; that is, rather than being a cost, it has to be viewed as a benefit.

may well be regarded by the Government as cost-inducing rather than benefit-giving, even though the market prices of such goods may be positive.

17. Second, the definition of outputs and inputs may have to be widened to make more sense out of the concept of technical efficiency. A physical unit of output may not be regarded as being as "good" as another, irrespective of where it occurs. The output created in a poorer region may be more valuable than the same one occurring in a richer area, for it may improve the distribution of income.

18. Again a practical example may be helpful. In terms of relative returns, it is arguable that irrigation projects in general will effect less additional output of crops than the alternative of fertilizer products in India today per unit of cost. The input composition is of course very different, but let us ignore that aspect for the moment, and consider the implications of getting more crop output from using a given bundle of inputs in fertilizer production than through using them in irrigation projects. Does it follow immediately that irrigation should be ruled out? Not really, for the increment in crop output will take place in different regions. Irrigation may increase the output in the relatively dry regions while fertilizers may increase it in the regions that are relatively wet, since fertilizers are not effective in the dry areas. If the dry areas are substantially poorer, and if transfers of output and income from the wet areas to the dry ones are not easy, it may be better to retain irrigation projects even under the stated adverse technical conditions.

19. The casualty here is not the concept of technical efficiency, but its use in a mechanical fashion. Under the circumstances mentioned, a unit of physical output of X_i in region R_1 is not the same as a physically identical unit of the output of X_i in region R_2. We have to treat them as two separate commodities. Thus redefined the two alternatives are not comparable in terms of technical efficiency, since one produces more of one, $X_i(1)$, and the other more of the second, $X_i(2)$.

20. Redefinitions of this type will save the day for the concept of technical efficiency, but the fact remains that this will be only at the cost of its easy applicability. That is, while technical efficiency is a good criterion when properly defined, thus defined its scope is very limited. The condition of technical dominance will be relatively difficult to satisfy once the distinctions outlined above are introduced.

Decomposable production of tradables

21. Consider the following case. A certain commodity X can be produced by input Y. Both X and Y sell in the international market at fixed prices, and perfect competition prevails. The production of X, however, has either an upper limit imposed from outside, or the requirement of Y per unit of production of X steadily rises from a low figure upwards without bounds, thereby imposing an upper limit in economic terms. Given the prices of X and Y, the technician can safely choose the size of the project without much need to consult a policy maker. He fixes the size of the project so that the additional output of X generated by an additional unit of Y equals the international price ratio of Y vis-à-vis X.[8/]

22. The reason that this decision is simple is that the activity of making X does not affect anything else in the rest of the economy, and it is assumed that it is better to earn more foreign exchange than less, when it does not cost anything. This is a policy decision, too, but is likely to be so generally accepted that it is hardly a debatable one. Given these two assumptions, the choice of the project is a purely technical question.

23. While this case undercuts the policy maker, it is a very rare case, like the case of technical efficiency alone permitting a complete selection of projects, discussed in the previous section. Its widest application will be in a situation where every input and every output are internationally tradable at fixed prices and where the job of technical planning will be to maximize the earnings of foreign exchange (with foreign exchange being used to provide suitable satisfaction of domestic needs).[9/] The model, however, is very unrealistic, thanks to the

---

8/ Formally, take $x = f(y)$. If f is "well-behaved", then with P_x and P_y as fixed prices of X and Y, the first order condition of the best decision is given by $f'(y) = P_y/P_x$. If, for example, $x = 100y - y^2$, then with $P_x = 1$ and $P_y = 10$, the right project is one using 45 units of y and making 2,475 units of x.

9/ This is similar to Irving Fisher's recommendation to the investor to do all his calculations at the market rate of interest and only adjust his borrowing and lending so that his individual rate of discount equals the market rate. See Irving Fisher, Theory of Interest (1907).

existence of "non-tradables", of transport costs and of imperfections of international markets.[10] Hence, the policy maker has to get involved in decisions in project selection to supplement the international price information by other values of benefits and costs.

24. These two exceptional cases, discussed in this section and in the previous one, where the technicians are more or less self-sufficient, are important. They clarify the technical basis of some of these decisions. But they also indicate how special are the assumptions in terms of which the policy makers' participation in project selection can be dispensed with and the technician can be in sole charge of these decisions. We now turn to the more general question of the relationship between policy makers and technicians, leaving out these special cases.

Conflicting objectives and relative weights

25. Objectives can be satisfied at different levels of sophistication and details. A compromise has to be struck between practical convenience which requires some aggregation, and complete articulation which tends to demand detailed specification. An illustration may be helpful. It is well known that in a multi-commodity world, no separation of considerations relating to the size of the aggregate income (or consumption) and those relating to its distribution can be fully satisfactory.[11] Bearing this in mind, it has been pointed out by Franklin Fisher that judgements about distribution can be made in terms of a gigantic "distribution matrix" indicating the proportion of each commodity going to each individual.[12] With

---

10/ Some of the simplicity of the model is, however, preserved in a contribution by I.M.D. Little, "Public Sector Project Selection in Relation to Indian Development", to be published in a Nehru Memorial Volume of Essays, ed. A.V. Bhuleskar. This breaks down the cost of non-tradables into tradables components in a model of surplus labour (and no relation between the size of the wage bill and effective consumption).

11/ See I.M.D. Little, A Critique of Welfare Economics, Oxford (1957).

12/ Franklin Fisher, "Income Distribution, Value Judgments, and Welfare," The Quarterly Journal of Economics, LXX (August, 1966). Without "homothetic" utility functions there are certain difficulties with this presentation which we need not go into here.

500 million people, even if we take only 1,000 commodities (a vast under-estimation), there will be 500 billion items in this matrix. The judgement will be very comprehensive, but it is not an easy one for a mortal to make.[13/]

26. While the above is very articulate but not easily put into practice, the other methods tend to be practical but not very articulate. An alternative may be not to worry about distribution except in so far as people are actually starving, and to concentrate on maximizing the total size of aggregate consumption evaluated at given prices, subject to no one's income falling below a certain minimum level. This is indeed very practicable but does not fully reflect our value judgements.

27. A compromise is to take the aggregate consumption at given prices, but attach some extra weight to the aggregate consumption of backward regions or of poorer classes.[14/] For example, income generating in Bihar may get a special weight (say, of 10 per cent) in our evaluation of benefits for the Indian economy as a whole, in addition to the normal weight it gets as a part of the national income of India. Similarly, depressed classes or groups may be given special weights. This is not very sophisticated, certainly not as compared with Fisher's distribution matrices, but it is no doubt a practical method of getting some distributional judgements thrown into the evaluation of benefits.

13/ This is not meant as a criticism of Fisher's approach, for his object was largely to clarify the analytics of the problem. Furthermore, the same approach can be partly applied to sections of the community rather than going all the way to individuals.

14/ Marglin, Public Investment Criteria, op. cit.

28. The relation between the objectives and weights is indeed an intricate one. Presumably, the Government would prefer a higher aggregate consumption at constant prices, given the distribution by region and by class. Presumably also a Government inclined towards distributive justice would prefer a more equal distribution between the regions and the classes, given the total.[15/] But the two objectives conflict, and in the selection of projects much will depend on what relative weights are attached to each. Consider the choice: between project A which produces x tons of fertilizers to be used in Punjab and yielding 1 million additional tons of wheat per year; and project B which is an irrigational project yielding 0.90 million additional tons of foodgrains in the dry areas of Bihar. Suppose, for simplicity, that both cost the same bundle of inputs.[16/] Now, if income generated in Bihar is given an extra weight of 10 per cent or less, 0.90 million tons will be revalued at 0.99 million, compared with Punjab's 1.00. However, if the weight is raised to, say, 11 per cent, the Bihar project takes over.

29. A technician serving as a project selector may not know what weights to attach, for the two reasons mentioned earlier. First, he may not know what relative importance is to be attached by the central Government to regional inequality. Also, he may not know the Government's ability to use income taxes and other inter-state distribution mechanisms effectively. The limits here are political, and an engineer may not know exactly what to assume. Second, the relative importance to be attached to income generated in Punjab vis-à-vis the income generated in Bihar depends on what other projects are being planned in these regions and what impact these projects (and others elsewhere) are expected to have on the income generating in the two states. In both these respects, the policy-makers at a high level are in a position to judge in a manner that the

---

15/ There are difficulties with a precise measure of distributional inequality, and once again compromises are called for to get a practical usable method. The same applies to the measurement of <u>total</u> income to be distributed.

16/ This is quite unrealistic and is being used to illustrate the basic point. We are also abstracting from the fact that irrigation creates potential for later use of fertilizers, a point of some importance. In a real evaluation, all these additional considerations have to be taken into account, but the nature of the problem outlined here survives these additions.

project selector may not be. Thus, in a choice of this kind, the role of the policy maker is absolutely crucial.

30. The example given here is a special one, and two warnings seem to be in order to prevent misunderstanding. First, income distribution between regions is only one consideration among many with which we may wish to supplement the aggregate income objective. Some of the effort may involve expectation about the future, e.g., the relative weights to be attached to this year's consumption vis-à-vis that of a year hence. Some judgement may also involve intricate decisions on the importance of especially meritorious benefit, usually called "merit wants", e.g. educational opportunities opened up by technical development in some areas of backward education, where the gain may be taken to exceed the willingness to pay of the recipients of the education. Some may even involve very far-fetched calculations, e.g., the impact of economic development in a certain area on the migration of population to and from that area, and the Government's attitude to such redistribution of population.

31. Second, the example given here is not very apt in at least one respect. The technician generally is not asked to choose between an irrigation project in Bihar and a fertilizer factory for Punjab. Such decisions are in any case left to higher authorities. But choices of this kind are involved in what is left in fact to the technicians. For example, a choice between different locations for a fertilizer factory itself involves a substantially similar set of considerations. Furthermore, when a technician rejects or accepts a given project, he is in effect rejecting or recommending the transfer of resources from different fields, and possibly from different regions, the project at the location in question. All this is implicit in his decision, and the relevant costs in his calculation refer to benefits foregone elsewhere.17/

17/ Marglin, Public Investment Criteria, op cit.; Sen, "General Criteria of Industrial Project Evaluation," United Nations (document CID/IPE/3.9).

32. In choosing between degrees of mechanization, a conflict between present consumption and future consumption may be faced, and this once again requires the policy-maker's evaluation. In the choice of different kinds of transport, a decision may require a relative evaluation of foreign exchange vis-à-vis domestic resources, for one technique may use much more of an imported commodity (e.g. oil in India), while the other may use more domestic resources.

33. Finally, in evaluating costs and benefits of a given project, the usual practice is to compare it with what otherwise would have happened to the resources. For an economy where there is a substantial private sector, this might mean a comparison between public projects and private ones. There, in addition to considerations of income, its distribution and growth for the future, the Government's general attitude towards public and private enterprise is relevant. This again may have to be reflected in terms of relative weights to be attached to different types of benefits and costs.

Time and interest

34. Enough has perhaps been said about the general role of the policy-makers in supplementing the efforts of project technicians. We can now try to achieve some concreteness by discussing two particularly intricate problems in the selection of relative weights. The reference is to the choice of (a) shadow interest rates and (b) shadow wage rates in an economy with surplus labour. There is difficulty in taking up these problems because they involve more complicated issues than most others, so that the net impact of this discussion may be an encouragement to nihilism. But decisions have to be made, and nihilism is a luxury reserved for theoretical economists, and not for economic policy-makers. What is more important is that by a proper posing of the questions, we can narrow the problems to those of greater intuitive meaning, where judgements do become easier to make even though their intricacies do not disappear.

35. The rate of interest used in project evaluation essentially serves two different purposes. First, it expresses the relative extra weight to be attached

to benefit today as compared with benefit tomorrow.[18] Second, it is supposed to reflect also the productivity of capital in the economy so that we can find out the alternative returns that capital would have if invested elsewhere. Only if these two values -- the marginal rate of discount appropriate for the society and the marginal rate of return for capital investment -- happen to coincide, can we expect that the usual calculations in terms of a given interest rate without any further corrections, will turn out to be appropriate.

36. It has been widely observed that there are reasons to expect that the market rate of interest does not properly reflect either of these two conditions, and particularly not the social rate of discount. The market rate of interest does not reflect the proper rate of discount because of the fact that individuals face a strictly limited lifespan, whereas the vision of the society may be much longer. A variety of arguments can spring from this realization. An argument that has been much discussed is that the Government might take a more long-run view, serving as an arbitrator between different generations and thereby over-ruling the market rate of interest as reflecting the preference for present benefit over future benefit as expressed by the limited views of the present generation. This argument has been described as "authoritarian",[19] and it is so in some respects, since the Government can use this argument for any purpose without fear of contradiction by generations which are yet to be born. On the other hand, it is obviously unsatisfactory to regard the representation of merely the present

---

18/ This includes the valuation of costs also, as costs are best seen in the form of benefits sacrificed. For example, the cost of using resources in a certain public-sector project may be what it could have alternatively produced in the private sector. Thus, the question of weighting the benefits over time, and that of the costs over time, really boils down to the same thing.

19/ See S.A. Marglin, "The Social Rate of Discount and the Optimum Rate of Investment", Quarterly Journal of Economics, February 1963.

generation's interests as "democratic", and perhaps the concept of democracy is not an easy one to use in this problem of inter-generational distribution. Unhappily, in certain long-lasting projects, e.g. irrigation projects and some types of heavy industry, the problem of inter-generational distribution is quite crucial.

37. Even when the question of the Government representing anything but the present generation's views is left out, the market rate of interest may still be misleading. Individuals may feel that they are willing to make some sacrifice of present consumption for the sake of future generations in order to induce others in the present generation to do the same. For example, every individual may be willing to vote for a proposal that everyone be forced to sacrifice one unit for the sake of future generations; even when left to themselves. None of them may make the sacrifice on their own. All individuals may have some concern for the future of the nation, for the sake of which marginal savings are needed for use in some long-term projects. They may prefer that others do the saving, and not themselves. But given the choice between the alternatives that nobody saves and that everybody does, they may prefer the latter. This is not an uncommon type of psychology in dealing with development plans. Left to atomistic actions on their own, each individual may then prefer not to do the saving, regardless of what he expects the others to do; however, each may be willing to vote for a contract which forces everyone to do the requisite saving.[20/] When

---

20/ A.K. Sen, "On Optimising the Rate of Saving", Economic Journal (September 1961); S.M. Margin, "The Social Rate of Discount and the Optimum Rate of Investment", op. cit.; R. Lind, "The Social Rate of Discount and the Optimal Rate of Investment: Further Comment", Quarterly Journal of Economics (May 1964); A.K. Sen, "Isolation, Assurance and the Social Rate of Discount", Quarterly Journal of Economics (February 1967); E.S. Phelps, Fiscal Neutrality Towards Economic Growth (New York, 1964).

this type of situation exists, the market rate of saving may be unduly small in terms of the individual's own preferences without bringing in the responsibility of the Government to represent the interest of future generations.

38. What is important to recognize is that the sub-optimality of the market savings arising from this type of interdependence indicates the inappropriateness of the market rate of interest as the social rate of discount. In general, an argument for a higher rate of saving amounts to an argument for a lower social rate of discount, for a lower social rate of discount indicates the appropriateness of a larger volume of investment (of saving), by making some investment profitable which would not have been so under higher rates of discount. Based on considerations of this kind it may be argued that the market rate of interest should not be used for project evaluation and that, instead, a lower social rate of discount may be appropriate.[21/]

39. The technician who evaluates a project may be fully aware of this problem but may not be able to do very much about it without guidance from policy-makers as to what would be an appropriate social rate of discount. The question is a very general one, and not one that can be necessarily solved by technicians who are experts, say, on the cement industry or on fertilizer production. It is equally important to remember that, even for a policy-maker, the choice of a social rate of discount is not an easy one, for the considerations involved are rather complicated. Nevertheless, it is a choice that belongs more to the legitimate sphere of activity of the top-level policy-makers than to that of project planners as such.

40. The whole question relates also to the integration of project planning with the national plan as a whole. If the national plans of investment over the relevant years are sufficiently large to make the policy-makers quite satisfied with the rate of saving, no special additional weight need be attached to the creation of savings opportunities. If, however, the planners are unhappy about the over-all size of the rates of saving, clearly an extra weight on savings seems to be called for. This tends to go with a lower social rate of discount, as noted before. The policy-maker has to evaluate the question in terms of the general level of planning.

21/ Marglin, op. cit.

41. At the risk of oversimplifying a highly complicated problem, perhaps the following illustration may be useful. The rate of discount today can be taken to be the premium that today's consumption is supposed to have vis-à-vis that of tomorrow. This premium can arise from a variety of considerations. One important consideration is that, with the growth of income, people will be richer tomorrow than they are today. If the object is to maximize the sum of aggregate utility over a certain[22/] horizon, it can be shown that within this horizon the appropriate rate of interest is simply the rate at which the marginal usefulness of a unit of benefit is falling over time as a consequence of people getting richer. This links the rate of discount simply to the consideration of the so-called "diminishing marginal utility". In particular, the following formula holds:

$$i = m. \frac{\dot{C}}{C} \qquad (1)$$

when i = the social rate of discount,
m = the absolute value of the elasticity of marginal utility of consumption with respect to the increase in consumption,
C = the level of consumption, and
$\dot{C}$ = the rate of change of consumption over time.

42. For example, policy-makers might ask themselves the following question: If there is a 10 per cent rise in the level of consumption tomorrow compared with today, this may reduce the urgency of an additional unit of consumption; but by how much would it be reduced? If he feels, after reflection, that a 10 per cent increase in consumption will reduce the welfare value of an additional unit of consumption by as much as, say, 8 per cent, then the appropriate elasticity of the utility function happens to be -0.8. In that case, a growth rate of consumption

---

22/ See O. Eckstein, "Investment Criteria for Economic Development and the Theory of International Welfare Economics", Quarterly Journal of Economics, LXXI (1957); S. Chakravarty, "Optimal Savings with Finite Planning Horizon", International Economic Review, III (September 1962).

envisaged in the plan of, say, 3 per cent a year will imply a rate of discount of only 2.4 per cent.[23]

43. This is really the simplest possible calculation. One can indeed make the formula more realistic by bringing in the growth of population over time and by relating utility not to total consumption but to per capita consumption.[24] The main usefulness of formulae of this kind is in clarifying one's own ideas about the precise role of the social rate of discount. They do not solve the problem; they simply restate it in different terms. But they do make it easier for the policy-maker to see what it is that he is trying to find out.

23/ The intuitive argument may be put in the following way. The planner argues: "Next year the nation will be 3 per cent richer in consumption. So, given our assumption, the value of an additional unit of consumption will be three times 0.8 per cent less, i.e. 2.4 per cent less. That is, if I discount next year's marginal consumption by 2.4 per cent, we shall get its equivalence with today's units of consumption. Hence, the appropriate marginal social rate of discount is 2.4 per cent."

24/ When population is a variable, there are a number of alternative assumptions that we can make. We may take social welfare to be reflected only by: (i) per capita utility or (ii) per capita utility multiplied by the number of people. The formula for the social rate of discount will depend on which value judgement we make, i.e. whether we are concerned with the average well-being or with the size of total well-being in the community.

When "n" the percentage rate of growth of population, "$\bar{m}$" the absolute value of the elasticity of per capita marginal utility with respect to per capita consumption, and "C" and "$\dot{C}$" are as defined before, then the social rate of discount is given by the following two formulae, corresponding respectively to the two cases specified above:

$$i = n + \bar{m}\left(\frac{\dot{C}}{C} - n\right) \qquad (1.i)$$

$$i = \bar{m}\left(\frac{\ddot{C}}{C} - n\right) \qquad (1.ii)$$

The intuitive explanation is less simple than in the case discussed in foot-note 23. The best discussion of the problem is to be found in S.A. Marglin, Industrial Development in the Labour Surplus Economy, op. cit., chapter VIII.

44. Clearly, the technician has a role to play even in this, but it is of a somewhat more limited kind. Two roles in particular will be worth pointing out. The technician can calculate the benefits and costs of a project and indicate that the present total value of a project will be positive if, say, the social rate of discount is taken to be below "x" per cent, and zero or negative otherwise. Once the problem has been thus stated, the policy-maker simply has to face the question whether he regards the "x" per cent social rate of discount to be too high. This is a dialogue in which both the technicians and the policy-makers have their own roles. The not uncommon practice - for the engineer to look, at this stage, at the market rate of interest and then come to his own conclusion - is an illegitimate one which does not serve the best interest of planning.

45. A second role of the technician in this general context is the relationship between the social rate of discount and the productivity of capital in the economy. Suppose the policy-makers indicate that the social rate of discount should be 10 per cent; however, if the technician thinks that, by and large, capital in the private sector yields a return of 15 per cent, he might face a problem. If he discounts the particular public project in review at 10 per cent, he has been true to the relative evaluation of present benefits and future benefits as seen by policy-makers, but he has been unwise in, perhaps, sacrificing a private project yielding 15 per cent in order to shift resources to a public project yielding 10 per cent.

46. Considerations of this type have prompted some to doubt the usefulness of the social rate of discount and to suggest that perhaps everything should be evaluated at the appropriate rate of profit.[25/] But to do all the calculations in terms of the private rate of profit would also be illegitimate, because that would mean turning down some projects which would substitute one unit of consumption today for, say, 1.12 units tomorrow, even when the public policy-makers would be willing to substitute one unit of consumption today for 1.10 units tomorrow. Clearly, we

---

25/ See the comments of J. Hirchleifer concerning the paper by O. Echstein, "Survey of Public Expenditure Criterion" in National Bureau of Economic Research, Public Finance: Needs, Sources and Utilization, Princeton (1961).

need something else for consistency, and this is a very good example of the need for integrating the technical calculations and the policy-maker's decisions.[26]

47. The appropriate policy would be to bear in mind the fact that in undertaking this public sector project, one is sacrificing some alternative private investment, the value of which is not represented by the market price of capital. That is, one unit of private investment yielding 15 per cent a year in perpetuity, when discounted at 15 per cent, yields a value of one unit. That is the logic of the market valuation of private investment. But since the public policy-makers regard a 10 per cent discount to be appropriate, unity is not the proper "social" value of that unit of private investment. In fact, a project yielding 15 per cent in perpetuity when discounted at 10 per cent yields a value of 1.5 units. Therefore, in calculating the opportunity cost of public investment, one has to bear in mind that the market value of the investment tends to underestimate the sacrifice of future benefits in a situation where the social rate of discount is taken to be lower than the marginal return on capital investment. Various formulae for correction of this are known, but at the level of this paper, it is not useful to go into them in detail. Essentially, the method is to compare the time series of benefits from the public sector project, as well as the time series of benefits of alternative private sector investment (which may have been sacrificed by having the public project), both discounted at the social rate of discount. So both benefits and opportunity costs require the same treatment.

48. The case discussed here is indeed a very simple one, where one unit of public investment replaces one unit of private investment, and the rate of return from private investment is a simple perpetuity and no further reinvestment out of it is considered. More complicated cases have been studies by Marglin, Weisskopf, and

---

26/ The best thing to do for the economy as a whole is to raise the over-all rate of investment until the marginal social discount equals the marginal return on investment. If that is impossible, we have a "second best" problem, and this is what is discussed below for public sector project selection at the micro-level.

others.[27] Given explicit assumptions, the calculations can always be made.[28]

49. The question of how to do this calculation precisely is, of course, a purely technical matter. Therefore, given the guidance of the policy-makers about the appropriate social rate of discount, and given the knowledge of the approximate rates of return in the private sector, the project evaluator can technically proceed to do his calculations consistently. The policy-maker's help is needed at one stage, but given that, the rest of the job falls once again on the shoulders of the technicians.

The question of surplus labour

50. Reference was made earlier to the problem of valuing labour cost in an economy where surplus labour exists. It can be argued that the appropriate shadow price of labour in this case should be nil, even though the market wage rate is positive. There has been a fair amount of controversy on this question, but I shall not go into it in detail, having discussed it extensively elsewhere.[29] The role of

---

27/ S.A. Marglin, "Opportunity Cost of Public Investment", Quarterly Journal of Economics (May 1963); idem, "Public Investment Criteria".

28/ A slightly more general case is the following. Let "r" be the rate of return on capital investment in the private sector, "i" the social rate of discount, "p" the reduction in private investment and "q" that in consumption as a consequence of one unit of public investment, with $(p + q) \leq 1$. (The inequality may be strict when there are unemployed productive resources.) The opportunity cost of one unit of public investment in the case of no reinvestment out of private returns can be expressed in units of present consumption as:

$$C = p\left(\frac{r}{i}\right) + q \qquad (2.i)$$

In the case where there is a continuous reinvestment of "z" proportion out of private returns, the corresponding cost is given by:

$$C = p.\frac{(1 - z)r}{i - z.r} - q \qquad (2.ii)$$

29/ Choice of Techniques, Oxford (1962). A considerably more satisfactory discussion of this problem is to be found in S.A. Marglin, Industrial Development in the Labour Surplus Economy, op. cit.

the policy-maker on a question like this is crucial, and we shall concentrate on this aspect of the problem.

51. The reason for doubting that the appropriate shadow price of labour should be nil arises from the idea that more employment means a larger wage bill, hence a higher level of consumption, which in some cases may reduce the rate of savings and the rate of economic growth. If a special weight is attached to the volume of savings, extra employment might imply some cost in the shape of a reduced volume of savings, and treating labour as free may not be a very good idea. Much depends in this case on how we value an additional unit of savings vis-à-vis an additional unit of consumption. This is clearly a matter for the high-level policy-maker to determine, and not for technical experts dealing with specific projects. Considerations that the policy-maker might bear in mind include: (a) the extent to which the actual volume of savings is thought to fall short of the desired level; and (b) the limits that apply to raising the rates of saving through standard fiscal means. If the level of savings is thought to be not short of the desired value, or savings can be raised through taxation with negligible cost, there is no reason to attach any cost figure to the employment of labour, even when the market wage rate is positive. If, on the other hand, savings are thought to be very inadequate and an expansion of savings through taxation is not thought to be feasible (perhaps for political reasons) or very expensive (perhaps for administrative reasons), then it might be folly to treat labour as costless even in an economy with surplus labour.

52. Various precise formulae have been suggested to deal with this problem, and we need not go into them here.[30/] Two points, however, are worth making in a very general context to clarify the role that the policy-maker is expected to have in this branch of decision-making. First, the link between this problem and the one discussed in the previous section is obvious. We discussed in the previous section some reasons for considering the market rate of saving to be below optimal, and if this is indeed what the policy-makers accept, then the need for going into the

---

30/ Apart from the references cited above, see L. Lefeber and S. Chakravarty, "Wages, Employment and Growth", Kyklos, XIX (October 1966).

question of labour cost becomes obvious. If, however, the market savings are thought to be just right, and the social rate of discount is taken to be just equal to the market rate of interest, then there is no obvious case for attaching any extra value to savings vis-à-vis consumption, and the fact that additional employment may shift marginally the distribution between consumption and saving makes no difference because at the margin both are equally valuable.

53. A second point to emphasize is that much depends on what we mean by the shadow price of labour. We can take it as the value of the cost that we attach to a unit of employment of labour to be compared with the marginal product of employing an additional unit. It is in this sense that the shadow price might be taken to be positive when extra employment generates extra consumption and the value of savings is higher at the margin than the value of consumption. However, this is not the appropriate definition of the shadow price as used in the literature on programming. By the shadow price, we may refer there to the difference that is made to the value of our objective (whatever we are trying to maximize) by relaxing the constraint of labour by one unit. When labour is surplus, clearly the relaxation of labour availability by one more unit should make no difference whatever to the value of the objective achieved. In this sense, the shadow price of labour must be nil, whether or not we attach an extra weight to savings.

54. The difference between the two cases is purely terminological, and the policy-makers should be aware of the distinction in the two presentations if only to prevent misunderstanding in the dialogue with the technicians. If Q is the value of the output produced in a project, and S the volume of savings generated in it, then the objective function may be taken, for the purpose of this discussion, to be $(Q + k.S)$, where k is the extra weight to be attached to savings. Let an additional unit of employment change Q by Q_L and change S by S_L. Unless Q_L is positive there will, in general, be no point in considering the application of this additional unit of labour. With labour being available in plenty, the planner may ideally choose that degree of labour-intensity which makes the additional contribution made by an additional unit of labour to be zero. It is in this sense that the shadow price of labour is indeed nil. However, this implies that:

$$Q_L + k.S_L = 0. \qquad (3)$$

In the special case when consumption equals the wage bill, we have S_L equalling the difference between the marginal product of labour and the wage rate, i.e. equalling $(Q_L - w)$. It then follows from (3) that we should equate the marginal product of labour with the following:

$$Q_L = \left(\frac{k}{1 + k}\right) w. \qquad (4)$$

Interpreting the magnitude that is equated to the marginal product of labour as the "shadow price", this can be given that name.

55. It is easy to check that (4) yields all the standard results. If the extra weight to be attached to savings, for either of the reasons specified earlier, is nill, i.e. if we take $k = 0$, then clearly the "shadow price" of labour is zero also in this sense. The other extreme is one where the future is so important that k is very large, which will make the right-hand side of (4) go to w. Between these polar cases are situations where the "shadow price" of labour lies between 0 and w.[31/]

56. The assumption that all wages are consumed and all the rest is saved, is only for convenience. In a practical exercise more realistic assumptions will have to be made. This change can be introduced very easily,[32/] and no essential complications are involved. What is, however, rather more complicated is to

---

31/ See Sen, chapters II and V; Marglin, chapters II, IX and X. Much depends on what we assume to be the method of financing the wage bill: see Marglin, pp. 121-123. Marglin assumes that in the case of labour in operation, as opposed to construction, the cost is met from project revenue which comes entirely from investment that would have taken place otherwise. Marglin's definitions are also different from ours.

32/ In the more general case where the wage earners consume "c" proportion of their income, and "c" proportion of other incomes is consumed, we have:

$$S = (Q - Lw)(1 - c') + Lw(1 - c).$$

That is

$$S_L = (Q_L - w)(1 - c') + w(1 - c).$$

Therefore, for optimal allocation we have:

$$Q_L = \frac{k(c - c')}{1 + k(1 - c')} w. \qquad (4*)$$

In the special sense noted before, (4*) gives the "shadow price" of labour.

appreciate the exact difference in the sense in which "shadow price" of labour is defined in the two cases. For a practical cost-benefit analysis, no special cost need be assumed for the employment of labour if the "benefits" are properly defined, i.e. inclusive of the value of savings with an appropriate weight. An additional unit of employment will add to the benefit through Q_L and subtract from it (beyond a point) through a negative S_L, and both sides of the picture will be already included in the impact of this additional employment on total benefit. It is in this sense that the shadow price of labour is to be taken as zero.

57. On the other hand, there are some very general discussions on whether the most labour-intensive technique that is technically efficient should be chosen in a surplus labour economy. In that context, it is worth pointing out that labour does involve a cost (really a reduction of benefit) through its consumption-inducing effect. An additional unit of employment is not necessarily justified "as long as it produces something". If we want to use the "shadow price" of labour as something we subtract from the marginal product of labour to obtain net gains, then the second definition of "shadow price" becomes relevant. It is obvious that it matters little whether we treat additional consumption at the cost of saving to be a reduction of benefit or an addition to cost. As long as the policy-makers explain to the technical project evaluators in which sense they are using the term "shadow price" when they recommend some figure for application, there need not be any difficulty.

58. This problem may look somewhat complicated, which is in fact the case, and may also look a little unrealistic, which is, however, not the case. To simplify the presentation, we have been talking about smooth variations and marginal products, but the problem is much more general and will crop up in one form or another in exercises of project evaluation in economies with surplus labour. How we define the objective (whether there is an extra weight on savings or not), how we value the cost of labour, and how we choose the extent of labour use, are all problems of great importance in project evaluation. And here the contribution of the policy-makers to the job of the technician evaluating the project is indeed very significant.

Domestic and foreign prices

59. Finally, we consider a very general problem of the use of domestic and foreign prices in project evaluation. Suppose we are evaluating a fertilizer plant. We may find that the output of the plant will be x units per year, and the application of this to agriculture will raise the crop of a certain kind (say, rice) by y units. If the price of that crop is p per unit, we might say that the total market value of the product resulting from additional fertilizer production is (p. y). A series of such output values for future years may thus be obtained, and the series may then be discounted at appropriate rates of interest to obtain the present value of the stream. Other benefits (or costs) associated with this process may also be taken into account, with appropriate weights, as indicated earlier.

60. But is (p. y) the right value of the output to take? In the presence of "external effects", it clearly is not. But suppose there are no external effects. Will (p. y) be a good measure then? There are at least two reasons why it need not be. First, the price of rice may depend on the quantity sold. The price may become p when y units of rice are added to the supply that would have been there otherwise. But while people are ready to pay p for the last unit, they would have been willing to pay more for earlier units. With a downward-sloping demand curve, there exists what Marshall called the "consumers' surplus". So (p. y) understates the value to the consumers of rice attributable to the additional supply of fertilizers. Sometimes this difference can be very significant.[33/]

61. While the correction discussed above will tend to raise the value of the output from (p. y), our second consideration will point in the opposite direction. What has been said above applies to the additional use of fertilizers, but that is not the same thing as the additional production of fertilizers. For the use

---

33/ For an extremely interesting empirical calculation of the consumers' surplus and producers' surplus involved in the expansion of rice and wheat production through a greater use of fertilizers in India, see Gerhard Tintner and Malvika Patel, "Evaluation of Indian Fertilizer Projects: An Application of Consumer's and Producer's Surplus", Journal of Farm Economics, 48 (3), Part I (August 1966). The methodology involved is also explained in that paper.

of fertilizers can also be raised through imports. Suppose that by exporting domestic goods which are worth p* to us, we earn enough foreign exchange to import sufficient fertilizers to increase rice production by one unit, the domestic worth of this unit being p. Suppose p* is less than p. In such a situation, it can be argued that what we are gaining by producing sufficient fertilizers for one unit of additional rice production is not p, but p*, which is a smaller value. This is so because we have the option of carrying out an exactly similar expansion of rice production through additional importation of fertilizers. So (p. y) may overstate rather than understate our gain from additional fertilizer production.[34/]

62. Another way of putting the same thing is the following. By not producing just enough additional bit of fertilizers to produce an additional unit of rice, we might lose one of two things, viz., (i) the additional unit of rice itself, valued at p, and (ii) domestic goods worth p* which are instead exported to get enough fertilizers to produce that unit of rice. Since we have the option of choosing either of the alternatives, if we are sensible we should choose the less costly of the two, i.e., p or p* whichever is lower. In the case discussed above, p* is, therefore, the relevant return from the additional bit of fertilizer. Thus even if the fertilizer factory yields a very high net benefit when the output is valued at the domestic price p, it might conceivably still be a bad project if the gap between p and p* is large.

63. Needless to say, the same considerations will apply if we try to value the fertilizer output in terms of the market price of fertilizers (and not of rice resulting from the use of fertilizers), when the cost of importing fertilizers from abroad is substantially lower. In fact, for all tradable commodities, this is a very important consideration. It also applies indirectly to non-tradables when they can be made out of tradables.

64. How does the policy maker come into all this? In at least two ways. First, the fact that there is a gap between p and p* indicates that at the moment the opportunities offered by trade are not being fully used, for clearly it is better to export goods worth p* in order to earn exchange to import fertilizers to produce

---

34/ I.M.D. Little, "Public Sector Project Selection in Relation to Indian Development", op. cit., section V.

food worth p, when p is larger than p*.[35] There may be a variety of reasons for this, reasons varying from political considerations to sheer ignorance. We have to make sure, therefore, that if in fact the fertilizer project is abandoned, then the corresponding import of fertilizers would really take place, so that p* would really be the relevant advantage from domestic production of fertilizers. What is relevant for the technician to know in order to be able to evaluate the project properly is the consequence of abandoning the fertilizer project. If there will be additional imports and exports, then the relevant cost will be p*. If, on the other hand, no such trade will take place, then p will indeed be the relevant benefit from the additional output. This is a matter of general policy, and the project evaluator has to find out what the over-all policy makers intend to do.

65. Second, the question of the shadow price of foreign exchange is important. We avoided that problem here by postulating that domestic goods worth p* at home could be exported to earn exchange to import fertilizers enough for one unit of rice production. But the project evaluator may not have such information, and all he may know is the foreign price of fertilizers or of rice. He can, of course, convert it into domestic terms at the official exchange rate, but the question will then arise as to whether that is the correct price of foreign exchange. Once again, the general policy makers have to co-operate with project evaluators at the micro-level.

66. In fixing the shadow price of foreign exchange, the policy maker has to consider the alternative costs of earning foreign exchange and the alternative benefits from using it. Suppose we wish to consider everything in terms of domestic usefulness or benefits. A unit of foreign exchange may be earned by exporting one of a number of bundles of commodities, e.g. E_1, E_2,... E_n.[36] Let the domestic benefits (not necessarily equal to the respective domestic prices) of sacrificing these bundles be P^*_1, P^*_2,... P^*_n, respectively, in the evaluation of the policy makers. And the use for a unit of foreign exchange may be in importing any of the following bundles, viz., M_1, M_2,... M_m.[37]

35/ Actually if there is a time gap between the two, proper discounting procedures will clearly have to be used.

36/ Contrary to the notation used here, the number of possible bundles may not be finite.

37/ The number of bundles here may also be infinite.

The respective benefits from them may be put at P^{**}_1, P^{**}_2,..., P^{**}_m. It can be argued that the relevant shadow price of foreign exchange is:[38]

$$P_f = \text{Min } [\text{Min } (P^*_1, \ldots, P^*_n), \text{Max } (P^{**}_1, \ldots, P^{**}_m)]$$

That is, it is given by the minimum cost in earning an additional unit of foreign exchange or the maximum benefit from using a unit of foreign exchange, whichever is less.[39] By using an additional unit of foreign exchange, what we lose is the benefit from the best use we could have made of it, unless of course the least cost method of earning foreign exchange involves a smaller sacrifice of benefit than this. It is of course true that if Min (P*) is less than Max (P**), then in the absence of complications like indivisibilities, it can be argued that the volume of trade should be expanded, but the existence of this type of suboptimality is by no means uncommon.[40]

67. The actual calculation of a proper shadow price of foreign exchange is rather difficult even with the use of techniques of analysis like programming.[41] But the principles are clear enough, and at least some rough guidance can be given by the policy makers to project technicians. Our attempt here has been to convert everything into units of domestic benefit, for which units have to

---

38/ It is assumed here that the relevant minimum and maximum exist, even when the bundles in question may be infinite in number. When such existence is not fulfilled, we have to use the infimum and the supremum if relevant bounds exist.

39/ It is sometimes possible that even when the additional unit of foreign exchange is not available, one of the imports that will take place with earlier units will yield a benefit value of P' which is less than Min (P*) as well as Max (P**). Then an additional unit of foreign exchange can be "earned" by stopping this import. This, incidentally, represents an irrationality in importing something yielding P', less than the maximum benefit from the imports not yet chosen. When, however, such irrationality is present, we can widen the domain of choice by including among P* the cost of "earning" foreign exchange through import restriction. When, however, rationality prevails, P' cannot be less than Max (P**), so that P_f cannot equal P'.

40/ The case of fertilizers in India referred to earlier may be one such case.

41/ Note that P_f will correspond to the Lagrangean Multiplier relating to the constraint on foreign exchange.

consistently chosen. It is often useful to take as the unit of account the benefit from a unit of average consumption today,[42] but we can use some other means of normalization also. The shadow price of foreign exchange P_f will be expressed in those units. We can, of course, alternatively take P_f as 1 and normalize the other magnitude in terms of this.[43] As long as we maintain consistency, it matters little what we use as our unit of account.

Concluding remarks

68. Social benefit-cost analysis is an approach meant to assist in formulating and evaluating projects to be incorporated in the national plan. Its application by project formulators and evaluators necessitates that a set of parameters be provided at the national level; in particular the following: (i) the relative weights to be attached to different national objectives, (ii) the social rates of discount, (iii) the rates of social return on investment, (iv) the pattern of reinvestment and of return on investment and (v) shadow prices of key inputs such as foreign exchange and labour. The first two of these parameters, viz. the relative weights and the social rate of discount require direct value judgement by the policy makers at the national level. Given these and some other value judgements, the values of the remaining parameters can be calculated on a technical basis. Some of these are purely factual and even the others are not directly derivable from basic value judgements alone, although they will be affected by the value judgements already made including those on the relative weights of objectives and on the social rate of discount.[44]

69. It is hoped that the illustrations in the last three sections involving the shadow price of foreign exchange, that of labour, and the choice of the interest rates, clarify the general considerations involved in the role of policy makers outlined in the previous sections of this paper. The job of project formulation and evaluation is not purely technical, and involves intricate judgements about

---

42/ Cf. Marglin, Public Investment Criteria, op. cit.

43/ Cf. Little, "Public Section Project Selection in Relation to Indian Development", op. cit.

44/ For a discussion of the analytical framework underlying the distinction between the two types of values, see A.K. Sen, "The Nature and Classes of Value Judgment", Philosophical Quarterly, January 1967.

the relative importance of different benefits to the community. These judgements depend not only on the values implicit in the national planning efforts, but also on the precise plans that the government proposes to carry out (a) in the absence of, and (b) in the presence of, the project in question. In formulating and communicating both these types of data, the policy makers can contribute towards the integration of project formulation and evaluation into the national planning efforts. This paper has been an attempt to analyse and illustrate some of the aspects of this integration.


6. 10. 71