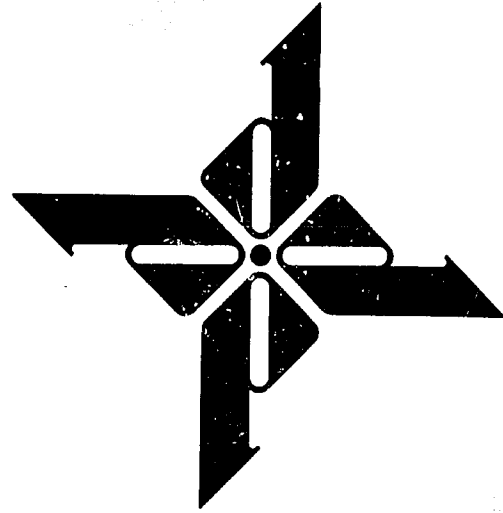


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COST-BENEFIT ANALYSIS AND PROJECT DESIGN

Edited by
John D. Donahue

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Contents

Cost-Benefit Analysis and Project Design <i>John D. Donahue</i>	1
Part I: The Basic Structure and Pragmatic Approaches	9
Performing a Cost-Benefit Analysis <i>Peter G. Sassone and William A. Schaffer</i>	11
Economic Analysis of Agricultural Projects <i>J. Price Gittinger</i>	20
Cost-Effectiveness Analysis <i>Peter Delp</i>	33
Part II: Three Methodologies for Cost-Benefit Analysis	41
Project Appraisal and Planning for Developing Countries <i>I.M.D. Little and J.A. Mirrlees</i>	43
The Essentials of the UNIDO Approach to Benefit-Cost Analysis <i>Stephen A. Marglin</i>	56
A New Approach to the Economic Analysis of Projects <i>Anandarup Ray and Herman G. van der Tak</i>	64
The Emphases, Assumptions, and Arithmetic of the Three Methodologies <i>John D. Donahue</i>	71
Part III: Critics and Skeptics	77
The Use of Shadow Prices <i>R.N. McKean</i>	79
A Note on Cost-Benefit Analysis and Class Conflict in LDCs <i>Frances Stewart</i>	88
Project Selection for Poverty-Focused Rural Development <i>Robert Chambers</i>	96
Economic Analysis in AID	107
Selections from AID Handbook 3	108
Inside Cost-Benefit Analysis in AID <i>Kenneth P. Jameson and Laurel Worthington</i>	111

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Foreword

If economists could manage to get themselves thought of as humble, competent people on a level with dentists, that would be splendid.

—John Maynard Keynes

It might indeed be splendid, and even better if economists and some of their tools and techniques were better understood by non-economists.

Cost-benefit analysis is one of those aggregations of tools and techniques. Its object is to generate information about the economic soundness of planned activities, and then to inform decisions about goals and the allocation of resources.

The guiding principle that cost-benefit analysis serves is both simple and honorable: "Waste not!" But the analysis demonstrates the complications that this principle can present. Cost-benefit analysis, innately normative as well as technical, sometimes raises as many questions as that ancient theological issue, "How many angels can sit on the head of a pin?"

Yet the basic elements of the analysis are not arcane. With a bit of effort any interested non-economist can master them, and many should, because the results of cost-benefit analysis must usually be judged and applied by non-economists. This is certainly true in the

field of "development" and in other fields where projects are a way of life, where they have economic costs and consequences, and where decisions may properly turn on estimates of relationships between costs and benefits.

The aim of this material is to help those participants in planning, designing, and approving projects (as well as other prospective consumers of cost-benefit analysis) to understand an analytical contribution to decisionmaking that has come to be widely used, and sometimes abused.

This, then, is an introduction to the theory, the intent, and the techniques of cost-benefit analysis. It is our promise and our intent that, by studying what follows, you can add something to your ability to judge and use the products of an analytical process that offers real but limited contributions to solving some of the unending problems of choice.

—William J. Siffin, Director
International Development Institute

Cost-Benefit Analysis and Project Design: Objectives, Options, and Opportunity Costs

John D. Donahue

Projects are meant to make things happen. They expand the range of possibilities for individuals and communities. Yet the commitments that projects require cut off other options. Projects *change things*. The challenge lies in ensuring that the changes are, on balance, for the better. Thus, as a development project is conceived and designed, a question must be confronted: Does it make sense? This fundamental concern has several aspects: Does the project promise to do useful things? Is it a wise way to commit money and commodities and manpower? Will its *benefits*—there it is—exceed its *costs*?

People who design development projects are used to asking these kinds of questions. The experience of practitioners and the efforts of theorists have produced a substantial literature on the principles of cost-benefit analysis, several manuals suggesting how to do it, and a degree of controversy. As more attention has come to bear on basic issues of development and project design (and as it becomes clear that some projects have indeed failed to make sense), interest in cost-benefit analysis has increased. The literature expands, the manuals are refined and reissued, and the controversies heighten. This reader offers a selection from the literature, including a survey of the basic principles, an introduction to the manuals, and a sampling of the main problems and issues.

The underlying principle of cost-benefit analysis is profoundly simple: Determine the best option and do it. The tools involved are similarly straightforward. Discounting, computing summary measures, and sensitivity analysis are unmythical procedures.

Performing a cost-benefit analysis consists in exploiting the tools in the service of the principle. It can be seen as a series of steps: First, *set the objectives* the project should serve and *fix boundaries*—technical, temporal, social—around the system. Second, *identify the options* open for project design and determine the resources each option requires and the results it promises. Third, *appraise each option* by criteria appropriate to the objectives; this involves estimating the values of inputs and outputs and discounting to take account of time. Fourth, *summarize* the information that has been collected and processed (by computing the benefit-cost ratio, rate of return, or net present value) and *compare* the alternatives. Finally, *test* the results through sensitivity analysis to ascertain their vulnerability to uncertain assumptions and predictions.

SOME DEFINITIONS AND DISTINCTIONS

If it is so straightforward, why does cost-benefit analysis tend to be troublesome? One reason is that this five-step summary is a simplified description of the way analysis works. In practice the process is seldom strictly sequential. New alternatives appear in the course of the analysis. Options are discarded as they are shown to be unworkable or dangerously dependent on shaky assumptions. Objectives evolve as the discovery of the possible reshapes and constrains the desirable.

There is also some ambiguity of terms. “Cost-benefit analysis” is a label that covers several ways of looking at projects.

Financial analysis is concerned with the cash flow. It inquires into the profit a firm can expect from an investment or tests whether an agency's budget will suffice to implement a project or whether farmers who are supposed to participate will find the project financially attractive.

Economic analysis takes a broader view. It seeks to promote the best allocation of resources within an economic system. Planners call on economic cost-benefit analysis when they believe that economic efficiency will not be achieved by a financial calculus alone. (A new road's contribution to production, for example, will not be reflected in direct revenues.)

Social cost-benefit analysis introduces objectives beyond ordinary economic efficiency. The aims that inform social cost-benefit analysis include special attention to the distribution of costs and benefits; the challenge is to compare and weigh equity and efficiency objectives. (Maximum efficiency may dictate putting the road through a prosperous region; a concern for equity points to a backward area. Where should the road go?)

Inconsistency can complicate the terminology. Depending on the context, "cost-benefit analysis" may refer to any of these dimensions of project appraisal. "Social" can indicate a wide-ranging inquiry into all project impacts, or it may signify an economic analysis that simply goes a step beyond financial accounting.

The calculations that divulge the benefit-cost ratio, the rate of return, and the net present value (or worth) are sometimes taken to be different analytic approaches, although they are just shorthand measures for summing up an extensive common process of analysis tuned to slightly different aspects of the basic question.

Another potential source of confusion is that cost-benefit analysis can be put to the service of three partly distinct tasks. The first—the true theoretical domain of cost-benefit analysis—is *ranking* a collection of project proposals competing for a limited pool of resources. Here high-level planners call on cost-benefit techniques to examine each option in the light of clearly specified criteria and to set priorities for implementation.

A second, more common use of the tool is *project design*. In the field, the key question is usually not "which project" but "what kind of project." Even when precedents and overall plans point to a road, a tubewell, or an extension project, the need to choose remains. What kinds of roads or wells? How should they be built, and where, and when? What is the best way to expand an extension system? Cost-benefit anal-

ysis can contribute to the decisions about technology, tactics, scale, and timing that project design inevitably involves.

Analysis is also used to *justify* projects to authorities and outsiders, especially when formal appraisal requirements must be met. There is a danger here. When the choices are made before the analysis begins, cost-benefit analysis becomes "cosmetic analysis," designed not to inquire whether the project makes sense, but to assert that it does. (Cost-benefit analysis inevitably depends on assumptions and is laden with judgments, so this is by far the easiest purpose to serve. Solid information is harder to generate than smoke-screens.)

THE MAIN CONCEPTS AND ISSUES

A few fundamental concepts shape the structure of cost-benefit analysis:

Costs and Benefits Depend on Objectives

Cost-benefit analysis cannot be a neutral technical exercise because costs and benefits are not technical concepts. Separating project impacts into gains and losses requires a set of criteria that are rooted in and represent the fundamental objectives a project should serve.

The distinctions between financial, economic, and social cost-benefit analysis can best be explained by the different objectives each addresses. Financial analysis takes its criteria from the objective of profit maximization. These criteria are relatively clear cut. A cost is money paid out and a benefit is revenue received. (But profit is not the *only* objective of even the most aggressive firm. Long-term growth and stability, legal obligations, and other concerns illustrate the ambiguity of objectives, even for a limited enterprise.) Economic analysis seeks to determine the most efficient allocation of resources for a broader system. But "efficiency" is not an objective; it is a description of a system's performance *in terms of* objectives.

What is meant by efficiency depends on what an economic system is supposed to do. Ideally, of course, any economic change should make *everyone* better off. But classical economists recognized early that this is a hard test for any enterprise to pass. Thus, efficiency is typically defined by reference to a less utopian objective called "Pareto optimality." The Pareto criterion declares that a system is operating at maximum efficiency when no feasible rearrangement of resources

could serve to increase the welfare of any individual *without* making someone else worse off. An innovation or an enterprise creates a Pareto improvement if it moves the system closer to this ideal: Someone wins, nobody loses.

But not even the inventor of a better mousetrap will be applauded by the manufacturers of newly obsolete mousetraps. The *potential* Pareto criterion is another concession economists make to reality. A potential Pareto improvement turns on the idea of maximizing *net* welfare gains. When those benefiting from a change gain more than the losers suffer, the winners *could* compensate the losers (through subsequent redistribution) and the net social effect would be positive: A potential Pareto improvement has been attained.

Formal criteria named for Italian economists may seem remote from the nuts-and-bolts realities of project design, but these ideas (whether expressed in technical or casual language) lie at the heart of the concept of efficiency.

Efficiency, so defined, can be a compelling ideal. But the objectives that projects embody are often born of broader—and messier—visions. Keen attention has come to center on the nature and distribution of goods and services as well as on raw amounts; expanded production and greater equity are hailed as twin aims of development.

Thus, project design is to be guided by attention to the participation of the poor and the distribution of benefits, as well as to the project's contribution to economic growth. The seeds of a dilemma are planted here, and they can quickly breed a jungle through which project designers must make their way. Multiple goals tend to conflict. If both growth and equity are to shape project design, how shall they be compared and weighed? Part II of this reader is devoted largely to this issue.

Objectives are usually expressed in heroic language calculated more to inspire consensus than to ensure clarity and precision. Cost-benefit analysis employs mathematical tools that can grip and process only quantified information. Grand development objectives must be translated into precise parameters. Many economists are most comfortable with cleanly specified "objective functions," giving numbers for calculating the appropriate tradeoffs among multiple goals. Such formulations promise clarity and consistency, at the price of a true picture of the rich and confusing ambiguity that always colors real-world objectives. The crucial

issue of how—and how far—to quantify social concerns will recur throughout this reader.

Alternatives and Opportunity Cost

Analysis only makes sense as an acknowledgment of alternatives and as a response to the challenge of choice. Without options, analysis is pointless; without analysis (rigorous or otherwise), options remain mysterious. The process of project design is a series of choices. Not even the most routine project is rigidly predetermined in every detail. Decisions—to make greater use of equipment or labor, to intervene on a larger or smaller scale, to aim for more or less rapid implementation—nearly always face project designers. Projects can be described as structured arrangements of resources designed to achieve certain ends. There is nearly always more than one possible arrangement.

Different sets of resources can serve the same purpose; similarly, a given resource can be put to different uses. A shovel, a tractor, or a hectare of land can be used to do several things, and the potential applications of a lump of convertible currency or a year's talented work are vast. Resources are the ingredients that make possibilities into realities; design is the recipe. Resources are scarce. Committing them to one use means forsaking other applications for those shovels, tractors, budgets, and manpower. Within any system, only some possibilities can be realized. From this perspective an old question can be asked and answered in a special and illuminating way. What is the real cost of committing a resource? It is the forsaken *opportunity* to use that resource in other ways. Seeking out and assessing opportunity costs is a powerful underlying theme of cost-benefit analysis.

Prices and Values

For public projects, benefits are defined as contributions to development objectives. Costs are opportunity costs—the benefits promised by the best alternative use of the resources required to do the project. How can these costs and benefits be known?

Concrete steps toward envisioned goals are hard to measure, and tracing lost opportunities can be an immense endeavor. Values are slippery, and this goes far to explain the appeal of an automatic mechanism for setting values—market prices.

The notion of prices as measures of value is the foundation of classical market theory. By invoking a convenient scenario called "perfect competition," classical economics demonstrated that the market price

of every commodity unambiguously measures its value and its opportunity cost. The textbook description of perfect competition has a questionable relationship to reality, but the importance of prices in cost-benefit analysis warrants some observations on the market-price model.

In a competitive market system, prices are established by *scarcity*, *consumer preference*, and *substitution possibilities*. A productive process can exploit resources in different combinations and ratios to create broadly similar products. On the input side, scarcity and possibilities for substitution set prices. Heat for firing pottery can be generated by either wood or coal. Which should stoke the kilns? It depends. Wood can do many things besides burn. If wood is rare and housing needs are urgent, people who want to build houses will offer a high price for lumber. The opportunity cost of burning logs is unbuilt houses. The price of wood in a competitive market will indirectly but effectively make this known. Wood's high price is a signal from house-builders to pot-makers that coal is a better way to fire kilns. A scenario in which wood is the cheaper fuel is no harder to concoct.

On the output side, the tastes of consumers enter with force. House-builders can offer a high price for wood because roofs and walls are valued. In a culture indifferent to shelter but keen on pottery, kiln operators could outbid carpenters for scarce wood supplies. When people find a commodity useful they advertise their preference by offering high prices, and are willing to pay little for lightly valued goods and services. Prices indicate *what* should be produced and *how* to arrange productive processes.

A Note on the Margin

Economic reality tends to change, and one virtue of the market model is that it allows relative prices to constantly adjust, reflecting revised priorities and new possibilities.

These adjustments take place "at the margin." Most commodities come not in indivisible lumps, but in separate units. In determining values and opportunity costs for pricing goods, attention properly focusses on the marginal unit—the very next one to be gained or given up. Units can have different values. What is the worth of one more liter of water? It depends—are you thirsty or drowning? For a community rich with pots but freezing in the rain, the marginal value of shelter—the worth of the next unit to be built—would be very high. Well-housed people would put less priority on one

more building and might offer more for the marginal pot. In cost-benefit analysis (and economics in general), the reference is nearly always to marginal costs and benefits.

Problems with Prices

To continue this quick run across some (and to some, sacred) theoretical ground, the forces that push market prices into alignment with social priorities and relative scarcities are seldom seen as the theory presents them. The system can malfunction, trivially or totally, in several different ways.

Markets may be distorted. Suppose pot-makers have friends in high places and get a special discount on wood. Or house-builders may be bad managers and offer more for wood than they really need to. Coal could be heavily taxed and wood subsidized, clouding the picture of opportunity costs given by prices and biasing decisions on resource substitution. Taxes or subsidies on pots or houses might similarly violate perfect competition and skew the market-pricing mechanism. Market distortions can be minor hindrances or absolute obstacles to efficient resource use.

Some categories of costs and benefits stand outside the market system. Many economic activities have unpriced *external effects* that influence welfare. Smoke from kilns can choke the neighbors, or a new house on the landscape may please or repel them. Yet, the market mechanism is oblivious to such gains and losses. When externalities are substantial, the market loses some of its grip on the larger question of efficiency.

Markets also have little ability to set values on *public goods*, like national defense, roads, or police protection. Benefits are received from these goods whether one pays or not, so each individual has an incentive to let others pay. A market system will under-price—and under-produce—public goods, since they cannot be sold, unit by marginal unit, to individual buyers. This problem is usually resolved by taxation, which sidesteps the market and results in no observed price by which to measure value. (Many goods are partially public, such as health care or education. When someone educates his child or vaccinates him for typhus, he benefits himself and his family, but also a wider community. The total benefit of the act is not captured by the price the immediate buyer is willing to pay.)

A third problem applies even when the market mechanism works well. *Creating a Pareto improvement basically means making the status quo a little better.* A perfect market mechanism will edge the economy to-

ward a condition where nobody can gain greater satisfaction without inflicting a loss on someone else. The Pareto criterion allows no judgment on the existing distribution of income and is violated by the suggestion that gains by disadvantaged groups are more urgent than increasing the welfare of the rich.

The Pareto principle shapes the meaning of market prices. The price offered for a product is set by the ability and willingness of buyers to pay for it. Value can be said to be established by "voting," with each unit of applied purchasing power counting as a vote. If one individual has a thousand units to use and another has ten, the first person can exercise a hundred times the force of the second in setting market prices. If project sponsors are concerned with equity, market prices can be bad measures of social worth for valuing benefits, since the voices of the wealthy, amplified by income, can drown out those of the destitute.

Prices in Cost-Benefit Analysis

Financial analysis is concerned with movements of money and basically consists of accounting techniques applied to projected inputs and outputs (which is not to say that it is either simple or unimportant for development projects). It *always* uses market prices to value costs and benefits. The gain or loss promised by a project for sponsors and participants is vital information. But development, broadly seen, involves whole communities and societies, and most development projects take a public point of view. When objectives go beyond financial profit, market prices can be misleading indicators of social values and opportunity costs. Economic and social cost-benefit analyses usually start by estimating *shadow prices* to adjust or supplement market prices when appraising a project's profitability.

Different kinds of shadow prices do different things. In economic analysis, shadow prices are used to fill in where market prices fail to point out the path toward Pareto optimality. Correction is made for tariffs, taxes, and subsidies that distort the relative prices of resources. Analysts estimate the costs and benefits associated with unmarketed goods and with external effects that bear on efficiency. The numbers generated by this sort of shadow pricing are sometimes called *efficiency prices*.

Development projects are often aimed at goals that go beyond raw efficiency. Project sponsors may confront not only market failings, but the limitations of the Pareto standard itself. Market prices are blind to non-

market values, and efficiency prices are geared to the existing income distribution. "Social" prices encompass more. In social cost-benefit analysis, attention to distribution tempers the pure pursuit of efficiency. Social shadow prices embody *weights* that *redefine* efficiency. A social discount rate reflects the preferred pattern for spreading consumption over time. Other shadow prices deal with distribution among contemporaries. Benefits to backward regions or poverty groups may be considered more valuable than other benefits and may be given a higher shadow price when testing project profitability. Wages paid out to under-employed and impoverished workers may be declared a social benefit and their impact on the cost side partly discounted. Social shadow pricing employs mathematical recipes to systematically consider these objectives. (The practice of social shadow pricing can be applied in the name of any objectives, including national self-sufficiency, prestige, even a preference for hiring nephews, although income for the poor and employment that furthers equity are the most common concerns embodied in social prices.)

Using shadow prices in project appraisal invites controversy. Many economists agree that blatant market failures and distortions should be taken into account (although some depart from observed prices only with regret). Beyond favoring basic corrections in support of efficiency, professionals are in deep disagreement. Shadow prices are usually difficult to derive. They require high-quality data and clear objectives and nearly always involve judgments about facts and values.

Skeptics insist that economists are supposed to study and advise on matters of efficiency. Equity and other grand causes are valid, to be sure, but are best left to the political process, whose elusive criteria defy rigorous methodologies. Other economists disagree. They emphasize that projects are judged in social *and* in economic terms, and that there are often direct tradeoffs among multiple objectives. It is only sensible, they argue, to seek out ways to compare efficiency and equity in order to consider, consistently and deliberately, all the impacts of a project. If tradeoffs are *not* made clear and explicit, projects might sacrifice too much efficiency for not much progress toward equity, or vice versa.

The dispute about the proper place of non-economic objectives in cost-benefit analysis is explored elsewhere in these readings. The very existence of the

issue makes a telling point: Cost-benefit analysis is not and cannot be a purely technical endeavor when it deals with more (or less) than market prices.

THE MAIN PROBLEMS

Cost-benefit analysis yields a limited response to the question: Does a project design make sense? How good and how limited are the answers given by analysis depends on several things:

Future Facts and Group Values

To realize the full potential of cost-benefit analysis, some exacting conditions must be met. Alternatives must be clearly mapped out. The resource requirements and opportunity costs associated with each must be determined. The alternative time-streams of costs and benefits must be predicted. The objectives—financial, economic, or social—by which proposals are to be judged must be clearly and authoritatively articulated. In practice, all these conditions are usually violated to some degree, thus limiting the scope and certainty of analysis.

First, only rarely will a project designer or an organization be in a position to ascertain and explore every alternative approach to a problem. Nor can all the opportunity costs of a given project design be easily determined. The best that can be realized, for any organization, is an optimal use of the resources it controls within its domain of authority.

Second, facts about the future tend to be precarious. Predicting the long-term impact of a project is often as much a matter of faith as of reasoned projection. The environment in which a project operates can change; the project may not work as expected; the project may itself unexpectedly alter its environment. Calculations based on future costs and benefits are always uncertain, and this problem plagues financial, economic, and social analysis alike.

Third, the values that inform social cost-benefit analysis are group values. The comprehensive methodologies introduced in part II embody a commitment to maximizing "social welfare." A social discount rate reflects a social preference for consuming now versus consuming later. Consumption weights and regional premiums quantify special priorities for disadvantaged people or areas. But legitimate group values are hard to find—some even argue that the term "group values" is meaningless. In general, social objectives—and the numbers that represent them,

"social parameters"—are inferred from policies or are stipulated by those in a position to do so. If taxes stop and welfare payments begin at a certain income level, for example, economists might take that level as the point below which individual consumption is considered more valuable than money in the government treasury. But the policies on which social parameters are based tend to be either the preferences of articulate subgroups or a synthetic compromise of conflicting values. Either formulation of social values is potentially arbitrary and inconsistent, and likely to change. When economists multiply future benefits to poor farmers by a weighting factor born of ambiguous social values, they come up with a number that is not exactly an unshakable basis for decisions.

The inevitable contingency of uncertain facts and values in the data that go into a cost-benefit study suggests a shorthand rule for appraising cost-benefit analysis—"garbage in, garbage out." Good guidance cannot come from any analysis, however sophisticated, when the numbers fail to reflect reality.

Problems of Method

Certain controversies exist about the proper method for performing a cost-benefit analysis. Some of these issues have immediate practical implications for doing and interpreting a cost-benefit study.

Problems of quantifying and comparing different kinds of costs and benefits have already been mentioned. The logic of cost-benefit analysis demands that all project effects be expressed in comparable units. Analysts can then be faced with a double peril: If they limit their calculations to concrete, fairly definite financial and economic matters, decisionmakers may dismiss a study that ignores "what really matters." If analysts expand and refine their quantitative tools to translate all costs and benefits into common terms, they face the complaint that putting money values on environmental degradation or social justice is arbitrary, wrong-headed, and even obscene. Either way they risk seeing the results of the analysis disregarded.

Economists disagree on how far cost-benefit analysis should go to account for effects beyond efficiency. But even enthusiastic advocates of social cost-benefit analysis differ substantially on *how* predicted effects and development goals are to be brought together in clear measures. An illustrative issue concerns the discount rate. Economists concur that future costs and benefits should be discounted at some positive rate—but what rate?

In financial analysis, the discount rate is given by the actual rate of interest faced by the firm or agency. But setting a discount rate for economic and social analysis is problematic. Some scholars advocate estimating a social "time preference" rate, which will represent the pattern in which society prefers to distribute its consumption over time. Applying this rate to project proposals would reveal whether a time stream of costs and benefits accords with the relative priority of consumption now versus consumption later. Others reject the concept of social time preference or doubt whether any meaningful number could be derived. Instead, they suggest a rate based on the opportunity cost of capital in the economy. If a "unit" of resources can generate a 10 percent annual return, for example, expected net benefits should be discounted at that rate year by year, since only returns that exceed the opportunity cost constitute real gains. Other critics ask how to identify an "average" unit of capital or measure its productivity.

Another problem is related to the "garbage in, garbage out" principle. Bad analysis yields dubious results, but this analytical "garbage" is processed into neat tables of figures—compacted, deodorized, and blessed with an aura of scientific objectivity. The precision of the format can dangerously obscure the speculative roots of the data.

A final question occurs throughout these readings: What are the costs and benefits of cost-benefit analysis? As always, it depends on the case and the context, but the question is not idle. The costs of analysis are the alternatives foregone in favor of gathering and processing data, deriving proper values, performing the analysis, and presenting the results. The resources required can sometimes be substantial, scarce, and valuable. The promised benefits are comprehensive and integrated information for decisionmaking—leading, presumably, to better projects. Some suspect that these advertised benefits are frequently spurious and believe that institutional requirements for project analysis tend to divert talent from more important aspects of project design.

Cost-Benefit Analysis in Context

A true cost-benefit analysis enthusiast would envision an approach to decisionmaking considerably different from what occurs in most development projects. Project designers (or the analysts who advise them) would begin with clear statements of agreed development objectives. They would identify and calculate

tradeoffs. They would be aware of economic conditions causing market distortions and know whether ill-considered tariffs, taxes, or price rigidities are fixed or will eventually yield to economic reason. They would project the outcomes of alternative courses of action within known margins of error. In short, they would both possess the knowledge and command the authority to identify the most socially desirable uses of resources. Under such a scenario, the guesswork, debate, conflict, and compromise that characterize the project process would be elevated into neat computation.

Few people endorse so extreme a vision. Project selection and design simply do not work that way. And, barring substantial improvements in analytic methods and vast changes in the way most people approach problems of public choice, there is little reason to expect it ever will.

There are, first, the *intrinsic* limitations of cost-benefit analysis. Project appraisal is based on predictions and is thus inherently uncertain. Social values are elusive; the numbers that enter cost-benefit calculations are ambiguously related to the hopes and visions that propel development efforts. Controversies over method persist, rooted in theory as well as in the transition from theory to reality. Finally, it is often difficult for the "consumers" of a completed cost-benefit study to judge just what they are getting.

These limitations are not professional secrets. Promoters of a project know the ease with which favorable results can be obtained. Knowledgeable opponents likewise have little difficulty finding vulnerable predictions or judgments to attack.

There are also *external* limits on the impact of analysis. Defining costs and benefits, setting priorities, and choosing among projects are intensely *political* exercises. Some cost-benefit methodologies aim to incorporate policymakers into the system through asking (or inferring) policy objectives. These pronouncements are then translated into quantified values for distribution weights, discount rates, and savings premiums. The workability of such schemes remains an open question. Economists lament that political systems do not operate rationally. In any case, political choices are seldom neat, consistent, or rooted in mathematics.

Analysis and politics are parallel but distinct paths to decisionmaking. The issue of which predominates is rarely in doubt. Many case studies detail how project designs specified by cost-benefit analysis have been dismissed when they ran afoul of political and institutional imperatives. Few contrary cases, where strongly

supported proposals have been overturned by a compelling analytical demonstration of their folly, are on record.

Analysis can provide important information on the direct and indirect impacts of alternative activities. It can point out inferior proposals and perhaps promote reconsideration. It may help discourage truly bad projects by making their implications clear. Analysis can *inform* political processes; it cannot *preempt* them.

THE READINGS

This reader addresses three basic aspects of cost-benefit analysis: practice, principle, and problems.

Part I deals with general guidelines for carrying out a cost-benefit analysis. The three readings portray the

process and its rationale in basic, practical terms. The authors are more concerned with workable procedures than with theoretical elegance.

Part II introduces the three systematic cost-benefit methodologies that have been developed since the early 1970s. The readings focus on the assumptions and intents, rather than the mechanics, of each approach. An afterword to this section surveys the basic differences and similarities of the three approaches to social cost-benefit analysis.

Part III looks into some criticisms of cost-benefit analysis. These four readings probe the theory and examine the practice of project appraisal.

The meaning of cost-benefit analysis lies in its use, not in the process. This material provides a basis for non-economists to decide what they want from cost-benefit analysis and to judge what they get as they address their problems of choice.

PART I

The Basic Structure and Pragmatic Approaches

Too often, the tendency is to plunge directly into gathering data and estimating benefits and costs with the hope that it will all fit together at the end. In an undertaking as complex as CBA, this is not a wise course. Much effort is wasted and much remains undone when precise plans do not guide the analysis.

Peter G. Sassone and William A. Schaffer
"Performing a Cost-Benefit Analysis"

I will suggest pragmatic solutions to some problems of shadow pricing applied to agricultural projects. More theoretical economists will not agree, probably, but we must get on somehow with our project and with the development program.

J. Price Gittinger
From *Economic Analysis of Agricultural Projects*

Cost-effectiveness analysis is similar to cost-benefit analysis except that the non-monetary performance of the project is estimated.

Peter Delp
"Cost-Effectiveness Analysis"

This section deals with the underlying imperative of project appraisal and some pragmatic procedures for carrying out a cost-benefit analysis.

The first reading sets up a framework for project appraisal. Peter Sassone and William Schaffer establish a structure and outline the process of cost-benefit analysis. They begin by stressing a fundamental—but often slighted—prerequisite to identifying costs and benefits: defining the problem.

A second crucial step is designing the analysis itself. Sassone and Schaffer here introduce a recurring theme: Cost-benefit analysis itself is a project, demanding resources and directed toward objectives. Designing the analysis warrants care and judgment. The type and detail of information required must be carefully specified, and the analytical process should be geared to generate it.

This article also introduces sensitivity analysis and explains how it can be applied at different levels. Sassone and Schaffer offer some rules of thumb for dealing with different categories of costs and benefits and suggest a concrete format for organizing and communicating the results of an analysis.

J. Price Gittinger examines a specific type of analysis, the economic appraisal of agricultural projects, although the import of the lessons is not limited to agriculture. Gittinger is well attuned to the ambiguities and uncertainty that often surround development projects. He is rather skeptical of neat theoretical systems, and this article reflects his perspective. He underscores the theme that cost-benefit analysis is a process, not a technique, warning that its pertinence depends on the accuracy with which alternatives are identified and their inputs and outputs predicted. He presents some

guidelines for tracing and classifying a project's effects. Gittinger introduces a topic that will be expanded in Part II, the danger that market prices present inadequate criteria for economic analysis. He proposes some pragmatic approaches to shadow pricing.

In the first two readings, cost-benefit analysis is treated as an analytical procedure that requires inputs and outputs to be valued in common units, to produce conventional summary measures—benefit-cost ratios, net present values, and rates of return. For some kinds of projects it is impossible or impractical to measure outputs and compare them directly with inputs. Population control, education, and most nutrition and health

projects come quickly to mind as cases where benefits are difficult to quantify and price realistically. For such projects, *cost-effectiveness analysis* can be more appropriate.

Cost-effectiveness analysis determines ratios, but does not attempt to express outputs in the same units—market prices or derived prices—as inputs. Instead, some non-monetary measure of effectiveness is devised, and the analyst tries to determine the least costly way to reach some specified level of effectiveness. An excerpt from *System Tools for Project Planning*, a "toolbook" by Peter Delp and his associates, illustrates how this technique works and the kind of guidance it can give.

Performing a Cost-Benefit Analysis

Peter G. Sassone and William A. Schaffer

Sassone and Schaffer decided there was an unfortunate gap between much of the theoretical work on cost-benefit analysis and the real needs of project analysts. To help bridge this gap they wrote Cost-Benefit Analysis: A Handbook, the source of this reading. Sassone and Schaffer aim to synthesize a broad range of principles and issues into a workable approach to doing a cost-benefit analysis. These excerpts from the last two chapters of their book give the structure and a summary of that synthesis.

The authors deal carefully and emphatically with defining the problem that the project is to address and designing the analysis itself. No sensible calculations of cost and benefits can be made without a sense of what the project is supposed to do.

The authors observe that every project is properly compared with the "universal alternative"—not doing the project, which implies a time stream of costs and benefits like any other option. Planning a social cost-benefit analysis means stipulating the boundaries of the relevant "society," they point out, and they survey a range of different constraints that tend to complicate the pursuit of project objectives. Analysis deals with both facts and values, and doing a cost-benefit analysis demands cooperation between trained analysts and authoritative decisionmakers.

Some aspects of the dollar-value dilemma are explored. Sassone and Schaffer approach the problem by distinguishing three categories of costs and benefits. Market goods are inputs and outputs that have a price

or can readily be assigned one. Incommensurables are effects that can be clearly defined and measured, but cannot be directly expressed in money terms. Intangibles cannot be priced nor even clearly measured. The authors suggest a two-part procedure to capture all project effects. A quantitative analysis considers market goods (and whatever incommensurables can be translated into comparable measures), while a social impact analysis investigates more elusive project effects.

The authors list, and briefly explain, the three levels of sensitivity analysis. They offer a general principle for judging how extensively to test assumptions and estimates. Finally, they summarize their views on the process—and the purpose—of cost-benefit analysis and offer a format for presenting the results. [Ed.]

Get your facts first, then you can distort them as much as you please.

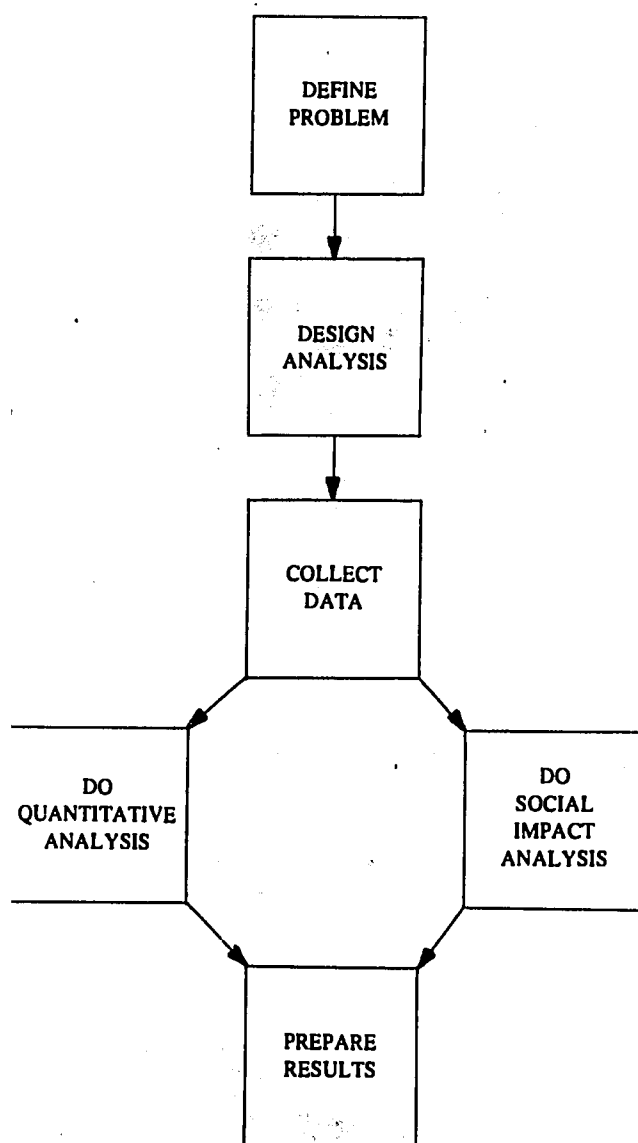
— Mark Twain

Our central theme is the importance of planning the design, or charting the course, of a CBA. Too often, the tendency is to plunge directly into gathering data and estimating benefits and costs with the hope that it will all fit together at the end. In an undertaking as complex as CBA, this is not a wise course. Much effort is wasted and much remains undone when precise plans do not guide the analysis.

Another theme is the analyst's interaction with the decisionmaker. The decisionmaker is the beginning and the end of the CBA cycle. Initially, the decisionmaker must communicate to the analyst a detailed description of the problem to be addressed and the nature

of the information desired, such as the scope of the sensitivity analysis or the emphasis of the social impact analysis. The analyst's design of the CBA will reflect, in large measure, the requirements of the decisionmaker. The completed CBA is finally used by the decisionmaker as an aid in making the requisite decision. The CBA is an information-processing "machine." The decisionmaker's input to the analyst will affect the analyst's output to the decisionmaker. The better the problem is specified, the more useful will be the final report to the decisionmaker. A schematic representation of the major steps in CBA is presented in figure 1.

FIGURE 1
Flow Diagram Depicting Major Steps
in Performing a Cost-Benefit Analysis



DEFINING THE PROBLEM

Although defining the problem to be analyzed may appear to be an almost trivial task, any CBA veteran will testify otherwise. This first step gives direction to the remainder of the analysis. It is here that the decisionmaker plays a crucial role, communicating to the analyst precisely what he wishes to be done. It is the analyst's task to record these desires, and elicit whatever information is needed to exactly define the problem. While each project has its own unique features, many aspects of problem definition are common to most, and, although such a listing can never be complete, it forms a basic checklist for *both* the analyst and decisionmaker. A discussion of these aspects is given below.

Project Scenario

A technical description and a detailed scenario definition for the projects to be analyzed are obviously important initial steps. The main point here is that explicit recognition should be given to all resource inputs and final outputs of the projects, and the calendar time in which they will occur. On the input side, these descriptions must include the types and amounts of resources (for example, numbers of scientists, managers, clerical staff; various types of capital components for initiation, operation, and maintenance of the projects; and amount and nature of land needed to site the facilities). On the output side, the time streams of each final good of the projects (for example, electrical energy, miles of highway, and retrained manpower) are equally important. The nature and physical dimensions of "externalities" (for example, smoke, noise, and water pollutants) must also be communicated to the analyst.

Often, some of this information will not be available. This lack of information is not detrimental to the analysis as long as this lack is recognized and dealt with, not ignored. The usual ways of solving this information problem are either to perform a simultaneous "engineering" study to determine unknown technical values or to parameterize the unknown values in recognition that the final results will be *conditional* on the assumed parameter values.

Baseline Scenario

Similarly, a technical description and detailed scenario of the universal alternative—the status quo—should be constructed. Every project has an alternative,

even if it is to “do nothing,” for to “do nothing” implies a time stream of costs and benefits to society just as a positive project does. Of course, it is exactly this “do-nothing” or baseline scenario with which each project is compared. The CBA focuses on how a project will change the baseline time stream of social well-being. Thus, only the *differences* between the baseline time stream and the *with-project* time stream are considered in CBA. The “good” differences are the benefits of the project; the “bad” differences are the costs. Since the *difference* that the project will make is of primal importance, it is essential to have the baseline scenario with which to compare the project scenario. An example will clarify this need for a baseline scenario.

Consider a project to provide electric energy by using wind, that is, “windmill” construction. Suppose that the social cost of a windmill—the value of the resources used to build a windmill—is known. Are the benefits the value of the electricity produced? Not necessarily. It depends on the baseline scenario. If, in the absence of windmills, conventional means of producing electricity would be expanded so that members of society would get the same amount of electric energy without as they would with windmills, the benefits would be in the value of fuel saved by conventional power generators, not in the extra electricity. There would be no *difference* in electricity generated, but there would be a *difference* in the amount of oil, for example, that could be put to alternative uses by society. On the other hand, if the baseline scenario provided less electricity than did the windmill project, at least part of the benefits of the project would be in the value of electricity produced by windmills.

Definition of Society

Cost-benefit analysis is an attempt to assess social costs and social benefits; that is, CBA takes the public point of view. The value of a project is the sum of its value to each member of society. Clearly, then, costs and benefits depend on who is included in society. For projects at the national level, the usual definition is that society consists of all citizens. At the regional, state, and local levels, the operational definition of society is not so easily posited for there are often benefit and cost spillovers (externalities) beyond the stipulated geographical bounds of the project. For example, a state-level manpower-training program has obvious spillover benefits: Some persons who receive training will eventually migrate out of that state. Benefits will accrue to

both residents and nonresidents of the state. Which benefits are to be counted in the CBA? The most appealing *normative* answer (to economists) is that *all* benefits ought to be counted. However, there are any number of circumstances in which this will not be very palatable. If the training program were financed entirely by taxes on state residents, political realities might dictate that the benefits to the residents outweigh the costs, irrespective of whoever else gains. The point here is that the decisionmaker must define the “society” that the analyst is to examine. Almost inevitably, some uncounted effects will occur and spill over onto persons not included in the society of the CBA. When this spillover is apparent, the analyst should point it out to the decisionmaker. To reiterate, the decisionmaker is the final authority on the bounds of “society” for the purposes of the CBA.

Constraints on the Project

It may be necessary that, to be chosen, a project must satisfy a number of diverse constraints. Such constraints may be budgetary, legal, social, political, or institutional. These, of course, must be communicated to the analyst at the start of the CBA. This early communication will enable the analyst to quickly exclude alternative projects that obviously are not feasible. It is impossible to completely explore the scope of each type of constraint; however, an example of each will convey their spirit:

Budgetary

The initial cost of the project cannot exceed \$X and annual operating costs cannot exceed \$Y.

Legal

Pollution caused by the project cannot exceed some set standards.

Social

Benefits and costs of the project cannot be divided along racial lines.

Political

Benefits and costs of the project cannot be inequitably divided among different political jurisdictions, for example, states.

Institutional

The project cannot usurp the powers of Institution X in favor of Institution Y, for example, place matters pertaining to the Department of Agriculture in the domain of the Atomic Energy Commission.

Although the placement of a particular constraint in a particular category may be somewhat arbitrary, the important point is that each constraint be explicitly recognized to the extent possible and incorporated into the analysis. It is the decisionmaker's task to inform the analyst of all such constraints.

Direction of Social Impact Analysis

One can argue that, in principle, the analyst should have free rein over the social impact analysis. After all, he must carefully describe all relevant non-quantifiable effects of the projects in an objective manner. However, the harsh realities of time and budgetary restrictions often impede a completely thorough approach. Thus, when the analyst is forced to trade off one area of investigation against another, it is useful to be aware of the decisionmaker's preferences and needs.

Accepting the decisionmaker's direction in the social impact analysis should not undermine the integrity of the analyst's report. The previous paragraph may cause alarm in those who feel that the decisionmaker often has biases and his influence will alter the neutrality of the CBA. Although the existence of bias is, of course, a possibility, the analyst must flatly state in his report which areas have not been investigated, and also state his opinion as to whether such an investigation would affect the overall assessment of a project. In addition, he should state to what extent the choice of areas for social impact investigation was influenced by the decisionmaker. In this way, the decisionmaker may be accommodated without a sacrifice of CBA integrity.

Control Variables

Often, all the technical details of a project will not be initially specified by the decisionmaker. Rather, the analyst will be charged with choosing optimal values for some variables, such as scale, location, start-up time, or number of installations. These can be termed *control variables*. In a strict sense, optimization falls outside the domain of CBA and generally into the domain of optimization methods.

Discount Rate

The discount rate is best considered a policy variable, to be set by the decisionmaker. He may desire that a single rate be used, or he may request that several values be considered. Alternatively, he may wish critical values to be computed. The analyst must get this direction from the decisionmaker.

Time Horizon

The time horizon is also a policy variable, although it is not as volatile an issue as the discount rate. The decisionmaker must decide how far into the future that costs and benefits are to be projected and thus counted into the net present value of the project. Ordinarily, most costs of a public project are incurred in its early years, and so a truncated time horizon has the effect of excluding more benefits than costs from consideration. Thus, a time horizon places a conservative bias on the NPV calculation, but it should be realized that with time horizons of 50 years or more, the bias is very slight. The discounting process is such that values occurring 50 years or more in the future add little to present value. Clearly, the higher the discount rate chosen, the shorter is the time horizon that should be considered.

Data Sources

Although source identification and data gathering are responsibilities of the analyst, it will often be the case that the decisionmaker, through his or her own investigations prior to commissioning the CBA, will have come across relevant data sources. The analyst, in the interest of saving time, should explore such possibilities before initiating his own searches.

Format of Results

The analyst's task is to present the decisionmaker with all the relevant information in a convenient format. Although this may not seem to be an important point, the convenience of the format may well affect the extent to which the decisionmaker utilizes the CBA as a decision aid. Thus, the analyst should elicit from the decisionmaker his preferences regarding the scope of the sensitivity analysis, use of critical values, and what general level of "technical language" should be used in the report proper.

Summary

In summary, *defining the problem* is the first step in a CBA and it requires close cooperation and communication between the decisionmaker and analyst. Insofar as it gives direction to the rest of the study, defining the problem should be treated as a major part of a CBA. Failure to invest time in problem definition almost invariably results in confusion and wasted efforts in the remainder of the study.

DESIGNING THE ANALYSIS

The formal design of the cost-benefit analysis should be done during its early stages, before plunging into data collection and cost and benefit estimation. The six basic points involved in carrying out the design are discussed below.

The Problem Structure

Determining the analytic structure of the problem follows directly from defining the problem. The purpose here is to determine which *measure* (for example, net present value or benefit-cost ratio) to employ in comparing alternatives. The main aspects of structure are the dependence or independence of projects, the type of constraints, and the variables to be optimized. At this stage of the design, the analytic structure of the problem should be written out as carefully as possible, and all vagaries, should be uncovered.

Preliminary Identification of Costs and Benefits

Basically, there are two ways of discovering costs and benefits: searching for affected goods and services or searching for affected persons. In practice, it is useful to employ both of these approaches, remembering, however, that *each is a different way of arriving at the same costs and benefits*. That is, either the commodities or the persons approach is a good way to discover effects, but only one can be used to count a cost or benefit. Using both results in double counting. How are the affected commodities and persons to be discovered? A number of complementary ways can be used to suggest what interrelationships exist between the project and the rest of the economy:

- (a) Economic theory.
- (b) Professional literature dealing with previous similar projects.
- (c) The scenarios developed in defining the problem.
- (d) Introspection.
- (e) Brainstorming with colleagues.
- (f) Interviews with interested persons, including the decisionmaker.

Thus, the result of this step is a list of costs and benefits that are likely to be incurred with each project under consideration.

Assessment of the Listed Costs and Benefits

This assessment is with respect to validity and quantifiability. With regard to the former, the analyst must

be wary of including transfer payments or sunk costs as social benefits or costs. He must also be sure that true values are not being double counted. It then must be determined whether, to what extent, and in what dimensions each valid cost or benefit can be quantified. This determination requires a cursory survey both of data availability and of the potential of gathering new data.

Scope and Dimensions of the Quantitative Analysis

In principle, a CBA should deal with *all* the costs and benefits of a project. Some of these will be quantified; the others will be treated in a qualitative fashion. It is not too great a departure from conventional usage to bring all of the qualitative analysis under the umbrella term of "social impact analysis." Of necessity, some costs and benefits such as intangibles can be treated only qualitatively. Among the quantifiable costs and benefits, some may not be quantified in the CBA because of time and budgetary restrictions. Of those that are quantified, some will be specified in money terms and others will be accorded their own dimensions (incommensurables). However, by no means is there a well-defined boundary between incommensurables and the costs and benefits that have ready dollar values. It is probably best to consider the costs and benefits of a project as lying along a spectrum of "quantifiability," ranging from intangibles through incommensurables to market goods. Intangibles would include the effects of the project on such things as social justice, social harmony, personal freedom, democracy, or aesthetics. These all involve values beyond the economic and do not exhibit even likely dimensions for measurement, much less actual numerical values. Incommensurables would include lives lost, injuries and illnesses sustained, national defense, other public goods such as recreation facilities, and some externalities. Evidently, incommensurables may involve economic or noneconomic values. Their distinguishing characteristic is that they may be readily quantified, but not in money terms.

Market goods are agricultural products, textiles, electricity, automobile servicing, and the like—any good or service exchanged through a market. The most important feature of a market good is the existence of a corresponding market price that, subject to qualifications, is a direct measure of social value in money terms.

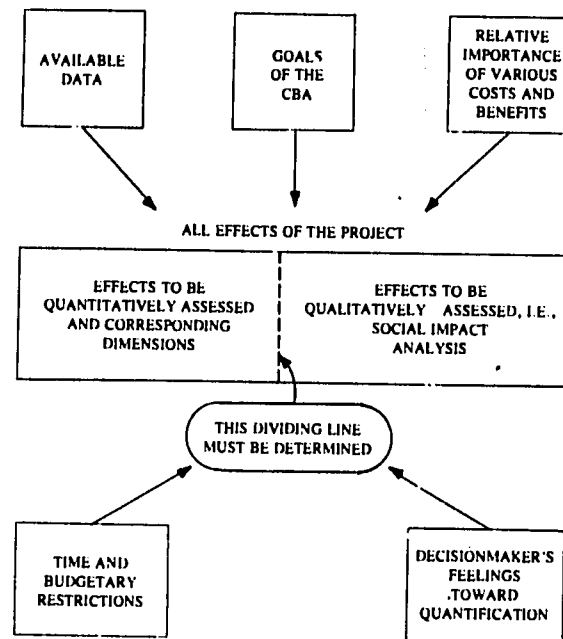
Thus, with regard to a spectrum of "quantifiability," all nonquantifiable costs and benefits fall into the

intangibles range, and all quantifiable effects are in the incommensurable or market-goods range. Only effects in the market-goods range, however, are readily measured in money terms. There is no clear-cut boundary between any of the ranges in the spectrum, and it often happens that some cost or benefit will appear to lie somewhere between incommensurables and market goods. Such a cost will be readily measurable in non-monetary terms but will also appear to be convertible into a meaningful dollar value. As an example, such costs may be associated with recreation benefits, or losses resulting from illnesses or injuries. One of the major problems faced by the analyst is determining how far to go in converting apparent incommensurables into dollar values. Some observers would argue that the analyst should convert all effects into dollar values, even intangibles. The idea is simply that the NPV thus computed captures everything. This complete conversion virtually obviates the role of the decisionmaker, since he could easily be replaced by a 3 x 5 file card containing such immutable rules as: If $NPV > 0$, accept the project. This notion—total conversion into dollar values—has probably been the greatest source of criticism of CBA. Fortunately, the advocates of that notion seem to be waning in strength.

On the other hand, a CBA that fails to convert very many effects into dollars will not be a successful decision aid, for the decisionmaker then will be forced to compare projects on the basis of two- or three-dozen dimensions, a situation not too far removed from "eyeballing" raw data. Once again, then, how far is the analyst to go in converting seeming incommensurables into dollar values? Although there is no categorical answer, the decisionmaker can specify to the analyst those apparent incommensurables for which he can accept dollar conversions and those for which he cannot. The decisionmaker and the analyst can jointly determine the dimensionality of the results. In effect, with the technical aid of the analyst in elucidating relevant tradeoffs, the decisionmaker determines the cutoff point in the cost-benefit spectrum between effects usefully measured in dollars and those better measured in their own dimensions. This process would appear to be the only way the analyst can ensure that his approach to quantification will be acceptable to the decisionmaker in the sense that the results are credible and thus useful as a decision aid.

In brief, this discussion has centered on determining the scope and dimensionality of the quantitative part of the CBA. Implicitly, then, the breadth of the social

FIGURE 2
Factors Affecting Quantification
of Costs and Benefits



impact analysis (the qualitative part of the CBA) is determined simultaneously, for whatever effects are not quantitatively analyzed must be qualitatively analyzed, at least cursorily. The factors affecting this determination are given in figure 2. There is no denying that the analyst must exercise his own judgment in allowing each of these factors to influence his determination.

Sensitivity Analysis

The analyst's attempts to gauge the degree of error in his estimates fall under the general term *sensitivity analysis*. Conceptually, we can distinguish among three levels of sensitivity analysis: subjective estimates, selective sensitivity analysis, and general sensitivity analysis.

Subjective estimates. This is the least rigorous and quickest approach. Calling on previous experience, intuition, "gut feeling," and the like, the analyst determines some estimate of the actual degree of error. For example, after calculating the NPV of a project, the analyst might state that this figure is subject to an error of plus or minus 10 percent or that the chance of the true NPV being more than 10 percent different from the estimate is less than 1 in 20. There are any number of ways the analyst can state an error estimate. However, the point here is that the error estimate is obtained

subjectively, that is, without recourse to formal calculation.

Depending on the skill of the analyst, a subjective error estimate may well be quite good. The advantages of subjective estimates are the fact that they can account for variability not reflected in objective measures, and (ordinarily) the speed with which they can be formulated. The drawbacks of the subjective approach are that the decisionmaker may place less confidence in such an estimate and that he may have difficulty in defending his decision to critics. Further, the absence of a well-defined approach to error determination, which necessarily occurs in subjective estimates, makes it impossible for anyone to trace the analyst's approach and to assess its reasonableness.

Selective sensitivity analysis. This is an objective approach to error estimation in the sense that it is arrived at via an explicit series of calculations. The most common variant of selective sensitivity analysis goes as follows. The analyst selects a parameter in the NPV calculation that he feels is both subject to error and capable of significantly affecting the NPV calculation. The analyst selects likely high and low (or best and worst) values for this parameter and computes the NPV with each. The decisionmaker is then presented with three NPV estimates for each project—high, medium, and low—and for each parameter selected for sensitivity analysis.

For example, in a project to determine the economic viability of a wind energy system, the price of oil for the period 1980-85 may be an important parameter. The NPV for the project would be computed initially by using all the "best" estimates for each parameter. Then, NPV would be computed, using the high and low prices of oil, but retaining the same "best" estimates of other parameters. Thus, the decisionmaker will have information on how sensitive NPV is to the 1980-85 price of oil. The same procedure, for example, could be carried out for the 1980-85 demand for electricity, or the discount rate.

The advantages of selective sensitivity analysis derive from its objective nature and relative ease of computation. Its objectivity ensures that defenders and critics alike argue the merits of the analysis on well-specified data and assumptions. The major difficulty with this approach is that it is usually unsuited for the analysis of anything more than a few parameters.

General sensitivity analysis. This approach hinges on the derivation of a *probability distribution* of NPV outcomes.

General sensitivity analysis is usually a complex and ambitious undertaking for all but the simplest cost-benefit studies. In an earlier chapter, Sassone and Schaffer present these seven steps:

1. *Identify the variables that affect the project's profitability.*
2. *Collect the variables into related sets.*
3. *Posit several values that could occur for each variable in each set.*
4. *Estimate the probability that each value will occur.*
5. *For each set, calculate the compound probability for each combination of values of the variables within it.*
6. *Calculate the NPV (or IRR or benefit-cost ratio) associated with each combination.*
7. *Determine from this information the cumulative probability of each possible value of the NPV (or IRR or benefit-cost ratio), and display in the form of a probability distribution.*

For each project, the decisionmaker can tell at a glance what are the chances of breaking even, of complete disaster, or of overwhelming triumph. [Ed.]

Choice of sensitivity analysis. In the absence of a specific charge by the decisionmaker, the analyst must determine the proper level of sensitivity analysis by an exercise of judgment. Is there some rule to guide this judgment? Yes—the economic rule for efficient resource use in production, since the analyst is *producing* a good, the CBA.

In deciding on a level of sensitivity analysis, the analyst must consider the demands of the decisionmaker, the necessary tradeoffs among dollars spent on the various tasks, and how each task contributes to the overall CBA.

Determination of Data to Be Collected

Once the nature of the quantitative analysis is set and the type of sensitivity analysis that will be employed is known, the necessary data to accomplish these tasks is manifest. Essentially, quantitative analysis determines the category of data needed (for example, price of electricity in 1985) and sensitivity analysis determines whether point estimates are needed, or whether bounding estimates should be used, such as high and low values in addition to a medium "best" estimate, or whether corresponding probabilities of occurrence need be sought.

COLLECTING THE DATA

Although it is not necessary to go into a detailed discussion on collecting data, a few common sense considerations deserve mention. *Planning* the format of the collected data is extremely important. The format should specify the number of significant figures for each entry, should allow easy access to any part of the data, and should be capable of quick updating. The data should be gathered from original sources when possible. By using original sources one minimizes the risk of recording errors which creep into transcribed data. All of the qualifications to the data should be accurately recorded. Finally, the sources of all data should be recorded for eventual reference in preparing the footnotes and bibliography.

PERFORMING THE ANALYSIS

The essence of quantitative analysis is the use of raw data and economic theory to make good estimates of social costs and benefits. If a thorough job of designing the analysis has been done, the analyst hopefully will encounter no major problems at this stage. Performing a thorough job is not to say that every estimate will be precise, only that any lack of precision will be acknowledged either verbally or in formal sensitivity analysis. The quantitative analysis includes finding "best" point estimates of the social value of a project along with a sensitivity analysis.

In the social impact analysis, all nonquantified effects are brought out as clearly as possible. As mentioned previously, some aspects may receive more extensive treatment at the expense of other aspects. There is no objection to this type of treatment as long as the relative importance of each effect is not obscured, and the analyst holds fast to a completely scientific (that is, neutral) viewpoint.

PRESENTING THE RESULTS

1. CBA depends on the proper identification and measurement of all project effects.
2. Incommensurables and intangibles, which are those effects that are not susceptible to quantification or monetization, must be acknowledged and displayed as accurately as possible.
3. CBA, ultimately, is an aid to the decisionmaker.

These three points provide, in a sense, the critical test of

FIGURE 3
CBA Account Work Sheet

	MONETIZED						INTANGIBLES					
	NATIONAL		REGIONAL		INCOME CLASS		NATIONAL		REGIONAL		INCOME CLASS	
PROJECT EFFECTS	1	2	3	4	5	6	7	8	9	10	11	12
MONETIZED EFFECTS												
REGIONAL TRANSFERS												
REGIONAL ACCOUNT												
INCOME DISTRIBUTION												
ENVIRONMENTAL												
STATISTICS												
IMPORTANT SITES												
WATER AND AIR QUALITY												
IRREVERSIBLE CONSEQUENCES												
OTHER												
HEALTH												
SAFETY												
EDUCATION												
CULTURE												
RECREATION												
EMERGENCY PREP												
OTHER												

NOTE: Line 1: National; Line 2: Regional; Line 3: Income Class

a CBA accounting scheme. Such a scheme must permit the comprehensive itemization of project effects and their corresponding quantification, along with the qualitative assessment of intangibles, all in a format useful to the decisionmaker.

A CBA accounting scheme should also lend itself to the special demands that are often made on project analyses. These special demands include analyses of project impacts on regional development, income redistribution among income classes, the environment, and social values in general.

An accounting format designed to fulfill the foregoing requirements is presented in figure 3. All project effects with which the analyst has associated dollar values are listed under *monetized effects*. Here, the entries are generally descriptive. However, quantitative information can also be presented, as when the particular effect is an "incommensurable." For both benefits and costs, the national entries are analyzed into regional and income-class components. Line 1 is a summary of the real direct effects of the project. Line 2 allows whatever income transfers are present to be displayed. Line 3 is a summary of the monetary effects on a regional basis. Line 4 is a summary of the effects by income class.

Obviously, this one-page format is more suggestive than practical. Few cost-benefit analyses can be summarized so easily. For a complex project, each block

could contain numerous entries; for a simple project, most blocks could be blank. In any case, and whatever the scheme adopted, the point is that a summary must be produced which is clear, succinct, complete, and understandable. A cost-benefit analysis is useful only when it is accessible.

Economic Analysis of Agricultural Projects

J. Price Gittinger

The text from which this reading is drawn originated in the Agricultural Projects Course conducted by Gittinger for the World Bank's Economic Development Institute. The approach is informal and pragmatic, and the content is colored by Gittinger's project experience as well as his economic training. Economic Analysis of Agricultural Projects deals with "practical, not-very-complicated ways to help ensure that when investment decisions are made resources will be used economically and efficiently."

Gittinger views projects as the "cutting edge" of development, and the function of analysis is to help hone that edge. His claims for the contributions analysis can make are modest. The decision to proceed with a project is a political act. Cost-benefit analysis can inform, warn, sometimes constrain—but never preempt—the political decisionmaking process.

Gittinger details the distinction between financial and economic cost-benefit analysis. He emphasizes that any form of analysis merely processes information and depends on clearly identifying the "underlying facts" about alternatives. Financial and economic analysis are incremental layers of appraisal that build on the knowledge generated by technical, commercial, managerial, and organizational analysis.

The second section deals with tracing a project's likely impact and identifying costs and benefits. The direct costs of a project are often fairly clear. Searching out project benefits can be a more subtle task, and

Gittinger offers some suggestions on what to look for. He reviews some issues surrounding secondary costs and benefits and outlines "stemming" and "induced" effects, economies of scale, "dynamic" secondary effects, and "multipliers." He briefly but emphatically affirms the importance of intangible costs and benefits.

The crucial chore of valuation is the subject of the final section. Gittinger reviews some principles concerning the connection between prices and values, and then explores the impact of some complications that reality often introduces. He inclines toward accepting market prices as measures of value, barring clear causes to doubt their validity, and points out that finding the relevant market price can be enough of a challenge. Accounting for the effects of inflation is concisely treated. The excerpt ends with a cautious discussion of shadow pricing, with special attention to foreign exchange, items that enter world trade, and agricultural labor. [Ed.]

PROJECTS: THE "CUTTING EDGE" OF DEVELOPMENT

Projects are the "cutting edge" of development. Perhaps the most difficult single problem agricultural administrators in developing countries face is implementation of development programs. Much of this can be traced to poor project preparation.

Clearly, project preparation is not the only aspect of agricultural development or planning. Identifying national agricultural development objectives, selecting priority areas for investment, designing effective price policies, and mobilizing resources are all critical. But for most agricultural development activities, careful

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project preparation in advance of expenditure is, if not absolutely essential, at least the best available means to insure efficient, economic use of capital funds and to increase the chances of on-schedule implementation. Unless projects are carefully prepared in substantial detail, inefficient or even wasteful expenditure of money is almost sure to result—a tragic loss in capital-short nations.

Yet in most countries the capacity to prepare and analyze projects lags. Administrators, even those in key planning positions, continually underestimate the time and effort needed to prepare suitable projects. So much attention is paid to policy formulation and planning of a much broader scope that it is often overlooked that much development cannot proceed unless there is a specific project on which to spend the money available. Ill-conceived, hastily planned projects virtually improvised on the spot are too often the result.

What Is a Project?

Generally, in agricultural projects we are thinking of an investment activity where we expend capital resources to create a producing asset from which we can expect to realize benefits over an extended period of time.

Often, projects are the first, concrete portion of a larger, less precisely identified “program.” The whole program, of course, could be subjected to analysis as a single project, but by and large it is better to keep projects rather small, close to the minimum size which is economically and technically feasible. If “projects” approach “programs” in size, then there is a real danger that high returns from one part of the project will mask the low returns from another. A 100,000 hectare land settlement program may well be better analyzed in terms of five 20,000 hectare projects if the soils or slopes in some areas are markedly different from others. Analyzing the project as a whole may hide from us the fact that it is economically unwise to develop some areas in the entire 100,000 hectare block instead of moving on to an entirely different region.

About all we can say in general about a project is that it is an activity on which we will spend money in expectation of returns and which logically seems to lend itself to planning, financing, and implementation as a unit. It is a specific activity with a specific starting point and a specific ending point intended to accomplish a specific objective. It is something you draw a boundary around—at least a conceptual boundary—

and say, “this is the project.” It is something which is measurable both in its major costs and returns.

Sometimes people become concerned that they cannot define a “project.” Don’t be. In practice, the definition works itself out; there are much more important aspects of project analysis to grapple with than trying to formulate an academic definition of a project.

The Project Investment Decision

Even though the analytical methods we will be discussing can be of great help in identifying which project alternative will increase social income most rapidly, they will *not* make the project investment decision for us. That decision is one on which many, many factors other than quantitative or even purely economic considerations must be brought to bear. A settlement project and a plantation project may have roughly similar economic benefits, but we may choose the settlement alternative on the grounds that it has better income distribution effects. Or, our analysis may reveal that the plantation project is more profitable and give us some quantitative idea of just how much more remunerative it is. We may then ask ourselves if the social benefits of the lower paying project are worth the loss of future wealth foregone from the higher paying project. In the end, any national investment decision must be a political act summing up the best judgment of those responsible. The function of project analysis is not to replace this judgment; rather it is to provide one more tool (a very effective one, we hope) by which judgment can be sharpened and the likelihood of error narrowed.

The Place of Economic and Financial Analysis in Project Evaluation

It should be clear from the outset that the kind of economic and financial rate of return or benefit-cost ratio which we will be discussing is not an end in itself; no single measure can be. Economic and financial analysis provides a framework within which all aspects of a proposed project can be evaluated in a coordinated, systematic manner. Careful project analysis will point up unrealistic or questionable assumptions and indicate ways in which a project can be modified to improve its wealth generating capacity or to increase the noneconomic or nonquantifiable values which we expect to gain from it. A project carefully analyzed and revised in the light of this analysis has a much improved chance of being implemented on time and of yielding the benefits we seek. The rate of return or the benefit-cost ratio when computed is a useful measure of a

project's wealth creating capacity, but it is the whole system of evaluation which justifies the time and effort devoted to a project analysis and from which comes the payoff in terms of better projects.

*Points of View in Project Analysis:
Economic and Financial*

In project analysis, there is a critically important distinction to be kept in mind between two complementary points of view. For any project, we are interested in the first instance in the total return or productivity or profitability to the whole society or economy of all the resources committed to the project regardless of who in the society contributes them and regardless of who in the society receives the benefits. This is the social or economic return of the project and we determine it by applying what we will term economic analysis.

In contrast, the individual financial entities which participate in a project—farmers, businessmen, entrepreneurs, private corporations, public agencies, or whoever—each is properly concerned about the return to the equity capital he contributes. We may consider this the financial return to an equity participation in a project and we determine it through what we will term financial analysis. Some economists term the financial return the "private" return, although financial analysis may quite properly be used for analyzing public sector investments of quasipublic agencies or even the return to the government treasury.

Note well that the manner in which we will apply the methodologies in *economic* (not financial) analysis makes this analysis neutral to income distribution and neutral to capital ownership as well. Although the analysis will determine the amount of the income stream generated over and above the costs of labor and other inputs, it does not specify who actually receives it. Part of the surplus income is normally taken through taxes for social purposes outside the project. Part is generally made available to compensate capital owners for the use of their money. Part may become the basis of an income transfer as would be the case if we decide to charge farmers benefiting from a land settlement project less than the full cost of establishing their holdings. Economic analysis is silent about this distribution.

In *financial* analysis, on the other hand, we are very much concerned about income distribution and capital ownership. Although we will be applying exactly the same discounted cash flow methodology in financial as in economic analysis, the way we normally set up our

analysis and the elements we normally will include in the cost and benefit streams mean that the result will be a measure of the return to the equity capital contributed to the project by each of the various participants, public or private. It is then a policy decision as to whether we wish to affect that return through income taxes, special lending terms, price subsidies, or any of the other tools open to the society.

Financial analysis may be applied to the costs and returns of the various public entities which participate in a project. A government credit agency, for example, is a failure as a development activity if it cannot recover the funds it lends to farmers. When preparing the financial analysis of the credit agency, this will be kept uppermost in mind as its accounts are projected. These accounts will, in turn, be related to an analysis of individual farmer accounts. Will the farmer be able to invest the money he borrows profitably enough in a new enterprise or practice that he will be able to repay his loan? Will his sales come at the proper time to enable him to meet his repayment schedule?

Financial analysis may show the public entity responsible for operating a project will not have receipts large enough to recover all the capital—or even operating—costs it incurs. Even so, it may still be worthwhile to carry out the project because the economic analysis shows the total return to the society to be favorable. One might think of an irrigation authority operating a project where the increase in farm output is enough to make the project economically attractive from a social standpoint but where a policy decision has been taken not to assess farmers a water charge high enough to repay all the costs of the authority. In this case, a public subsidy will be involved and financial analysis will give us an idea of how much this transfer payment will amount to, who will receive it, and how it will affect the financial return the recipient realizes on his own equity capital contribution.

Financial analysis is important when we turn to a consideration of the incentive structure associated with a proposed project investment. It will do us no good to have a project which is profitable from the standpoint of the whole economy if individual farmers are unable to earn a living from their participation.

The methodology of comparing costs and benefits is the same whether we are seeking the economic or the financial return. Only what is defined as a "cost" and what is considered a "benefit" is different.

The Underlying Facts

Project analysis rests on a broad range of technical information and an equally broad if less precise range of judgments about organization and administration. The technical information will require the specialized professional skills of a whole group of specialists—agronomists, civil engineers, soil scientists, and so forth. Putting all the individual parts of a project together in such a way that the project can have a good chance of success requires the skills of experienced administrators who know their society and the region where the investment is planned. Before you can proceed with the kind of economic and financial analysis we will be discussing, you will have to have the summary information of many, many other professionals. Gathering and verifying these underlying facts is more time consuming than is generally realized; be sure to allow enough time in your planning.

Aspects of Project Evaluation

Technical aspects. The technical analysis will concern itself with the inputs and outputs of real goods and services. Clearly technical analysis is extremely important and the project framework must be tightly enough defined to permit the technical analysis to be thorough and precise. Good technical staff are essential for this work—perhaps drawn from consulting firms or technical assistance agencies from abroad—but they cannot work effectively if they are not given adequate time or if they do not have understanding cooperation and informed supervision on the part of administrative officials.

Managerial and administrative aspects. Management and administration are very difficult to evaluate but they may be the key to success or failure of a project. In agriculture, our concern must be directed to two levels. On the one hand we must examine the ability of the project staff to administer such large-scale public sector activities as a water project, an extension service, or a credit agency, including arrangements to train the necessary personnel. On the other hand, we are concerned about whether farmers will have the opportunity to learn the new management skills they need if they are to adopt new practices or cropping patterns. Obviously both kinds of management skills can only be evaluated subjectively; but unless careful attention is given to making the best judgment possible, the chances of making a realistic decision about a proposed project are greatly reduced.

Organizational aspects. Closely related to the managerial and administrative considerations are the organizational aspects. Some, indeed, would say they are all part of a single, inseparable judgment about how well a project can be carried out. In breaking out the organizational aspects, the intent is to focus on the relationships of the project administration to other parts of the government. Are authority and responsibility clearly linked? Are there ample provisions to report up-to-date information about how the project is progressing? What about training arrangements? Can disbursements be promptly made? Without proper provision for these organizational arrangements, even the best manager or administrator is frustrated.

Commercial aspects. The commercial aspects of a project include the arrangements for marketing the output produced by the project and the arrangements for the supply of materials and services needed to build and operate the project. Clearly, in agriculture the marketing aspects are of great importance. Attention must be given to the proposed outlets for the products which the farmers will grow and to the efficiency of the marketing channels. Indeed, some projects may simply be marketing projects wholly concerned with improving the marketing process. On the input side, there must be appropriate arrangements for farmers to secure their supplies of fertilizers, pesticides, and high yielding seeds if they are to be able to adopt new technology or new cropping patterns. Commercial aspects of a project may also include the arrangements for procurement of project equipment and materials and for competitive bidding if there are to be major construction works.

Finally, there are the two aspects of project analysis to which this book is addressed: the financial and the economic.

Financial aspects. The financial aspect deals primarily with the revenue earning considerations of a project. It is concerned with whether the project will be able to secure the funds it will need and be able to repay these and whether the project can become financially viable. In agricultural projects financial analysis must address itself to two distinct phases. On the one hand, it must look at the financial results on individual farms to be certain there will be sufficient farm family income and enough incentive for participating farmers. On the other hand, financial analysis must concern itself with the results of public entities or commercial organizations such as cooperatives, banks, and private input distributors or processing companies.

Economic aspects. The economic analysis is directed toward determining whether the project is likely to contribute significantly to the development of the economy as a whole and if the contribution of the project is likely to be great enough to justify the use of the scarce resources which will be needed.

IDENTIFYING COSTS AND BENEFITS OF AGRICULTURAL PROJECTS

If the object in economic analysis of agricultural projects is to compare costs with benefits to determine which among alternatives is more remunerative, then the costs and benefits will have to be identified. Obvious enough, but tricky.

"With" and "Without" Test

An extremely useful rule of thumb approach to identify the overall return arising from an agricultural project is to ask yourself what will be the impact "with" and "without" the project. The difference is, in general, the net additional benefit arising from the project. You can then proceed to verify that the specific costs and benefits you have identified do add up to the difference "with" and "without" and that none are missing. Note that the question is not posed as the difference "before" and "after"; it is easy to miss some of the less obvious costs and benefits if the question is asked in that form.

Costs in Agricultural Projects

In almost all project analysis, costs are easier to identify (and value) than benefits.

Goods and services. Rarely will the goods and services employed in an agricultural project prove difficult to identify. For such things as concrete for irrigation canals or bulldozers for land clearing, it is not the identification which is difficult, but the technical problems associated with planning and design to find out how much will be needed and when.

Labor. Neither is the labor component of agricultural projects difficult to identify. From the highly skilled project manager down to the farmer maintaining his orchard while it is coming into production, the labor inputs raise less the question of what than of how much. Unskilled labor, however, while not difficult to identify, does raise special valuation problems and a shadow price may be appropriate.

Cost of land (net value of production foregone). Determining a proper value to place on land in an

agricultural project is often extremely difficult, but at least the basis for reaching the value can be made clear if we view land costs as the most important special case of the more general question of the net value of production foregone.

In most agricultural projects the land where the development is to occur already produces some amount of agricultural produce. An area to be irrigated may now be cropped on a dryland basis or an area to be converted to fruit may now be planted to wheat. If we take a new orchard as an illustration, the whole net value of the new fruit crop cannot be considered as a net benefit. Rather, to reach the incremental net benefit we must reduce the net value of the new fruit production by the net value of the wheat crop—that is, after deducting the value of the labor, seed, and fertilizer needed to produce the wheat—since the net value of the wheat which formerly was available for remuneration for the use of the land is now lost. The situation is not one of "before" and "after," but one of "with" and "without."

The economic cost of land in agricultural projects grows out of this concept of the net value of production or opportunity cost.

Taxes. Taxes are a transfer payment which require special treatment in project analysis.

In *financial* analysis where we are undertaking our analysis from the standpoint of an individual entity or enterprise all taxes are treated as a cost and there is no analytical problem.

In *economic* analysis, however, where we are considering the return to the whole society, we must allow for the fact that taxes are a transfer payment—a part of the net return from the project which is turned over to the government to spend on behalf of the society as a whole rather than by individual farmers or by the project management. Hence, taxes in economic analysis are *not* deducted from the income stream as a cost. This applies to all forms of taxes: income taxes, duties on imported items, and any local taxes which may be levied. Sometimes identifying the tax component in the prices which are available to you is difficult; this may be true, for instance, for imported machinery where the duties are generally not separated out in the market price.

Subsidies. Subsidies also pose a special problem when considering the costs of a project. They amount, in effect, to a transfer payment to the project (or to the farmers in a project) from the rest of society. A subsidy on fertilizer reduces its cost to the farmer and thereby

increases his income. Of course, this may well be justified on grounds of increasing incentives to adopt new technology or perhaps even on income distribution grounds.

In *financial* analysis terms, subsidies raise no problems. The subsidy reduces cost and the money transfer goes to those who participate in the project.

In *economic* analysis terms, however, we must adjust market prices to reflect the amount of any subsidy. If subsidies operate to reduce input costs, then we must add the subsidy to the market price of the commodity. If fertilizer is subsidized so that it sells at only 80 percent of its true cost to the society, then if we are to compare our agricultural project with alternative investments in the society, we must add one-fourth to the cost of the fertilizer used in the project. If the subsidy operates to raise prices, then in economic analysis we must deduct the amount of the subsidy from the market value of the product before entering it in our economic analysis.

Benefits of Agricultural Projects

Benefits in agricultural projects can arise either from an increased value of output or from reduced costs. The specific forms in which benefits appear, however, are not always obvious and valuation problems may be exceedingly difficult.

Increased value of output. The most common form of benefit in agricultural projects is an increase in the value of output.

Greater physical production. Increased value of production can most obviously arise from increased physical production of a crop or livestock product—providing the market and price relationships are such that the greater physical volume does not simply trigger a more-than-offsetting fall in price. Since most agricultural projects are not large enough in themselves that they will significantly affect price relationships, the interrelation of prices and production increases is usually not a problem in project evaluation. It can be, however, where projects are large relative to their proposed market or where there may be a rapidly growing supply of the commodity to be produced by the project.

The ways in which projects can increase physical production are virtually unlimited. An irrigation project is proposed to permit better water control so that farmers can obtain higher yields. Young trees are planted on cleared jungle land to increase the area devoted to oil palm production. A credit project makes available capital resources so that farmers may increase their expenditures both on production expenses—

fertilizer, seeds, or pesticides, for example—and on investment—a tubewell or a piece of agricultural machinery. The benefit is the increased production from the farm.

Quality improvement. In some instances, a benefit from an agricultural project may take the form of a quality improvement. In Ecuador, for example, one analysis for a credit project to make loans to beef cattle producers assumes not only that ranchers will be able to increase their cattle production but also that their new investments will enable them to increase the quality of their animals so that the average live price of steers per kilogram will rise from 5.20 sucres to 6.40 sucres in constant value terms over the twelve-year development period. Loans to dairy farmers may be intended to permit them to switch from producing market milk for processing to milk of a high enough quality for fresh consumption. Most often in agricultural projects both increased output *and* quality improvements are expected, but this is not necessarily the case. One word of warning: be careful when estimating quality improvement benefits since it is easy to overestimate both their rate and extent.

Changes in location and time of sale. In some agricultural marketing projects the benefits will arise from improved marketing which changes the location and the time at which the product is sold. A grain storage project may make it possible to hold grain from the harvest period when the price is at its seasonal minimum to a time later in the year when the price has risen. The benefit of the storage investment arises out of this change in “temporal value.” Other marketing activities may include transportation to carry products from the area where they are produced and prices are low to distant markets where prices are higher. The benefits of the project arise from the change in “location value.”

Changes in form (grading and processing). Loans to agricultural processing industries anticipate a benefit which will arise from a change in the form of the agricultural product. Farmers sell paddy to millers who, in turn sell polished rice. The benefit arises from the change in form. Canners preserve fruit, changing its form and making it possible to change its time of sale or location more cheaply. Even such a simple processing activity as a grading shed gives rise to a benefit through changing the form of the product from run-of-the-orchard to sorted fruit.

Cost reduction. In addition to increased value of output, benefits in agricultural projects may arise from a reduction in costs.

Gains from mechanization. The classic example of cost reduction is investment in agricultural machinery to reduce labor costs which may happen where tubewells substitute for hand drawn or animal drawn water, pedal threshers replace hand threshing, or that favorite example, tractors replace animal draft power. Total production may not increase, but there is a benefit arising because the costs have been trimmed (providing, of course, that any labor displaced can be productively employed elsewhere).

Reduced transportation costs. Cost reduction is a major source of benefits in agricultural marketing projects where transportation is a factor. Better transportation may reduce the cost of moving produce from the farm to the consumer with a resulting benefit which may be distributed among farmers, truckers, and consumers.

Losses avoided. One kind of cost reduction benefit may arise because of a loss avoided. This kind of benefit stream is not always obvious, but it is one which the "with" and "without" test tends to point up clearly. In Jamaica lethal yellowing is attacking the Jamaica Tall coconut variety. A large-scale investment is being undertaken by the Government of Jamaica to enable farmers to plant Malayan Dwarf coconuts which are resistant. Total production will change very little as a result of the investment. Yet farmers and the economy will realize a real benefit because of the loss of the former income which is avoided through the new investment. Projects for irrigation system maintenance or soil conservation may not envision any increase in production. Instead, the benefit arises from the loss of irrigation water avoided or the soil erosion prevented. Simple storage projects may avoid rodent damage.

Secondary Costs and Benefits

The realization that projects can lead to benefits being created or costs being incurred which arise outside the project itself has led to the argument that economic analyses should allow for "secondary" costs and benefits to be attributed to project investments. (Of course, this would be important only in economic analysis; the problem does not arise in financial analysis.) Both identifying and valuing these secondary effects has been the subject of a substantial and continuing exchange among economists.

Contemporary discussions of secondary effects generally distinguish among three varieties of such benefits: (1) the "customary" variety of "stemming from" and "induced by" generally treated analytically

by adjusting price relationships to reflect opportunity costs more adequately but sometimes treated by considering a project investment to have "multiplier" effects; (2) those due to scale economies; and (3) "dynamic secondary effects" which actually change the form or productivity of the resources involved. While it may be true that in terms of the economic development aspects of public investment the scale effects and the dynamic effects hold the greatest potential for large-scale impacts on the economy, they are by nature so difficult to evaluate that few attempts have been made to deal with them empirically. Analysts still do not have enough information about scale effects in projects to be able adequately to predict their magnitude or occurrence. Dynamic secondary effects prove extremely difficult to analyze given the existing state of economic development theory. Thus, the attempts which have been made to analyze scale effect and dynamic secondary effects have been of a largely theoretical nature and have little operational significance. Faced with these theoretical obstacles, economists concerned with secondary costs and benefits have spent most of their time and effort attempting to identify and measure the "stemming from" and the "induced by" effects.

Even a definition of secondary costs and benefits has given the profession difficulties. The most common example of secondary benefits which is used to illustrate "stemming from" and "induced by" effects is that of the new values which arise as a result of increased grain production from a new irrigation project. The direct benefit (in these discussions often termed the "primary" benefit) is the value of the increase in the grain output less the associated increase in the farmers' costs. The increased grain output, however, will involve increased activities by grain merchants, transportation concerns, millers, bakers, and so on, and, hence, give rise to an increase in their profits. If these new profits total, say, half the increase in the value of grain at the farm gate then it is argued that secondary benefits equal to this amount should be credited to the irrigation project investment. This is an example of "stemming" or "forward" linkage secondary benefits; "induced" or "backward linkage" secondary benefits, in contrast, are the extra profits made by firms which sell inputs to farmers.

The most commonly mentioned secondary benefit in developing countries is that of employment. It is argued that in many countries substantial unemployment and underemployment exist. By investing in a project new employment opportunities are created, and new wealth

is generated. Further, as newly employed people spend their wages additional employment is created as new service and production opportunities open up—a “multiplier” effect arising from the project investment which could properly be attributed to the project as a secondary benefit.

When there is a properly functioning price mechanism—one which accurately reflects the true values of the commodities—the argument in favor of including secondary costs and benefits in a project analysis becomes highly questionable. The market demand for wheat is a “derived” demand—one which arises from a “final” demand for bread from consumers—and so reflects the value of extra bread and the marginal costs for transportation, milling, and baking. In such a price environment, the values of wheat, transportation, bread, and so on are properly estimated, as is the value of the increased grain produced and the increased farm costs. All capital resources and all labor would be productively employed. The estimate of direct benefits obtained by using the price of wheat and the price of farm inputs is an adequate reflection of all the project benefits and no secondary effects would arise.

The problem is, of course, that such perfectly adjusted market structures only rarely exist, at least in developing countries. When market prices fail to reflect true costs and benefits and where there is unemployed or underemployed labor then project investments can lead to benefits not incorporated into an analysis based solely on market prices. There are two ways to deal with this in order that projects can be ranked appropriately taking into account both the primary and secondary benefits. The more straightforward and simpler is to impute a new price for those items which are not properly valued by the price mechanism and to use these prices in the economic (not financial) analysis of the project. In effect, this means that at least the largest part of all the effects which can be identified whether “primary” or “secondary” are incorporated directly into the project analysis and imputed as direct benefits to the project investment. Projects can then be ranked by their relative effectiveness in utilizing resources and no further adjustments need be made to allow for secondary effects.

An alternative approach to allowing for secondary benefits is to increase the benefit derived at market prices by some factor which represents the “multiplier” of the investment. Since different kinds of investments (or, at least, public sector investments as

opposed to private sector investments) could have different secondary effects, this adjustment would permit ranking different projects according to their overall impact on the economy including both their primary and their secondary effects.

It turns out, however, that there are many such relationships and thus it is simplistic to think in terms of “the multiplier,” although most discussions tend to make that assumption. The basic approach to secondary effects analysis through the multiplier effect has tended to revolve around the estimation of aggregate changes in output resulting from the secondary impacts of increased expenditures due to a public project. A multiplier concept in some form has been derived to estimate these impacts. Yet the conditions under which the full multiplier effects of an agricultural project as they are typically estimated would constitute a real net change in welfare are specific and operationally very limiting: (1) the public expenditure is not financed out of tax revenues so that the multiplier-creating expenditures are not drawn away from the private sector; (2) the conditions of supply for all factors stimulated to employment by the investment are perfectly elastic at prevailing prices; (3) the opportunity costs of those factors in the absence of the investment are zero; and (4) the outputs which result do not simply substitute for other products in the market place and, thus, do not result in unemployment for other factors of production. That none of these conditions hold fully in the general case should be apparent, although, of course, some or all partially hold in many cases. Attempts to quantify the impact of multiplier effects, have, however, tended to assume that all of these conditions are fully met, and thus the “secondary benefits” which have been generally estimated using secondary impact analysis are really not net secondary benefits at all, even from the viewpoint of the factors being employed, but rather are gross changes in the demand for these factors. As a result, empirical estimates using multipliers have exhibited a consistent tendency to overestimate the real welfare effects of secondary impacts. The gross change in demand for a factor could be taken as fully a secondary benefit only if its supply curve were perfectly elastic at zero price—that is, it had absolutely no other alternatives. Given these very restrictive conditions, secondary effects estimated from most projects will be grossly miscalculated using multiplier analysis alone without substantial adjustments.

A case where secondary benefits may be important and which is of particular interest to those concerned

with agricultural projects arises when development roads are to be built into hitherto inaccessible areas. It is argued that the production arising because of the induced investment activities of otherwise unemployed new settlers should be considered a secondary benefit of the road investment. This would seem to be a case of dynamic secondary effects and it proves extremely difficult to deal with in project analyses. One way of avoiding this problem is to view such a case as a land settlement project of which the road forms a component part. New production is then properly included among the direct benefits of the project, can be valued at market or shadow prices, and no attempt need be made to allocate the benefits between the road investment and the other kinds of investment which must be made by settlers and the government if settlement is to succeed.

A group of what have been called secondary costs have also been the subject of discussion in the professional literature. These have been termed "technological spillover" or "technological externalities." An example is the increased cost for dredging which arises downstream when a dam reduces river flow. These costs have been termed secondary because they occur away from the project site, but a better approach is to consider that they are direct costs of the project wherever they may occur and to include them as such in the economic analysis. In recent years adverse ecological effects have been mentioned as among the secondary costs of projects. Again, these are technological spill-overs and when they can be valued (or the costs of averting them can be estimated) they should properly be incorporated as among the direct costs of the project even if they do not occur at the project site.

Although the debate about secondary benefits persists in the economic literature and attempts continue to be made to incorporate some notion of secondary effects in project analysis through the use of a multiplier—especially in the United States—the weight of professional opinion remains skeptical. It seems best to conclude that for the present for most projects in developing countries it is better not to try to allow for secondary effects through the use of a multiplier. The major kinds of secondary benefits which are agreed to exist are better incorporated into the economic analysis by using shadow prices to reflect true opportunity costs. This appropriately treats the resulting benefits as being primary in nature and as arising directly from the project investment. The practice of the World Bank and that of most other international lending agencies reflects this conclusion.

Intangible Benefits

Almost every agricultural project has a group of costs and benefits which are "intangible." These may include better income distribution, national integration, national defense, or just a better life for rural people. Such intangibles are real and reflect true values. They do not, however, lend themselves well to valuation, although an attempt is sometimes made. (In the United States, irrigation projects will sometimes include among their benefits an allowance for improved recreation.) In most cases it would seem economic and financial analysis is an inappropriate tool to use for dealing with intangible effects. In any event, the final selection of a project depends on a whole range of considerations which must of necessity rest on subjective judgment. In one sense, that is what we are saying when we say that projects give rise to intangible effects. The best practice seems to be to acknowledge that intangible effects exist and are important but not to attempt to value them nor to include them in the economic analysis computations.

SELECTING PROPER VALUES

Once costs and benefits have been identified, if they are to be compared they must be valued. Since the only means to compare differing goods and services directly is by giving them a money price, this comes down to saying we must find the proper prices at which to enter costs and benefits into our analysis of agricultural projects.

Prices Reflect Values

Underlying all economic and financial analysis is an assumption that prices reflect values or can be adjusted to do so. Unless you have delved into economic theory a bit, it may not have occurred to you to worry much about this, but the fact is that market prices do not always do a good job of reflecting economic values.

Basically, economists hold that a "perfect" market—one which is highly competitive with many buyers and sellers—will wind up with every economic commodity priced at its marginal value product. That is, the price of every good and service will just exactly reflect the value the last unit utilized of that item contributes to production. Whenever a unit of goods or services can produce more in some other activity, its price will rise and it will be attracted there. When the economy is in "equilibrium," the "opportunity cost"—the best use in an alternative production

process—the marginal value product, and the price will all be equal. Resources will then have been allocated through the price mechanism to that use where the last unit utilized of every good and service in the economy is at its most productive use; no transfer of resources could result in greater output. Obviously, however, “perfect” markets do not exist, and, hence, prices do not always reflect values.

Without trying to push any further into price theory, we can turn to some direct implications for agricultural projects of this assumption that prices reflect values.

First, let it be noted that although markets are imperfect and prices subject to question, there is a large nugget of truth in the theory. Generally, the best approximation of a “true value” of a good or service which is traded is its market price. Put another way, if you can find a market price for an item, that is normally the best price to use in valuing either a cost or a benefit. In financial analysis, you *always* use the market price or your best estimate of it. In economic analysis, on the other hand, you may feel some price other than the market price is a better indicator of the value of a good or service—a so-called “shadow price,” a subject to which we return below. Remember, however, that the burden of proof is on you. In most instances, it is better to devote your time to trying to find the appropriate market price—not always an easy task, either—than to trying to determine a shadow price.

In all project evaluations it should be kept in mind that economic and financial analyses primarily deal with considerations of costs and benefits which are quantifiable in money terms. There are many, many other, nonquantifiable or noneconomic values which must be considered in a final judgment about whether to go ahead with one project or another. These values range all the way from considerations of national identity or national defense to such values as reduced water pollution, recreation benefits, or the advantages of literacy. Economists keep trying to enlarge their ability to attach monetary values to these benefits since the resources they require for realization must compete with alternate uses for clearly quantifiable benefits—increased rice production for hungry people, say, versus a better environment. But in the end, every project must ultimately be accepted or rejected on the basis of a subjective judgment about its worth; economic and financial analysis contribute to improving the quality of that judgment, but they do not replace it. The inadequacy of prices as a measure of values is only one more reason why this is the case.

Which Price to Use?

If some sort of market price is probably the best approximation of the “true” value of a good or service in an agricultural project, which price should we use? Often, even in a relatively good market, the problem of choosing the right price is not all that easy.

Point of first sale and intermediate goods. Other things being equal, perhaps the best place to value the output of a project is at the point of first sale. If the point of first sale is in a relatively competitive market and we can accept the price as a relatively good one (that is, a relatively accurate reflection of its true marginal value product), or if we can find an acceptable shadow price, then this provides a good measure of the value of the output.

During the production process there are often important intermediate goods—items used primarily as an input for some other production process—which are not freely sold. In that case, we may find we must define our project in such a way as to carry the production process forward to the point of first sale. Irrigation water is a good example. The “product” of an irrigation system—water—is, of course, really intended for use to produce agricultural products, and the price is generally determined administratively, not by any play of competitive market forces. If we were to try to separate out the irrigation system from the production it facilitates, we would be faced with a very difficult problem of determining the value of irrigation water. Hence, it is not surprising most irrigation projects take the value of the agricultural products which *are* offered on a relatively free market at the point of first sale as the basis for the benefit stream.

Inflation

Most countries have an experience of inflation and the only realistic assessment of the future is that inflation will continue. This raises the question of how to cope with inflation in project analysis. One means would be to inflate all costs and returns by what you expect will be an average rate of inflation. However, this is cumbersome and unnecessary (and may sidetrack discussion of your analysis to a discussion of probable rates of inflation). Much the better solution if it accurately reflects your expectation of reality is to assume that all prices on both the cost side and the benefit side will rise uniformly by the same proportion and that therefore they will not change their *relative* values. Then your analytical procedure can be simply to value all future prices at today’s levels, knowing full well that

future money prices will rise. This is equivalent, of course, to deflating all costs and benefits by some kind of price index, say, keeping all prices constant in terms of 1972 dollars.

Of course, if it is your expectation that inflation will have a different impact on some prices than on others, then your analysis will have to reflect the change in relative prices. Such differences might occur, for example, if you think the domestic rate of inflation will be different from that of world inflation or if you think inflation will affect costs to a different degree than benefits. In such a case, it is likely the best procedure is to assume constant prices for all items except the ones which you think will be affected to a different degree by inflation. Then the prices for those items you think will be influenced differentially, can be increased or decreased to reflect your views about relative changes in prices arising from the differing impact of inflation.

Shadow Prices

Shadow prices (which some economists prefer to call "accounting prices") are a very tricky and controversial aspect of the economic analysis of projects. In this brief discussion we will hardly deal with the theoretical problems that are raised; instead I will suggest pragmatic solutions to some problems of shadow pricing applied to agricultural projects. (Note that the whole question of shadow prices refers *only* to economic analysis. In financial analysis, as we noted, use the market prices actually to be paid, whatever the "true" value and, hence, the shadow price might be for purposes of economic analysis.)

For various reasons, markets are imperfect. There may be institutional rigidities, price controls, imperfect information about prices offered by competing sellers or buyers, monopoly elements, "traditional" prices, and so forth. The list is endless. Because these imperfections exist, the use of market prices may introduce a significant error into the economic analysis of a project. The price of foreign exchange may be too low, for example, tending to favor projects with a high import content. Or the wages paid to labor may be too high, tending to favor capital intensive projects over labor intensive projects. To avoid these biases in the analysis of projects, we may use instead of the market price, a shadow price which is intended to reflect the "true" value of the commodity or service. For purposes of operational project analysis, a shadow price may be defined as that price which would prevail in the econ-

omy if it were in perfect equilibrium under conditions of perfect competition.

The rub, of course, comes in trying to find out what *is* the shadow price. Theoretically, it would be possible to work out a giant econometric model for the economy and to use that to define all the prices in the system, but only the most ambitious computer enthusiast would want to embark on such an effort. So, in practice, a much less elaborate approximation of the shadow price is used in project analysis (and in national economic planning, too, I might add).

In agricultural projects there are generally only three areas where I feel anyone trying to do an economic analysis should consider the use of shadow prices rather than market prices. These are for foreign exchange, for commodities which are important in world markets, and for unskilled agricultural labor.

Foreign exchange. For those concerned with analysis of agricultural projects the easiest shadow price to dispose of is that for foreign exchange. My suggestion is simple: use the shadow price (that is, rate of exchange) which the central planning unit is using. For one thing, if some projects use one shadow price for foreign exchange and others use another, the whole point of using shadow prices to value import content correctly and uniformly in various alternative investment analyses is lost. Furthermore, trying to estimate the foreign exchange shadow price yourself is time consuming and tricky. If you use the shadow price for foreign exchange which the central planning unit uses, then any questions about how the rate was set may be passed on to them, and you can proceed with the problems of agricultural projects.

World market prices. The second kind of shadow price which seems to make good sense in analysis of agricultural projects is the use of world market prices in place of domestic prices in protected markets. The reasoning here is that world markets—whatever their drawbacks—are more nearly perfect markets than protected markets. Thus the world market price for wheat is more nearly a true measure of the "value" of wheat than a domestic price. In the last resort, you could always choose to import wheat rather than to increase domestic production. If your shadow price for foreign exchange is right, this would not introduce a bias into your analysis.

All the kinds of problems we touched upon in discussing which price to choose reappear here when we try to decide which world market price to use for project analysis. The same kinds of considerations apply: the

appropriate grade, the allowance for costs of marketing from the farm gate to the point where the world market price is offered (at the port, for example), and the imperfections introduced into the world market by the existence of commodity agreements.

A point to be mentioned is that shadow prices for agricultural products should not be limited to those crops which are intended for export. A better measure of the worth of an investment to a country may be obtained by shadow pricing the output of an agricultural commodity to be produced in a project than by using a domestic price, even if the commodity is expected to be largely locally consumed. Thus, it would seem to me that rice in Malaysia should be shadow priced at the world market price rather than the higher domestic support price for exactly the same reason that I think cocoa should be shadow priced in Ghana rather than valued at the domestic price depressed by the Marketing Board margin.

For many crops, of course, the question of world markets hardly enters and these would have to be priced at the domestic price level—vegetables, cassava, meat, and the like.

Labor. Now we turn to what seems to me to be the most difficult problem of shadow pricing: agricultural labor.

The price of labor in a perfectly competitive market would be determined by the marginal value product of the labor. That is, the wage would be equal to that amount of product which an extra laborer hired would produce. This is because it would pay a farmer to hire an additional laborer—for harvesting, for example—as long as the worker increases total output by more than the farmer has to pay for the additional labor. If labor is short and there is an active labor market, then the wage rate is probably a fairly good approximation of the real marginal value product of labor, although imperfections in the labor market are more prevalent than for any other item for which we try to establish a price.

The problem is, of course, that in many crowded countries the addition of one more laborer may not add anything at all to the total product. That is, if there is a surplus of agricultural workers there may be no productive outlet for their energies. In the jargon, we may say that the marginal value product of such labor—the amount that it adds to the gross domestic product—is zero. Since the marginal value product is also the opportunity cost of labor in equilibrium, we may make another statement: if we take labor away from a farm community where it is producing nothing and put it to

work producing something, then we do not have to forego any production in order to realize the new product. If an agricultural laborer was adding nothing to the production in his community, then we lose nothing by transferring him to productive labor elsewhere. This being the case, we need not consider that this labor has any cost attached to it. Its true wage is zero because that is what it could otherwise produce. Following this line of argument, the proper price to charge in the economic (not financial!) analysis of projects would be zero. And if the labor in an agricultural project is properly priced at zero, then it is likely the rate of return will look very favorable in comparison to, say, a capital intensive alternative project which uses labor saving tractors.

Note that the validity of this argument is not changed by the fact that agricultural labor is, in fact, paid a wage. This may well be due to a "traditional" concept of the "proper" wage, or to social pressures on the farmers who are better off in a community to share their wealth with their less fortunate neighbors. In parts of Java, for example, social custom prevents even quite small farmers from harvesting their own rice. Instead, they must permit landless laborers to do the work, even though the farmer himself may well have the time to do it. This is consciously seen by the community as a means to provide at least a little something for the poorest agricultural laborers.

At one time there was a large body of professional opinion which held marginal value product of labor in a number of Asian countries was, indeed, zero. More recently, professional opinion has swung to the view that the marginal value product is not quite zero, but often very close to it.

Now in practical terms where does this leave us? The problem of determining the "true" marginal value product of agricultural labor in an economy is extremely difficult. For purposes of project analysis, it would seem this question can be simplified without doing undue harm to the economic realities.

In some crowded communities the marginal value product of agricultural labor may be so close to zero as to make zero a good approximation of the real value. This would be the case where there is thought to be widespread disguised unemployment or where family labor cannot be adequately utilized. In these cases, it seems justified to shadow price unskilled agricultural labor at zero.

In other communities, there may be a very seasonal pattern to agricultural employment. During the harvest, for example, farmers may not be able to hire enough

labor to bring in their crop as fast as they would like to. In rice producing countries there may well be a shortage of labor at transplanting time, too. Under these circumstances, virtually every agricultural laborer can find employment at the peak season—and casual labor from urban areas may return to their home villages to help out. Surely at these peak times, the marginal value product of agricultural labor is not zero. Thus, for purposes of agricultural project analysis, it would seem reasonable to suggest that the price of labor in these cases be valued on an annual basis at a price which is determined by multiplying the wage when labor is scarce by the number of days in a year when it can be considered that labor is reasonably fully employed. This might mean, for example, that where the going wage is Rs. 5 a day and labor is scarce for 50 days a year during planting and harvest, that the *annual* wage for unskilled agricultural labor for a project analysis could be shadow priced at Rs. 250, even though it was expected that the labor would work 200 days a year and be paid an annual money wage of Rs. 1,000.

The third position is to value agricultural labor at the wage it commands. This is equivalent to saying not only is the marginal value product of agricultural labor more than zero, but in fact laborers produce additional output worth something near the value of their wage. In this case there is no shadow price.

The case where farmers create their own capital items by direct investment, such as building their own houses, digging their own irrigation canals, or clearing their own land may raise questions about shadow pricing the farmers' own labor at zero. The argument is that the farmer builds his house in his spare time and consumes no more food as a result of his efforts. The house, of course, is not considered to be costless—the value of the materials is a clear cost; only the labor cost

is shadow priced. In cases where farmers are working full time to create capital, as may be the case in land clearing or maintaining perennial crops until they are in production, the normal practice is to value the labor at the consumption level of the farmers. In the case of Federal Land Development Authority projects in Malaysia, for instance, the labor of farmers maintaining their own holdings before they come into production is priced at the maintenance allowance which the farm families receive.

Although agricultural labor in a country or project area is presently unemployed or underemployed, this may not be the case ten years hence when development has had a chance to proceed. In this case, you may wish to use all three positions I have suggested: from the first to the tenth years your shadow price would be zero; from the eleventh through the twentieth years labor would be thought to be fully employed at the peak season so you shadow price agricultural labor at, say, one-half the annual money wage; and from the twenty-first year to the end of the project analysis period you use the going wage rate as the best indicator of the value of agricultural labor.

While the value of unskilled agricultural labor may reasonably be shadow priced below the going wage rate, skilled labor probably should not be. In most cases skilled labor is quite scarce, and, indeed, a case may even be made for saying certain kinds of skilled labor should be shadow priced at a level *above* its wage to reflect its scarcity.

Capital. Shadow pricing capital is so common in project analysis that it is frequently not recognized for what it is. Comparing proposed projects to the opportunity cost of capital instead of the actual borrowing rate, for example, amounts to using a shadow price for capital.

Cost-Effectiveness Analysis

Peter Delp

Cost-benefit analysis requires that inputs and outputs be described in comparable units. For some kinds of projects this is unrealistic. Health and nutrition, population control, and education are common examples where a variation, cost-effectiveness analysis, promises to be more useful. The underlying principle—efficient use of resources—is the same.

Cost-effectiveness analysis employs one unit—usually money—for inputs and an appropriate quantitative measure—couple-years of effective contraception, student-months of primary education, number of individuals vaccinated—to measure benefits.

Cost-effectiveness analysis is a straightforward tool with broad applications, but it is less powerful than cost-benefit analysis. Despite its limitations, cost-effectiveness analysis is appealing in its clarity and is a sound approach to appraising many kinds of projects.
[Ed.]

USAGE

Purpose

Cost-effectiveness analysis evaluates the *effectiveness* relative to the costs of alternative systems.

Uses

Cost-effectiveness analysis is used to:

1. Evaluate alternative means for achieving specified

ends, e.g., alternative components of a system or project design.

2. Evaluate and compare alternative projects or systems for the purpose of selecting the most cost-effective alternative.

3. Analyze the tradeoffs in varying the size, complexity, or scope of a design, e.g., estimating the cost of increased effectiveness.

Key Definitions

1. The *effectiveness* of a project or system is the degree to which the project or system design objectives are achieved.

2. *Project efficiency* is the ratio of project outputs to inputs, e.g., the production rate for a given resource utilization rate.

3. A *system* is a collection of components that interact to achieve a common function.

Short Description

Cost-effectiveness analysis is a crucial step in a systems analysis strategy. After deciding on objectives, identifying alternative means to achieve the desired ends, and establishing criteria for evaluation, components are selected that maximize cost-effectiveness. Costs and effectiveness are central to the evaluation and design of systems or projects.

The criteria are used in one of two ways to rank alternatives:

1. By least-cost, considering only those alternatives that achieve the specified minimum level of effectiveness.

2. By maximum effectiveness, in which all alternatives have been designed so as not to exceed a specified maximum resource requirement.

Cost-effectiveness analysis is similar to cost-benefit analysis except that the non-monetary performance of the project is estimated.

Advantages

1. Cost-effectiveness analysis ranks alternatives by a process that is accessible to critical examination, in contrast to intuitive or committee decisionmaking processes. The technique provides a framework for systematic decisionmaking and "efficient employment of the knowledge, judgment, and intuition of available experts" (Quade, 1968, p. 32).

2. While the benefits accruing from a project are often not measurable (particularly in monetary terms), indexes of effectiveness can always be developed from project goal statements.

3. In contrast to *project efficiency* measures, e.g., the benefit-cost ratio and the internal rate of return, cost-effectiveness analysis compares the relative achievement of goals.

4. Because cost-effectiveness analysis is a carefully structured approach, the process leading to a decision may be retraced; and new knowledge or different subjective judgments can be used to update recommendations.

Limitations

The analyst must necessarily limit the scope of a cost-effectiveness study, which may lead to suboptimization. The most cost-effective alternative may not be the best choice when the larger problem situation is considered.

The complexity of the analysis increases significantly if more than one future situation (contingency) is examined. Consequently, analysts and decisionmakers tend to restrict the analysis to the most likely contingency.

Projects with different objectives cannot be compared using cost-effectiveness analysis because the scales of effectiveness will differ significantly. Cost-benefit analysis, although limiting the choice to financial or economic criteria, permits a comparison of these projects if benefits can be valued monetarily.

Ranking projects can be inconclusive when more than one measure of effectiveness applies. Often, determining a suitable measure of effectiveness is dif-

ficult, if not impossible (e.g., evaluating goal achievement of social service programs).

Cost-effectiveness focuses only on the system and its performance, in contrast to cost-benefit analysis which includes benefits and costs accruing to other elements in the environment. This may not promote better decisions, but cost-benefit analysis alerts the decisionmaker to these issues.

Cost-effectiveness analysis may be used to choose among projects only if they are alternative means to the same ends. Otherwise, a common measure of effectiveness cannot be identified for evaluating each alternative.

REQUIRED RESOURCES

Level of Effort

The major task in cost-effectiveness analysis is gathering information to measure effectiveness and cost. Once these data are obtained and transformed into quantitative measures, the analysis is essentially complete.

Skill Level

Considerable judgment must be applied to determine measures of effectiveness and to apply them in the analysis. This is never strictly a mechanical process of translating goals into measures, although construction of a system model is desirable for analyzing performances of large complex systems (or projects).

Time Required

A cost-effectiveness analysis may take several days if many projects are to be compared on more than one measure of effectiveness. The actual time required depends primarily on the availability of appropriate information.

DESCRIPTION OF TOOL

Supplemental Definitions

1. *Resource analysis* is the "process of systematically determining the economic resource impact of alternative proposals for future courses of action" (Fisher, 1968, p. 124). It includes not only estimating the direct costs, but measuring the drain on economic resources that could result if various alternatives were selected and implemented, e.g., diverting essential raw materials and skilled manpower to a project.

2. *Sensitivity analysis* is a process of varying the estimated values of selected parameters in the design in

order to determine the sensitivity of results to the uncertainty of the estimate. For example, the variation in total system cost is determined for selected values of key system specifications such as size, responsiveness, or reliability.

Required Inputs

The objectives must be established. Alternative means will have to be specified, e.g., various project approaches have been identified.

Cost data must be available to determine the cost for each alternative.

Tool Output

Cost-effectiveness analysis presents a rank-ordering of alternatives to aid decisionmakers. It does not select the best alternative unless non-quantifiable variables such as the political, social, and cultural implications are to be ignored—an unlikely situation for development planning. Consequently, the results of the cost-effectiveness analysis represent one part of the total information desired for project selection.

If project effectiveness is not identifiable as a single measure, the analysis may result in several rankings of effectiveness vs. cost, all of which are presented to the decisionmaker.

Important Assumptions

The results of a program or project can be evaluated using a criterion that measures the achievement of objectives. The objectives are determinate, stationary, and stable over the life of the project and consensual among the decisionmakers. Although these assumptions are not limiting, they should caution the decisionmaker and analyst against naively applying a cost-effective criteria without considering their implications.

METHOD OF USE

General Procedure

1. Given the project or system goals, identify the measure of effectiveness.
 - 1.1 Translate each goal into measurable sub-objectives.
 - 1.2 Repeat 1.1 until quantifiable sub-objectives are identified.
 - 1.3 Select quantifiable objectives which characterize the effectiveness of the project/system.

2. Construct an effectiveness scale.
 - 2.1 Determine the units of measurement, e.g., passenger-miles per hour, extension contact hours per farmer.
 - 2.2 If necessary, use a dimensionless index to compare subjective estimates of effectiveness.
 - 2.3 Identify the range of the effectiveness scale, typically 0 to 1 for an index.
3. Give alternative means and evaluate their effectiveness.
 - 3.1 When feasible, construct an analytical model to compute effectiveness estimates for each alternative.
 - 3.2 When mathematical modeling is not feasible, estimate the effectiveness subjectively. Pooled expert judgments may be used, or empirical data may be obtained (either by experiment or pilot study).
4. Determine costs by making a resource analysis of the alternatives.
 - 4.1 Determine a basis for costing that is comparable across all alternatives.
 - 4.2 Identify direct costs, both initial and recurrent, and costs associated with making resources (e.g., raw materials and manpower) available to the project.
 - 4.3 If the costs are distributed differently in time for each alternative, discount all costs to determine the present worth.
5. Rank-order the alternatives.
 - 5.1 Compute the ratio of effectiveness to costs for each alternative.
 - 5.2 Plot effectiveness vs. cost (optional).
 - 5.3 Determine the cut-off levels for considering alternatives:
 - a. If a minimum level of effectiveness is required, ignore all objectives that fall below this level. If none exceed the level, either change the specification or identify new alternatives.
 - b. If a maximum level of cost is permitted, ignore all alternatives that exceed this limit. If none have acceptable costs, consider scaling down the scope of the alternatives or identify less costly means.
 - 5.4 Rank-order the remaining alternatives using the ratio of effectiveness to cost. If two or more alternatives have identical ratios, select the

FIGURE 1
Reliability and Acceptance Rates for Alternative Means of Birth Control

Alternative Means	Probability of Preventing Pregnancy	Average Acceptance Rate for Specific Population	Effectiveness
Male contraceptives	.90	70%	63
Female contraceptives: Hormone pills Intrauterine devices	.95 .90	80% 50%	76 45
Male sterilization	.99	5%	5
Female sterilization	1.00	20%	20

FIGURE 2
Cost Analysis of Alternative Means of Birth Control

Alternative Means	Couple Year(s) of Protection	Estimated Method Cost ¹	Protection Cost Per Year
Male contraceptive	0.0083/condom ²	ψ 4.2/condom	ψ506
Female contraceptive Oral Intrauterine	0.0667/cycle ³ 3/IUD ⁴	ψ 30/cycle ψ 60/IUD	ψ449 ψ 20
Male sterilization	10 ⁵	ψ450	ψ 45
Female sterilization	10 ⁶	ψ900	ψ 90

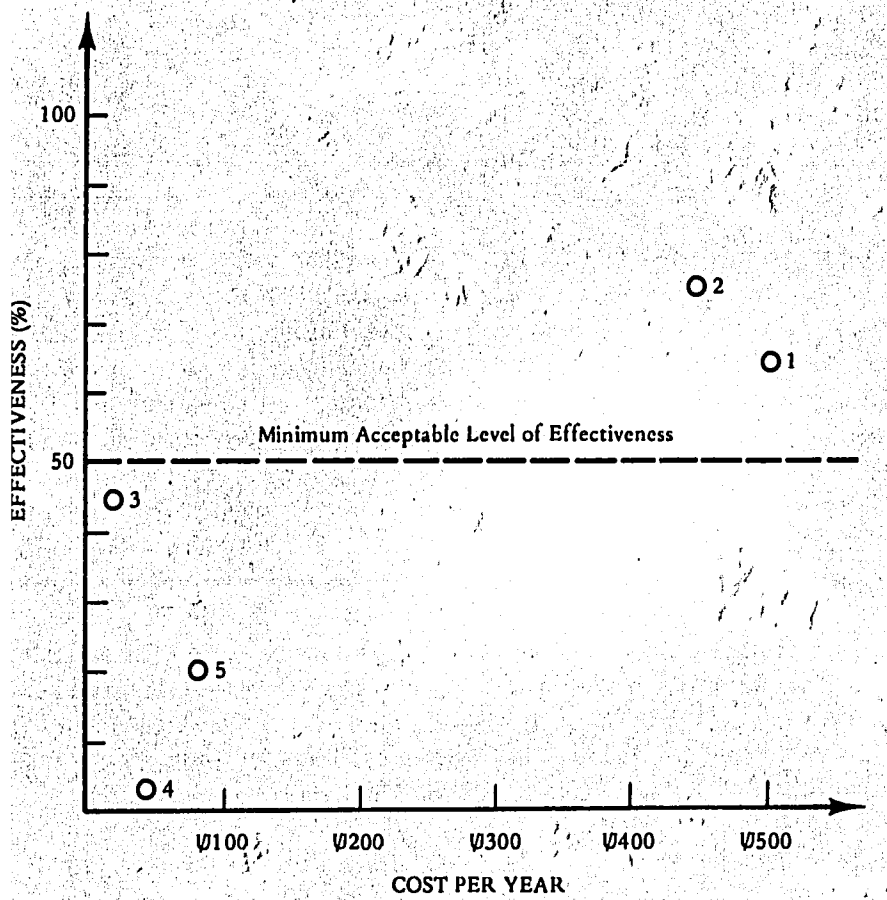
1. ψ = Unis = the national currency of Temasek.
2. Assuming an average use of 120 condoms per year.
3. Assuming 15 cycles are required each year (including wastage).
4. Assuming each IUD inserted is retained for an average 3 years.
5. Assuming 10 years from average age of sterilization (35) to onset of menopause.
6. Assuming same average age of wife of the man sterilized.

FIGURE 3
Cost-Effectiveness of Alternative Birth Control Means

a) Effectiveness-Cost Ratio

Alternative	Yearly Cost ψ	Effectiveness %	Ratio: Effectiveness to Cost
1. Male contraceptives	506	63	0.12
Female contraceptives			
2. Oral	449	76	0.17
3. IUD	20	45	2.25
4. Male sterilization	45	5	0.11
5. Female sterilization	90	20	0.22

b) Plot of Effectiveness vs. Cost



most effective or least costly depending on whether (a) or (b) holds.*

6. Test the sensitivity of the rankings.
 - 6.1 Select a variable (cost or effectiveness) for which the estimate is most certain.
 - 6.2 Using either the analytical model or an experimental design, estimate how a small change in this variable will affect the subsequent computation.
 - 6.3 Repeat 6.2 for several values included in the likely range of the variable.
 - 6.4 Present the sensitivity analysis results to the decisionmaker as a range of variation in the effectiveness to cost ratio or as a box which indicates the uncertainty on the plot of effectiveness vs. costs.

Example

The Temasek Family Planning Council proposed to examine the cost-effectiveness of various means of birth control in use in Temasek. The objective of the project was to determine the best means of birth control for funding. Two criteria were identified: the reliability of the particular method and the percentage of the population accepting that method. The effectiveness was defined as the product of reliability and rate of acceptance (see figure 1).

The next step was to analyze the costs of the alternatives. The measure adopted was the equivalent Couple Year of Protection for each technique (Edmonds, 1975). For example, data indicated that each couple used an average of 120 condoms per year. Then each condom afforded 0.0083 CYP. Similarly, a sterilization operation would protect a couple for the remaining child-bearing years. The corresponding CYP was computed by subtracting the average age at sterilization from the average age for onset of menopause (see figure 2).

The protection cost per year of each birth control technique was computed by dividing the estimated method cost* by the CYP. On a cost basis alone, there

were vast differences in the resources required to provide a year of protection by various alternatives.

The costs were compared to the estimated effectiveness (see figure 3). Computing the ratio of effectiveness to cost revealed that an intrauterine device was by far the most cost-effective technique. However, the level of effectiveness was estimated at less than 50 percent (due to the low rate of acceptance). If 50 percent were taken as the minimum level of effectiveness, then only oral contraceptives and condoms would be considered.

This analysis considered only the means of birth control. A cost-effectiveness analysis of a birth control program would ultimately have to examine the effects of using various techniques on the birth rate vs. the infrastructure necessary to deliver the techniques. Unfortunately, such an analysis is complicated by (1) the delay in observable changes in birth rate and (2) the multitude of alternative explanations for changes in birth rate. The problem in evaluating cost-effectiveness of these programs is described in Schultz (1972). In an earlier paper, Schultz (1967) formulated an economic model of family planning in order to measure benefits vs. costs.

THEORY

Cost-effectiveness derives from cost-benefit analysis (Rowen, 1969). Defense Department analysts realized that valuing the benefits of weapon systems was not feasible and looked for other measures of system performance. The theoretical analysis of system models and tactical and strategic plans followed (Quade and Boucher, 1968). The technique has been applied to policy planning and project design in fields like social services. The formidable task of valuing benefits is circumvented by using nonmonetary effectiveness scales to compare alternatives.

The role of resource analysis and sensitivity analysis in cost-effectiveness studies is presented by Quade and Boucher (1968). DeNeufville and Stafford (1971) address additional theoretical issues, such as determining the optimum system effectiveness as a function of the cost.

Krueckeberg and Silvers (1974) give an excellent description of cost-effectiveness analysis applied to urban planning and the theoretical basis for selecting among alternative projects using the effectiveness-cost ratio.

*Specifying both a minimum level of effectiveness and a maximum acceptable cost may lead to an under-specification of the system. The designer may fail to identify the most cost-effective alternatives.

*These costs ignore the infrastructure required for delivering the various techniques. Although this could be incorporated into each method cost as an overhead component, a separate analysis of the means of delivery is more appropriate.

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PART II

Three Methodologies for Cost-Benefit Analysis

The essence of a cost-benefit analysis is that it does *not* accept that actual receipts adequately measure social benefits, and actual expenditures social costs. But it does accept that actual receipts and expenditures can be suitably adjusted so that the difference between them, which is therefore very closely analogous to ordinary profit, will properly reflect the social gain.

I.M.D. Little and J.A. Mirrlees
From *Project Appraisal and Planning*

The UNIDO approach begins with a definite commitment to the simultaneous pursuit of more than one objective, or dimension of welfare, in project formulation and evaluation.

Stephen Marglin
"The Essentials of the UNIDO Approach"

The economic rate of return of a project defined in terms of prices that incorporate distributional weights (social prices) may be called its "social rate of return." It will frequently differ from that calculated on the basis of traditional efficiency prices.

Anandarup Ray and Herman G. van der Tak
"The New World Bank Approach to the
Economic Analysis of Projects"

This section introduces three major methodologies for social cost-benefit analysis that appeared in the 1970s. The intent of each is the same, and the strategies are consistent with traditional appraisal systems, though more elaborate. The differences among the methodologies are mostly matters of emphasis and mechanics, though they can be significant when it comes to putting a methodology to work for designing and selecting projects. Where these approaches differ most from traditional practice is in establishing values for project inputs and outputs. Each methodology is built around a system of shadow prices, a system rooted in

the application of theory and logic to a survey of a project's economic context.

The first reading is from *Project Appraisal and Planning* by I.M.D. Little and Jan Mirrlees. In the previous section, J. Price Gittinger described projects as the "cutting edge" of development. Little and Mirrlees, invoking a less vigorous but perhaps more apt metaphor, say that projects are the "building blocks" of a plan; they point out that a plan can be no more solid than its parts.

Little and Mirrlees engage an issue that inevitably confronts proponents of elaborate shadow pricing sys-

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tems: Why bother? They insist—simply—that good project design is of such overwhelming importance that bringing the right information to bear on project choices warrants considerable effort. They insist too—though more or less implicitly—that such effort can and will consistently foster better projects.

The notion of “social profit” that Little and Mirrlees develop and contrast with private profit, centers on the distortions and imperfections in market systems that act against efficient resource use through market forces, particularly in underdeveloped economies. The second reading broadens the scope of social profit. *Guidelines for Project Appraisal*, published under the auspices of the United Nations Industrial Development Organization, aims to apply cost-benefit techniques to further “national economic profitability,” a sort of umbrella objective that comprehends both aggregate consumption and concerns for equitable distribution. A reading by Stephen Marglin, one of the authors of the *Guidelines*, sets out the main features of the UNIDO approach.

Marglin begins with the same logic Little and Mirrlees establish: When market signals diverge from development priorities for whatever reason, commercial profitability becomes an unreliable guide to social value. Thus, projects undertaken with the end of maximizing social benefit should be shaped by cost-benefit accounting using shadow prices.

The UNIDO system of shadow pricing invites weighting costs and benefits to reflect concerns for equity as well as efficiency. It departs from the Pareto criterion, and Marglin makes this clear. Hence the *Guidelines* has a somewhat different emphasis than the Little-Mirrlees methodology, in the way weights are to be set. Little and Mirrlees envisage weights being

established in advance by political authorities and then applied to costs and benefits by project designers. The authors of the *Guidelines* doubt that officials would be able to formulate such technical parameters or willing to make unambiguous pronouncements about matters like distributional priorities. They propose instead that operating agencies present alternative project designs to decisionmakers, where the superiority of one design over another would depend on the value set for the discount rate or the relative priority of benefits to a backward region. The officials would then display their values through the choices they make.

The most recent methodological development is set out in *Economic Analysis of Projects*, written by Lyn Squire and Herman van der Tak and published under the auspices of the World Bank, although not as an “official” World Bank methodology. This book includes no fundamental concepts or procedures that do not appear in the other two approaches and is in many ways a hybrid of the two. Yet it is clearly different in at least two ways: It is designed largely for projects where external financial institutions like the Bank are involved, and it aims to offer a cost-benefit methodology less theoretical and more readily applied than either the Little-Mirrlees or the UNIDO approach.

The final reading contrasts the Squire-van der Tak methodology with more “traditional” cost-benefit methodologies, such as Gittinger’s.

Economic Analysis of Projects shares with the UNIDO approach an explicit emphasis on balancing equity and efficiency goals. The mechanics of this methodology, however, are mostly adapted, or adopted wholesale, from Little and Mirrlees. The similarities and differences of the three approaches are discussed in the last part of this section.

Project Appraisal and Planning for Developing Countries

I. M. D. Little and J. A. Mirrlees

Economists Little and Mirrlees offered the first attempt to bring together broad principles of economic theory and the calculations of project appraisal in 1968, when the Organization for Economic Cooperation and Development published the Manual of Industrial Project Analysis. This reading is drawn from a successor to that volume, expanded to encompass other kinds of projects. The bulk of the book deals with deriving and applying "accounting prices," the label Little and Mirrlees deliberately chose for shadow prices. These excerpts comprise an exceptionally lucid presentation of the need for, the intent, and the process of social cost-benefit analysis for development projects.

The authors define a project as any plan that can be sensibly subjected to project appraisal, including sub-projects and overall programs. They assert that this appraisal is likely to yield its full potential only when applied in the early stages of project design. It is sometimes argued that project appraisal is often of such limited use that it is not worth the effort. Little and Mirrlees emphatically disagree. They perceive an unavoidable choice facing project designers: Either inquire carefully and diligently into whether a proposal makes sense within its economic and social context or "put one's faith in God or in the insight of some other central planner."

Having made their position clear, they review the principles and process of discounted cash flow analysis

as it is applied to guide commercial investment decisions. They pronounce the basic methodology useful but point out that a commitment to "social profit" demands a broader view of costs and benefits. Continuing their case for social cost-benefit analysis, they go to the heart of classical economic theory and confront some basic issues with direct, and potentially profound, practical implications. Profit-seeking is a mechanism for getting things done. Prices point out what to do and how to do it. Profit-seekers, whether public or private, are led by price incentives to combine the lowest-priced resources to produce high-priced outputs. Thus they inevitably, even if inadvertently, perform a vital social function, transforming lesser into greater social value. The market mechanism, guided by price signals, makes this happen without central direction—when the price is right. But sometimes the prices are substantially wrong; prices can give inaccurate information about value. If the mechanism goes awry, it guides profit-seekers into enterprises of low social priority or induces them to use scarce resources in wasteful ways.

The moral: Project designers pursuing social profitability should beware the signals given by market prices. The Little-Mirrlees strategy: Craft a supplemental system of accounting prices to inform social cost-benefit analysis and shape project design. [Ed.]

PROJECT ANALYSIS: PRIVATE AND SOCIAL PROFITABILITY

Projects are the building blocks of an investment plan. All investment is planned by someone; factories and canals do not just happen. The plan cannot be good

From *Project Appraisal and Planning for Developing Countries*, by I.M.D. Little and J.A. Mirrlees, (c) 1974 by I.M.D. Little and J.A. Mirrlees, Basic Books, Inc., Publishers New York. Reprinted by permission.

if its constituent parts are faulty. This applies whether we are considering the investment plan of a corporation, or a country.

The Definition of a Project

We mean by a project any scheme, or part of a scheme, for investing resources which can reasonably be analyzed and evaluated as an independent unit. The definition is thus arbitrary. Almost any project could be broken down into parts for separate consideration: each of those parts would then be by definition a project. But it would not be sensible to consider separately two projects if they were so closely linked that one could not be operated, or fulfill its purpose, without the other. In such a case the two parts must be considered as a whole—that is, as one project.

Some examples will suggest when it is sensible to break down what would otherwise be a project into smaller projects for separate consideration, or build up what would otherwise be smaller projects into a larger one. A transmission system is essential to the functioning of a motor-car; but it is possible to buy transmissions, whose production can be considered as a separate project; furthermore, if it was decided to make transmissions it might be right to make them for other car manufacturers as well as for oneself. On the other hand, it would not make sense for an irrigation authority to present as two projects, for separate consideration, a dam and the main canal to distribute the water. These are both cases where one part cannot work without the other. The difference is that transmissions may be more economically made by another manufacturer, perhaps even in another country, possibly because he has spare capacity, or because they can be made on a scale which is not linked to the particular motor-car whose production is under consideration; while the canal is precisely linked to the size of the dam, and its construction cannot be economically integrated with other construction work.

One can give other examples where the separability or otherwise of parts of a project is more in doubt. Let us suppose an airport authority is considering turning a landing ground, with no runway and a few old huts, into a small civil airport. Should it expect its planning staff to present the proposed runway and terminal building as two projects or as one? A civil airport can hardly operate with no passenger facilities at all, but the huts could be used as a make-shift. Without the terminal there would be some traffic and many complaints: with it, traffic would build up a little more, and there would be

fewer complaints. This makes it possible to assess the terminal independently: it is a separable part of the airport, and its inclusion or exclusion makes a difference to costs and revenue. In theory, then, it should be a separate project. In practice, in such a case it is very possible that it would not be submitted to the board of management as a separate project.

The above example brings out the important point that projects are considered at many levels. The fact that the planner might submit only a design for a runway-terminal complex, together with a profitability analysis, to his board, does not necessarily imply that he has not himself considered the terminal as a separate project (and if he has not done so, he should have). It is possible that a very cursory consideration convinced him that it was not worth the detailed work required to present it separately to the board. Or again, he might be correct in assuming that the “intangible” factor of complaints would weigh so heavily with the board that the decision would be a foregone conclusion.

Thus designers and planners themselves accept and reject many sub-projects before making any formal submission of a project to higher authority. This is really part of the process of design, or formulation of a project. It is also inevitable. Higher authority cannot be consulted about everything. But we should further note that, in accepting and rejecting sub-projects, planners, down to quite junior levels, inevitably make judgments which are commonly thought of as judgments of policy. For instance, in failing to submit the terminal as a separate project, the planner may have been partly guided by the thought that air-passengers ought to be provided with certain standards of service. Moreover, in the design of the terminal itself, he must himself have taken many decisions of the same kind.

Planners, of course, must keep broadly in line with policies laid down from above. It is an essential part of good economic management, both at the national and lower levels, that policies should be laid down in such a way that planners and administrators feel able to go ahead without constant reference upwards, and yet feel that they are not usurping political authority to an undue extent. Nevertheless, they must usurp political authority to *some* extent. Economic advisers and administrators are, for instance, constantly influencing and taking decisions which benefit one person at the expense of another, and which are not predetermined by any rigid rule—decisions which are in the nature of value judgments. The planner who is too chary about making such judgments is not worth his salt.

What have we now established? First, a project is not just some grand design for a steelworks, a river valley, or a supersonic passenger plane which will be described (and normally recommended) in several tomes, and be considered (and normally approved) by a Cabinet Committee. It is any item of investment which can be separately evaluated. Thus projects are considered and evaluated at all levels from a junior engineer to the Planning Commission or the World Bank. They are also analyzed at all depths, from the back of the envelope to many volumes of erudite programming and scientific guesswork or prediction. Secondly, project *decisions* are taken at all levels: the process of design consists of rejecting and accepting alternatives, many of which are projects in our sense of the term.

It is clearly desirable that all projects should be evaluated, so far as possible, by applying the same principles. Otherwise inconsistent decisions are certain to be made. Thus our junior engineer, or settlement planner, should be guided by the same rules and methods as are used in the final appraisal of the steelworks or the river valley scheme.

The above kind of planning harmony should not be too difficult to achieve in the case of a corporation whose sole aim is to maximize its profits (or, more accurately, its present value). The planning engineer then knows that he should design with this aim in view. He will have to predict market prices in so doing, these being the prices which the corporation faces. As against this, it quite often happens that executives get a hunch about some scheme, and become personally committed to promoting or opposing it as the case may be. It is not then difficult for them to steer their predictions to support their case. The board is often in no position to check the predictions, and may well not understand how they were arrived at. The same applies in the case of a nationalized industry and its responsible ministry; and in the case of spending ministries and the planning department or finance ministry.

In general, we shall see that harmony is much more difficult to achieve when one is trying to plan to maximum social advantage for a whole country. This book can be considered as an exploration of the means of achieving this very difficult aim.

A General Defense of Project Appraisal

Before turning to the analysis of projects, it is worth mentioning that a few economists, mostly those who put great faith in broad macro-economic strategies, have tended to belittle the subject. One line of argument

is that what matters for development is simply more investment, the kind of investment being of little importance. It is difficult to see how anyone can still believe this when there is so much evidence of investment in LDCs which has yielded little or nothing. A more sophisticated reason given is that the whole is greater than the sum of the parts. This enigmatic proposition can be explained with reference to our airport. If one evaluated the terminal without the runway, and the runway without the terminal, and added the two together, one would understate the value of the airport. It is undoubtedly true that very many projects help each other—in economists' jargon they have external benefits. Others may damage each other. Where this is obvious, one will consider such interlinked projects together (one thus internalizes the externalities of the sub-projects by considering them together as a single project). It is also true that a new project may help or damage existing investments. What is being claimed therefore is that project evaluators will habitually neglect the less obvious externalities—and that these are important enough to make project analyses dangerous or even valueless.

We believe this attitude has done enormous damage in developing countries. It strains the imagination to believe that these unclear external effects (if they are clear they can be allowed for) vary so much from project to project as to make the analysis of individual acts of investment valueless. The logical end to this line of argument is to say either that it does not matter what a country invests in or how it does it; or to put one's faith in God or in the insight of some other central planner. Since few, if any, really believe either of these conclusions, the effect has been not to eliminate project evaluation, but to cause it to be undervalued and hence to be badly done. There are many monuments to this neglect in the developing world (and some in all countries).

It is often argued that management is very important; and with this we certainly agree. But the importance of good management in no way reduces the need to have well-designed projects which, if they are operated properly, will substantially increase the national welfare. Many investments are made, which work as they were designed to do, being well managed, and are yet very poor investments because they produce the wrong things or satisfy only a low priority need. Indeed, we would think that good management usually tends to be discouraged if the managers know that they are working at something which was ill-conceived: no doubt cases

can be cited where an ill-conceived investment turns out to be quite good, because an imaginative and flexible management solves the problems which are thrown up, and in so doing learns something which may be of further use; but that "company doctors" may learn a thing or two is hardly a good reason for producing handicapped infants.

The Basic Data Required

It is easiest to approach the subject of the social cost-benefit analysis of a project by first considering how a private profitability analysis is conducted.

The starting point of the analysis is to specify all the expected inputs and outputs of the project, and to put a price to each such input and output. In this way, one arrives at anticipated expenditures and receipts. These will be spaced over time from the inception of planning to the economic demise of the project (that is, when it ceases to be profitable to operate it), or to eternity. These guesses are then combined into some measure of profitability. It is now generally accepted that, from the point of view of an enterprise, the best method of thus combining the data is that known as "discounted cash flow" (DCF).

Reverting to profitability analysis, the basic figures required annually in order to conduct a DCF analysis are as follows:

1. All payments received from the sale of outputs of the project for each year of the life of the project, these including the sale of any buildings and equipment remaining at the end of the life of the project; and
2. All payments made for goods and services used by the project according to the year in which they are made, from the date of the first expenditures until the end of the life of the project.¹ These include payments of capital costs, whether for initial equipment or for replacement, as well as all current costs.

For purposes of prediction and for assessing the reliability of such prediction, all the values of the above receipts and expenditures should wherever possible be split into quantities and prices. To ensure that all related receipts and expenditures are taken into account, the total effect of the project upon the enterprise must be considered. The key question is: what would the annual receipts and expenditures of the enterprise be if the project were undertaken, compared with what they would be if it were not?

These figures of annual receipts and incomes, split into quantities and prices, are required for a social cost-benefit analysis just as much as for a profitability analysis. While, as we have seen, a social cost-benefit analysis may revalue the quantities of goods and services used and produced (that is, use different prices from those appropriate to an estimate of profitability), nevertheless such shadow prices will often be based on the prices which enter into the profitability analysis.

The above figures are thus the raw material with which the economic evaluator works, whether he works for an enterprise or in a planning bureau. If these basic predictions are to be as accurately established as possible, a great deal of preliminary work is required. It cannot be too strongly emphasized that such work is as essential for social cost-benefit analysis as it is for profitability analysis.

The reliability of the basic figures—the quantities and prices of inputs and outputs—~~depend upon~~ three kinds of considerations: (1) technical, (2) human and managerial, and (3) economic.

It is a technical matter whether the physical inputs and outputs, which are presupposed by the figures for receipts and expenditures, are consistent with each other. For instance, is it true that the stated quantities of raw materials, components, and fuels, when properly fed into the designed plant will produce the stated quantities of outputs for the number of years for which the project is supposed to endure? This all concerns quantities, not prices, and is a matter for engineers. Its importance is obvious. Dams do break and plants have technical troubles. The quality of inputs may be wrongly assessed, with disappointing results—and so on. With advanced technical processes, for example, in the chemical and metallurgical industries, economic failure has quite often been due to technical failure. But, considering investment as a whole, it is probably true that technical miscalculation is a cause of major economic failure in a minority of cases.

Turn now to the question of management and skills. This is a more frequent cause for disappointment. One should distinguish four different ways in which optimistic assumptions about the quality of management and the skill of the labor force affect the predicted figures for inputs and outputs. First, the period of construction is underestimated. Despite exceptions, it has been the rule in developing countries (and common in all countries) that major projects take longer to complete than is allowed for in the project report. This has probably been because neither the consultant engineers

nor the host government departments had much experience of industrial projects in developing countries and therefore underestimated the difficulties. Secondly, the period between when a plant is finished and when the new management team and labor force are sufficiently skilled to be able to operate it at its rated capacity, has usually been underestimated. Again, the reason has probably been that there was little experience to go on. Thirdly, of course, it is always possible that the rated capacity is never attained, despite there being no reason for this, from a technical point of view, because of insufficient demand or insufficient supply of materials. Fourthly, although the rated capacity is attained, it may be attained only with the use of more inputs, especially labor, than was allowed for. This excess use of labor is extremely common, and is not always the fault of the management itself. It is often forced upon the management for political reasons, or because labor laws make it virtually impossible to sack anyone.

We turn now to the economic assumptions which lie behind the basic figures used for the economic evaluation of profitability or cost-benefit, and first consider the receipts. First, the figures naturally imply that a certain amount of output can be sold, and at a certain price, for every year of the project's economic life. This presupposes that a sound demand analysis has been made. Demand will always depend to a lesser or greater extent on government policies and/or planning. From a cost-benefit point of view, outputs may be valued at different prices from those actually obtained, but this in no way interferes with the need to establish that the outputs can be sold at the actual prices assumed in the project analysis.

Secondly, of course, the basic figures also presume that realistic prices have been attached to current inputs of materials, components, and labor, throughout the life of a project: and that these inputs will be obtainable when wanted. The chief reasons for their sometimes not being obtainable are (1) exchange control forced on the government because of a failure to be realistic in foreign exchange planning, and (2) delays in the establishment of other projects which should have supplied these inputs, and/or a failure to supply inputs of the right specifications.

As far as this initial capital investment goes, the reality of the cost estimates depends largely on the advice of the engineers, and also on the nature of the contracts with the supplying firms. Particular attention must be paid to construction costs and estimated construction periods, since underestimation and long de-

lays are commonplace. It should also be noted that changes in design may release supplying firms from the original contract prices.

In saying that all the above matters are presupposed in the basic figures which confront the economic evaluator or evaluation team, it should not be assumed that their function does not include that of asking nasty questions about all of these assumptions. Certainly, in the case of major projects, it must be someone's function to do just this. Indeed, it is of great importance that some central staff should undertake this essential probing. This is because projects will come up from many different sources, from different departments of government employing their own different staffs, or from different consulting engineers. In these circumstances it is almost inevitable that different degrees of care will have been exercised. Moreover, different, even conflicting, assumptions will often have been made.

From now on, since our subject is the *evaluation* of projects, not their design and formulation, it is assumed that the basic engineering and demand and cost analyses have been properly conducted for every project and every variant of every project which is to be evaluated.

DCF Analysis and Measures of Profitability

We first outline the procedure from the point of view of a firm or enterprise, and then turn to social cost-benefit analysis.

The principle upon which DCF evaluations are based is that money has a time value. One hundred dollars received now is worth more than \$100 received in a year's time, because it can be used meanwhile to earn a return. For example, if it could be invested at 10 percent p.a., it would be worth \$110 after a year and \$121 after two years. In these circumstances \$121 received in two years' time can be said to have a "present value" of \$100, the future sum being "discounted" at the rate of 10 percent p.a. The discounting process is thus simply compound interest worked backwards.

The first step in carrying out a DCF evaluation is to record, year by year throughout the expected life of the project, all expected expenditure payments for goods and services for the project (including capital expenditures) and all expected receipts from the project. For each year, the subtraction of the former from the latter shows how much cash the firm gains or loses as a result of the project. Borrowing and lending, and interest or dividend payments, are normally excluded from the concept of "cash flow" when this is used for the

purpose of assessing the profitability of a new investment. The fairly common exception to the above rule is when the financial flows, or some part of them, are tied to the project and thus cannot be separately considered. It should also be noticed that direct tax payments are, from a firm's point of view, a use of resources; from the social point of view, this is not so.

The difference between cash flow accounting and most forms of normal commercial accounting are as follows:

1. In normal accounting income and expenditure represent the values of goods or services delivered (sometimes into stock) and received; not the cash received and paid out for them.
2. Normal accounting shows financial liabilities, with respect to interest and tax, not payments. There are sometimes large differences of timing here.
3. A financial allowance for depreciation and obsolescence of capital is made in normal accounting. In cash flow accounting there is no such provision, but anticipated renewals and replacements will be included as well as the scrap value of the equipment.

The second step is to discount future cash flows back to the present. For this purpose the enterprise must select a rate of discount. This is the rate of return which, given the financial conditions for obtaining cash and the investment opportunities likely to be open to the firm in future years, it deems prudent to aim to earn on its new investments.

As already explained, the process of discounting is simply compound interest worked backwards. In general, the present value of any future receipt or expenditure is calculated by multiplying it by $1/(1+d)^t$, where $100d$ is the percentage rate of discount and t is the number of years ahead.² Thus, by this process of discounting, expenditures and receipts which occur at different times throughout the construction and operation of the project (and are to this extent incomparable) are all revalued to make them comparable to present expenditures and receipts. They can then all be added up to give a single figure which is therefore named the *present value of the project* (PV). It comes to the same thing, and is more convenient, to subtract expenditures from receipts to give a net cash flow for each year, and then discount these cash flows back to the present. This also gives the PV of the project—hence the term “discounted cash flow.” PV is one important measure of

profitability. It assumes that capital funds, and receipts on current account, need not be distinguished from each other. They are, both of them, just money. This lack of distinction between the two is fully justified if the firm can borrow (or lend) as much as it chooses at a fixed rate of interest equal to the discount rate used to arrive at the PV. If this is the case, there can be no special shortage of investible funds.

But if investment funds are constrained in any way (other than by their price) then it becomes impossible to give any simple investment rule. This is because there is no rate of discount, given from outside the enterprise, which expresses the value of capital and is independent of its own investment opportunities (which will themselves partly govern its future investible funds). In these circumstances the enterprise will need to guess a discount rate which will, it hopes, be a sufficient measure of the financial constraints it suffers and yet will not be so high as to stop investments which would have been beneficial. Such a rule, using some arbitrary discount rate rather higher than the market rate, is certainly useful, perhaps essential, but cannot be regarded as better than a “rule of thumb.”

It is also useful to calculate a second measure of profitability, the *internal rate of return* (IRR)—that is, the “yield”—of the project. By definition this is the rate of discount which makes the PV of the project zero.³ It can be called the “yield,” because it is closely analogous to the yield of a security. Thus if a \$100 bond pays a dividend of \$5 per annum forever, one says that it yields 5 percent. But the IRR of a purchase of this bond is also 5 percent, because \$5 forever discounted at 5 percent gives a PV of \$100, equal to the purchase price of the bond—so that the PV is zero.

One reason for calculating the yield is that entrepreneurs and other investors are more used to judging investments by their yield than by either of the other measures put forward. Another reason is that the PV gives no indication of whether a project is close to the margin of acceptability. Two projects may have the same PV, one being a large project with an IRR only just above the discount rate, while the other is a very small project with quite a high IRR. If the management is unsure of its target rate of discount, then it is useful to have this information. Finally, the enterprise may not have decided on a rate of discount to use, and in this case the PV cannot be calculated: on the other hand, the IRR is of limited use if decisionmakers do not have a target yield to compare it with; and, in effect, a target yield is the same thing as a rate of discount.

Moreover, the IRR is not always a reliable guide. This can be seen by turning to the ways in which measures of profitability may be used to select and reject projects. In discussing this we shall assume that the enterprise has unlimited access to funds at a given interest rate.

Suppose the enterprise has to choose between, say, a small factory and a large one. Now it is possible that the small factory would give the higher yield, but the smaller PV. In this case, the firm should of course borrow more and build the larger factory, for it is its PV that it wants to maximize. The point is that the IRR, being a pure number, gives no indication of size. Sometimes it is best to make a large investment at a lower yield rather than a small one with a higher yield.

Why not make both investments, the reader may well ask? But that would not be possible if the large and small factories were mutually incompatible—and each was evaluated on the assumption that the other would not be built. Other examples of mutual incompatibility arise when comparing the same factory this year and next year; or a large and small dam on the same river; or any number of alternative schemes for settling the same agricultural region. In all these cases, the IRR may give the wrong answer. It is necessary to stress this. Only very recently a famous firm of consultants told us that they had been instructed by the IBRD to maximize the internal rate of return when designing an irrigation scheme: no doubt there was some misunderstanding.

Thus the IRR can be safely used only if there is no incompatibility:⁴ it then makes no difference whether one follows the rule “do everything which yields 11 percent or more,” or the rule “do everything which has zero or more PV at a discount rate of 11 percent”; the same projects would qualify under either rule—and the same ones fail.

The Consideration of Alternatives

In the case of incompatible alternatives, confusion sometimes arises because of the dictum that a profitability (or social cost-benefit) analysis is essentially comparing the future stream of profits of the enterprise (or society) with and without the project under examination. This seems to imply that the alternative to doing the project is to do nothing. Yet, of course, the alternative of doing nothing is frequently unrealistic. For instance, the realistic alternative to building a new factory may be to enlarge and refurbish an existing one. This particular confusion is easily resolved. Each option, refurbishing or building anew, is compared with

doing nothing: the PVs of the difference which each option makes as compared with doing nothing can then be compared with each other.

Even so, some ambiguity as to the meaning of “doing nothing” can arise. For instance, does “doing nothing” imply that the old factory would not even be maintained? In the case of an ongoing business contemplating expansion, it could be taken that “doing nothing” meant going on as before—that is, using and maintaining the old factory. However, it is quite possible to compare the PV of continuing as before with closing down the business. The moral is that one should be quite clear what is being compared with what. Usually the comparison will be as between some new investment, or several alternative new investments, and carrying on as before.

Neglect of possible alternatives can be regarded as a case of making the wrong comparison. Suppose a country is contemplating a new port, because an existing one is rapidly falling into disrepair. The PV of the new port might look very great if, without it, the country would lose much of its foreign trade. It may still be a bad project, because rebuilding the old port might show a still higher PV—both being compared with letting the old port go to ruin. Equally, some repair work may show a high PV: but this does not prove that the asset should not have been allowed to fall to pieces, and a new one built.

Discounted Resource Flows, and Social Profitability

Turning finally to social cost-benefit analysis, we can be brief because it takes exactly the same form as a profitability analysis. Indeed, a profitability analysis is a private cost-benefit analysis—although, to save words, we shall use the phrase “cost-benefit analysis” always to refer to the social variety. The easiest way to understand social cost-benefit analysis is therefore to examine the differences.

Two differences have already been referred to. The first was that inputs and outputs may be differently valued. For instance, the output may or may not be valued net of indirect taxes; similarly, payment for current inputs will probably include some indirect taxes, which may be subtracted. We emphasize the word “may.” Nor are taxes the only reason for putting different values on inputs and outputs from those which are relevant for the enterprise’s own accounts.

The second difference is that there may be some benefits or costs resulting from the project’s operation which would not appear as inputs or outputs in the

ordinary accounts. Any such benefits or costs have to be separately added or subtracted for every year of operation during which they occur.

The third difference is one of timing. For instance, in a project's DCF accounts, payment for items of equipment will occur well after the dates when resources were used in its construction, which is when the social costs are incurred. It would be a counsel of undue perfection always to try to allow for this, but sometimes it could be important.

Only one further point requires to be made at this stage, which is that the discount rate used to arrive at the *present social value* (PSV) will usually differ from the market rate of interest which might be used by a private firm.

THE NEED FOR COST-BENEFIT ANALYSIS

It is a tenet of laissez-faire capitalism that profits measure the gain which society derives from a project. The acceptance of this view seems to permit capitalists to claim the moral plaudits of society as they line their pockets. Yet it cannot be dismissed as intolerable hypocrisy, for the theory that profits measure social (and not merely private) gains has no necessary connection with capitalism at all. Indeed, many would think the theory more valid for a socialist society; and it is generally recognized that profits have an important, even essential, role to play in a socialist society. But just what role?

The Function of Profits

Profit (or loss) can be thought of as a necessary feature of any decentralization of economic decisions. If institutions and people (these inevitably include local and central government departments and agencies, private people who sell their services and buy consumption goods, and foreigners; and also, in a mixed economy, private firms) are free to buy or sell then they must have an effect on the profit of any project—for there must always be a profit or loss if *any* output or input is bought or sold, rather than allocated without charge. But these offers and demands can be made effective only if some positive response is made to them, such as making investments which promise to be profitable and rejecting those which do not. It is clear that such a response may be the wrong one if profits in fact fail to reflect social gains. Thus profits are an almost essential signaling mechanism for guiding decentralized investment decisions—but they may or may not be a *good*

signaling mechanism. They are good only if expenditures closely measure social costs and receipts closely measure social benefits.

The reader may well ask at this stage if it does not make a difference that public sector profits accrue to the state, and private sector profits to individuals (to the extent that they are not taxed away). It may well seem more plausible that profits can be a good measure of social gain if they are, in the first instance, received by the government rather than going, in part, directly to individuals. If profits which go to individuals are worth less to society than those which go to the government then a cost-benefit analysis can make allowance for this.

The essence of a cost-benefit analysis is that it does *not* accept that actual receipts adequately measure social benefits, and actual expenditures social costs. But it does accept that actual receipts and expenditures can be suitably adjusted so that the difference between them, which is therefore very closely analogous to ordinary profit, will properly reflect the social gain. The prices used, after such adjustments have been made, will be called "social accounting prices," or for short "accounting prices." The difference between receipts and costs measured at accounting prices is, therefore, most appropriately called "social profit." A rider to this is that a further adjustment may be thought necessary in the light of the previous paragraph depending on who receives the actual profits.

We sum up the above discussion by saying that cost-benefit analysis is the more necessary the greater the extent to which project expenditures differ from the social costs which, according to the theory of laissez-faire, they ought to measure—and similarly for project receipts.

The Conditions Which Make Cost-Benefit Analysis Desirable in Developing Countries

In offering guidelines for the use of cost-benefit analysis in developing countries we pay special attention to industry and agriculture, as well as to infrastructural projects where the output has a market price. Education, health, and defense are neglected. This is not meant to imply that useful work is not going on in these fields. Certainly, cost-effectiveness analysis can be applied. But it is still very controversial whether full cost-benefit analysis in such sectors, where benefits are particularly difficult to measure, is as yet sufficiently soundly based to be a good guide for policymakers.

Thus we are concerned with the application of cost-benefit analysis precisely in fields in which it is considered unnecessary in developed economies. The justification for this can only be that it is felt that within such sectors of more advanced economies the price mechanism works in such a way that profits are a reasonable measure of net benefit, but that this is not true of most developing countries.

Why should one start with the presupposition that actual prices are very much worse reflectors of social cost and benefit than is the case in advanced economies? The main reasons are briefly adumbrated below. Naturally not all of these reasons apply to all developing countries.

Inflation. Very rapid inflation is more common in developing countries, particularly in South America. This is no accident. The very urgency of the desire to develop rapidly results in a constant tendency for demand to outrun supply; furthermore, lagging supply in the sectors which are most resistant to change, particularly agriculture, results in sectoral price rises which tend to transmit themselves across the board, and may virtually force the monetary authority to increase total money demand if a recession of activity is to be avoided.

If inflation proceeded uniformly so that relative prices were unaffected, it would not be a reason for prices to be a poor measure of real costs and benefits. But this, for institutional and political reasons, is seldom the case. For example, governments in such circumstances will often use price controls in selected fields where they can in practice be operated. This makes activity in these fields relatively or absolutely unprofitable, without regard to the net benefit of such activities.

A particular case of such control concerns the price of foreign exchange, which brings us to the next reason.

Currency overvaluation. In almost all countries, the government "manages" the price of foreign exchange. With inflation, if the exchange rate is unaltered, domestic prices get out of line with world prices. This implies that on average, the domestic prices of imports and exports are too low relative to those of goods which are not traded. So long as the currency is not devalued to rectify the situation, the demand for foreign exchange for imports and other purposes will exceed the supply, and the government will be forced to restrict imports, often in ways which open up gaps between the market prices of goods and the real cost of procuring them. But some governments faced with a price infla-

tion do not resort to import controls in order to maintain the domestic currency overvaluation, but devalue more or less frequently. If inflation is rapid and the government devalues periodically but not very frequently, then it is inevitable that the currency will be alternately undervalued and overvalued. If the inflation is slow, the government usually tries to avoid devaluation, and long periods of overvaluation are likely.

Wage rates and underemployment. The theory of competition requires that the marginal product of labor (the extra output resulting from the employment of a small extra amount of labor) be equal to the wage paid.

Because of monopoly power, and immobility, there are undoubtedly serious imperfections in the labor markets of many industrialized countries. But these imperfections are not usually thought to cause major intersectoral distortions of the pattern of production (regional distortions may be an exception, and here wage subsidies have been used). On the other hand, it is often argued that this is the case in many developing countries.

In "modern" sectors of the economy—including modern industry and commerce, government, and plantations—it is common to find that unskilled workers earn three or four times as much as casual rural labor, a difference far greater than can be accounted for by the difference in the cost of living; and therefore that the cost of employing people in these sectors is apparently much greater than the loss of rural production, assuming that such rural earnings are a fair measure of labor's marginal contribution to production. It has been argued that the earnings of casual labor overstate the marginal product of labor. This is because, in most developing countries, the greater part of rural labor is family labor. Since a dependent member of the family cannot be sacked, he may "earn" (i.e., consume) as much as a hired man but yet have a lower marginal product. As against this, in some places it is probable that the marginal product of a hired man is greater than his earnings because the employing farmers exercise some monopsonistic power.

That men by working are unable to contribute as much to production as they consume is what is meant by underemployment. The extended family system permits underemployment in the towns as well as the countryside. If relief were given institutionally, via unemployment benefits, the very low productivity urban activities—petty trading, car-watching, etc.—would largely disappear and more people would become openly and wholly unemployed, a circumstance

which would, of course, imply that wages did not reflect the social cost of employment.

The real cost of employing a man in the modern sector is still a subject of controversy, mainly because insufficient is known about the effects on the traditional sectors including agriculture, and because these effects will vary widely from country to country, and perhaps from region to region, or even town to town. However, there is rather wide agreement that modern sector wages almost everywhere overstate, perhaps greatly overstate, the social cost of employment.

Imperfect capital markets. Where risks are equal, interest rates on loans should be equal, if profits are to measure net social benefits. Interest rates have such an enormous range in many developing countries, that it is implausible to suggest that this is just a measure of differential risks. Other factors operate, such as government intervention, ignorance, and monopoly elements in the supply of capital, to widen the range from low to almost astronomical rates.

Large projects. It is more common in developing countries—especially in small countries with, as yet, little development—that a project will be so large as to have important repercussions on profits elsewhere in the economy. In these circumstances, as we have seen, the profitability of the project itself cannot be regarded as a good measure of net social benefit.

Inelasticity of demand for exports. In a number of developing countries, a large part of export receipts is accounted for by one, two, or three export commodities. Where a country also accounts for a considerable part of total world production, then it can influence, within limits, the price it obtains by restricting sales—which is, of course, an abrogation of the conditions of perfect competition. The free market price cannot then correctly measure the benefit, because, like any monopolist, the country would gain if it exported less at a higher price.

This, in turn, implies that the country would gain by devoting rather less resources to producing these primary commodities, and rather more to others, or to industrialization. This situation can be best rectified by suitable export taxes on the commodities, together with other policies (including use of the revenue thus raised) which encourage the transfer of resources. Some countries recognize this situation and do in fact use export taxes. But the situation has also been used as an argument for encouraging industry by protection—which brings us to our next section.

Protection: Import quotas, tariffs, export disincentives. The protection of domestic industry may be a deliberate interference with the price mechanism designed to make it operate in a manner more conducive to society's benefit than would a laissez-faire commercial policy. A well-designed interference, in the shape of special encouragement of industrialization, may well make industrial profits a better guide to social advantage than they otherwise would be.

The main way in which industry is specially encouraged is by tariffs and import quotas. Thereby, the domestic price of the output is kept above the import price. But the outputs of one industry are often the inputs of another. Consequently, when an industry contemplates exporting, it finds that the very system which protects it in its home market puts it at a positive disadvantage in export markets; whereas reason suggests that if industrial production is worth special encouragement, then it is worth special encouragement, and not actual discouragement, in producing for export. Thus tariff protection, like currency overvaluation, implies that the domestic price obtainable for an export underestimates the social value of that export. Some developing countries have taken measures to offset this effect, but such measures are often insufficient, and not very scientifically devised in such a way as to make the domestic price measure the benefit to the country.

Apart from the fact that protection discourages exports of both industrial and agricultural products, it is also the case that different industries receive enormously different degrees of protection, usually for no apparently rational economic reason. This situation has arisen partly because countries have selected industries or plants (or have agreed to protect private initiatives) without the kind of economic appraisal being advocated here. Protection has followed the establishment of industries, rather than itself being used as a screening device.

Another reason why the relative gap between domestic and world prices is highly divergent as between industries is the extensive use of import quotas. A country runs into balance of payments problems. The situation is brought under control by restricting imports and, naturally, the least essential goods are most restricted. The result may be a growth of domestic industry, behind protective quotas, which bears little relation to the long-run comparative advantage of the country. If a wrong industry gets established it handicaps any other industry which uses its output. For instance,

steel-using industries will be handicapped by a high-cost local steel plant, unless the latter is subsidized so that it can supply at prices no higher than the import price. It is our belief that bad management of foreign trade or foreign exchange is one of the principal reasons why internal prices get highly distorted, and hence lead to industrial investments which are of little or no benefit to the country concerned.

We have now outlined seven important and fairly non-controversial reasons why the price mechanism and the profit motive may not work as closely for the social advantage as in developed countries. Other more general reasons could be adduced, such as ignorance of opportunities and techniques, inertia, short-sightedness, lack of a market economy, and greater fragmentation of markets leading to local monopoly power; but these have relatively little direct bearing on project evaluation especially in the public sector. We turn now to a further three reasons, which may be more controversial.

Deficiency of savings and government income. Two projects may have the same net profit, but a different effect on the relative amount of extra consumption, savings, and taxation.

Economic theory often treats savings and investment as of equal value. This is really a facet of the principle of consumers' sovereignty. It is assumed that it can make no difference to benefit whether some extra income is consumed, or saved and hence made available for investment. This is reasonable for an individual who freely chooses whether to spend or not. For him, an extra dollar of savings is worth the same as an extra dollar of consumption. But is it true for society?

To cut a long story short, if the government believes that rather more savings and rather less current consumption would be good for society, there may be a conflict. The point is that savings can be transformed into investment, and investment can produce extra future consumption for a sacrifice of present consumption: and the government may put a relatively higher value on the consumption of people in the future than do private persons. Furthermore, private persons may be inhibited from saving by income and other taxes which have the effect of double-taxing savings. We have already referred to these problems above, where it was argued that the rate at which society ought to discount the future may differ from the rate at which a firm can borrow. Thus, if the government chooses a discount rate for projects which is lower than the market rate of

interest,⁵ this is in effect to say that it considers future consumption to be more valuable than is indicated by the aggregate choices of private individuals. If the public saved more, interest rates would be lower, and the government pleased. In other words, the government considers present savings to be more valuable than present consumption.

Governments can reduce aggregate private consumption, and thus increase savings, by taxation. On the other hand, taxation has administrative and political costs. So perhaps it is money in the hands of the government which should be considered to be more valuable than private consumption: this view is strengthened by the fact that a rational government should see to it that the value of its expenditure at the margin is equal in all lines, whether it be defense, agricultural extension, education, or investing in industry. Many people will be rather unwilling to accept that money in the hands of the government is more useful than many kinds of private expenditure, especially when governments are seen to waste money and promote silly investments. But the project evaluator may in any case have to take a government view. This is a difficult and controversial matter.

Finally, it should be noted that although discussion of this problem has arisen mainly in the context of developing countries, it seems to us that it arises also in the case of rich countries.

The distribution of wealth. The preceding section was largely concerned with the distribution of benefits, as between the present and future. But there is also a problem of the distribution of benefits today—the problem of inequality. There is a dilemma here, for inequality tends to promote savings, and help future generations. This is especially true of corporations: company profits belong mainly to the rich, but are one of the main sources of saving. The dilemma can be made less acute insofar as public savings can, by increased taxation, take the place of the savings of the rich; but there is a limit to this, and some element of dilemma remains. There is the additional important question of how far a practicable criterion for project selection can take proper account of inequalities.

External effects. Some economists believe that external economies are of special importance in developing countries: that some industries have important beneficial effects on others in ways which cannot be, or anyway are not, reflected in the price obtainable for the output of the industry, or in the price it pays for its

inputs. There has been much speculation and debate on this subject. But there is very little positive evidence. Certainly there has been much naive wishful thinking—for instance, that the provision of electricity, steel, or transport would somehow create its own demand.

Many of the more obvious external effects can be allowed for by a suitable definition of the project to be considered. But others will remain.

Social Objectives and the Notion of Accounting Prices

A rather strong case has now been presented for saying that a project's anticipated receipts and expenditures cannot be relied upon to measure social benefits and costs in most developing countries. It is believed that this is true also of more developed economies, but to a lesser extent. There is therefore a strong *prima facie* case for the use of cost-benefit analysis.

We have seen that the basic idea of such an analysis is to use hypothetical rather than predicted actual prices when evaluating a project. The rate of discount may also not correspond to any actual interest rate. These "shadow" prices, as they are often called, are chosen so as to reflect better the real costs of inputs to society, and the real benefits of the outputs, than do actual prices.

The name "shadow price" is perhaps unfortunate. It suggests to many, even to some economists, that an analysis based on them is remote from reality, and therefore academic and highbrow, and so is to be distrusted. Of course, shadow prices may be unreal in that they are not the current prices of goods in a market. But then no price in a project analysis can ever be an actual price—for every price assumed in such an analysis necessarily lies in the future. The whole point of a shadow price is indeed that it shall correspond more closely to the realities of economic scarcity and the strength of economic needs than will guesses as to what future prices will actually be. We shall use the term "accounting prices."

It is worth emphasis that if any input or output is valued at a different price from that actually expected to be paid or received by the project, then, in our terminology, a social accounting price is being used. In this sense, most project appraisals have made use of accounting prices. For instance, it is widely accepted in project analysis that indirect taxes on inputs should not be counted as costs. Or again, for some years now, direct imports and exports of projects have often been valued at c.i.f. or f.o.b. prices (border prices, as we

shall term them) by, among others, consultants working for the IBRD. Some evaluators may think that they are not using shadow prices when they make such adjustments. That is a matter of terminology. What we want to make clear is that, in our terminology, they are using accounting prices.

While accounting prices have been in use for some time, they have seldom been used in a comprehensive and systematic way, but rather haphazardly. This is dangerous. Once some important prices become badly distorted—e.g., the price of labor or foreign exchange—the repercussions are widespread. Every price is then liable to need adjustment. What we are primarily concerned with is to show how a whole set of accounting prices can be systematically and logically estimated and applied, yielding a practical method of analysis which can be expected to measure net social benefit better than ordinary profitability analysis. Being practical precludes perfectionism. We make no claim that accounting prices can be exact reflections of social costs and benefits—merely much better reflections than actual prices for many projects in many countries. Nor, of course, is it claimed that the use of accounting prices is a very satisfactory method of dealing with distortions. Many of the distortions can be fully dealt with only by removing them—that is, by adopting policies which lead to proper correspondence of prices, and costs and benefits. There may be yet others which, because of the difficulty of measuring them in a reasonably objective way, cannot be satisfactorily allowed for in a usable and politically acceptable criterion. These have to be left to the judgment of the politician and his advisers.

Notes

1. Strictly speaking, the life of a project is not a technological datum. The project should "die" when it no longer pays to operate it, making such repairs and replacements as are necessary. Sometimes it is easiest to estimate on the basis of an infinite life, allowing sufficient replacement expenditure to make it so. Accuracy is not, however, important in assigning a life to a project, unless the discount rate used is exceptionally low.

2. We have assumed, for simplicity, a constant rate of discount over time. But it is possible that changes in the rate of discount will be anticipated. More generally, a future item may be multiplied by

$$\frac{1}{(1 + d_1)(1 + d_2) \dots (1 + d_n)}$$

where d_1 is the fractional discount rate between now and next year, d_2 the rate between next year and the one after, and so on. If the d s are all equal this collapses to $1/(1 + d)^n$ as in the text.

3. In the case of some projects there may be several discount rates which make the PV zero. In that case, it is probable that none of these discount rates is very useful for comparing it with other projects. This is one of the reasons why general reliance cannot be placed on the internal rate of return.

4. Except when the possibility mentioned in the previous footnote arises.

5. "The market rate of interest" may be quite a wide band in developing countries, even if we restrict the meaning of "the market" to that for medium and large scale industrial borrowing.

The Essentials of the UNIDO Approach to Benefit-Cost Analysis

Stephen A. Marglin

The United Nations Industrial Development Organization issued its contribution to the project appraisal field in 1972 with Guidelines for Project Appraisal. This reading outlines the rationale underlying the UNIDO methodology.

Marglin begins with the theme developed by Little and Mirrlees: Commercial profitability and social (or "national economic") profitability are similar in concept but often widely different in content.

Marglin, on behalf of his UNIDO colleagues, judges that concern for income distribution merits equal attention with efficiency and economic growth. Once having established the legitimacy of multiple objectives, Marglin describes the special "bottom up" mechanism that the Guidelines uses for setting priorities. Here the initiative is taken by project designers and evaluators. Alternative designs are prepared, and sensitivity analysis yields "switching values" for crucial parameters that determine the superiority of one design over another. Policymakers display their preferences through the choices they make between alternative project designs.

The UNIDO approach distinguishes between "weights," which are political value judgments, and the shadow prices derived from these judgments and technical information. Weights must accord with national objectives, and thus are stipulated at upper administrative levels. Many shadow prices, which turn on

specific features of a project and its environment, are more appropriately calculated at the field level.

The reading concludes with a review of the Guidelines' distinguishing features and a summary of its limitations. [Ed.]

NATIONAL AND COMMERCIAL PROFITABILITY

The point of benefit-cost analysis in general is to do for a government ministry or agency what a cash-flow analysis does for a private investor: to provide guidance in the formulation and evaluation of investment projects. The essential difference is the point of view: Cash-flow analysis examines projects from the vantage point of an owner for whom the assumed goal is the flow of funds into the company treasury; benefit-cost analysis examines projects from the vantage point of a government for which the assumed goal is the improvement of the quality of life.

The balance of a project's cash-flow account, its "commercial profitability," may be very different from the balance of its benefit-cost account, its "national economic profitability." For example, a project that would expand the supplies of an essential commodity might find markets only if the commodity's price is reduced by an amount that more than offsets the expanded volume of sales. The negative cash-flow of such a project would obviously make it commercially unprofitable even without any calculation of its costs. From a national point of view, however, the benefits to consumers from lower prices might make the project very desirable.

The difference in point of view makes it quite natural that commercial profitability and national economic profitability should diverge. The effects of a project on consumers, on employment, on the balance of international payments, on the distribution of income—all of which are essential concerns of a government—are merely instrumental to a project's commercial profitability. It is only in an abstract model of the economy, one stripped of concentrations of economic power, of external effects and other inconvenient attributes of the real world, that the "invisible hand" of competitive markets can be counted upon to make the particular interest characterized by commercial profitability coincide with the general interest characterized by national economic profitability. In reality, commercial profitability is a poor guide to formulating and evaluating investment projects in the public interest.

This is not to say that calculations of national economic profitability can or ought to completely replace calculations of commercial profitability. A government that evaluates private sector projects in the role of development banker, or controller of foreign exchange or specific raw materials, cannot ignore a project's commercial viability. For it cannot in general enjoin a private firm to undertake the project or make substantial alterations in its design or operation in order to enhance its national economic profitability if these would wipe out the project's commercial profits. Whenever a private firm (or a public agency whose charter requires it to be self-financing) must be counted upon to implement a project, commercial profitability remains an essential consideration for a government as well as for the private firm. But even here the role of commercial profitability is not the same for the government as for the firm. For the government, commercial profitability appears, if at all, as a *constraint*, for the firm it is a *primary objective* and may be even the sole objective.

Thus a government's evaluation of an investment proposal may or may not include an analysis of its commercial profitability, depending on whether or not it must rely on private firms or self-financing public agencies to implement the project. Its evaluation should always include an analysis of the project's national economic profitability.

THE DIMENSIONS OF NATIONAL ECONOMIC PROFITABILITY

Commercial profitability is relatively easy to measure, at least in principle. One calculates receipts and

expenses year by year and then discounts future returns and outlays to a common present value. National economic profitability is inherently more difficult to calculate because of the many elements that go to make up the quality of life. Even when attention is confined to the economic dimensions of life, as is customary in benefit-cost analysis, the vagueness of "national economic profitability" is obvious. Most governments profess concern to promote growth, equality, employment, self-reliance—all at the same time. Any attempt to provide guidelines on project evaluation must therefore begin by resolving the forces pulling ourselves in opposite directions: Should we limit ourselves to a single "most important" dimension of economic performance (for example, growth in aggregate consumption) in the interest of easy quantification? Or do we consider a large number of dimensions, for the sake of comprehensiveness?

Various arguments have been advanced from time to time for emphasizing growth in aggregate consumption over all other dimensions of economic welfare. Among the more important is first that growth in the aggregate is politically neutral, whereas other dimensions of welfare such as distributional equality involve value judgments that put them beyond the competence of the project analyst. Second, it has been argued that other dimensions can be handled adequately outside the project framework by means of general economic policies. For example, fiscal policy is to be relied upon for achieving a proper slicing of the economic pie, and the design and operation of projects can be formulated solely in terms of the size of the pie. Concretely put, an irrigation project that could equally well serve large scale, efficient, and wealthy market-oriented farmers and small scale, inefficient, and poor subsistence peasants would be designed to serve the rich, either on the grounds that concern for the distribution of the project's benefits would introduce political dimensions into choice or on the grounds that taxes and subsidies could be employed to redistribute the benefits from the rich to the poor, if desired.

The UNIDO *Guidelines for Project Evaluation*¹ rejects both these arguments and the implication that attention be confined to growth in aggregate consumption. Since the reasons why these arguments are rejected are basic to the UNIDO approach, it may be useful to review them briefly here. The first argument, the "political neutrality" of aggregate growth, falls almost of its own weight as soon as it is fully articulated: It is in

fact (though logically) not an argument for maintaining the status quo with respect to distribution, since one of the effects of existing inequality is to make the relatively rich better able to make efficient use of investment projects. This is not the place for extensive analysis of the evidence; it will have to suffice to point out that virtually every social institution, running from informal networks of friendship through the family to highly formal educational establishments, serve to reinforce the disproportionate "absorptive capacity" of the rich with respect to the benefits of public or publicly supported investment. Whether calculated or not, the effect of "letting the chips fall where they may" is almost certainly to perpetuate inequality, hardly a neutral result in any meaningful sense of the word.

The second argument—handling such objections as distributional equality through fiscal policy—is not much more robust than the first. Quite apart from the technical arguments that any system of transfers apart from "lump-sum" transfers, which is to say any practicable system of transfers, distorts incentives and thereby reduces aggregate consumption; there are two excellent reasons for not relying on taxes and subsidies to correct undesirable distributional consequences of projects. One is the moral repugnance that attaches to the dole or any system of subsidies that smacks of the dole. More important are the practical difficulties of taxing away the benefits enjoyed by the rich. Throughout most of the world political power is highly correlated with wealth and income, and the prosperous are generally able to avoid taxes that would effectively redistribute income, even where egalitarian ideals lead to tax laws that are on their face highly egalitarian. As a practical matter it is simply unrealistic to rely on taxes and subsidies to correct undesirable distributional consequences of investment projects.

This is not to suggest that to reflect distributional considerations in the criteria for project formulation and evaluation is to solve distributional problems. We are dealing with decisions at the margin, with the tactics of economic development, not basic strategy. And *none* of the objectives of development can be adequately dealt with on a tactical basis alone, distribution included. But due regard for distribution at the project level may prevent matters from getting worse, and, more important by bringing choices and conflicts out into the open in simple, clear and dramatic ways, can stimulate and focus debate and discussion about basic development strategy.

For these reasons the UNIDO approach begins with a definite commitment to the simultaneous pursuit of more than one objective, or dimension of welfare, in project formulation and evaluation. But we do not seek to capture every conceivable aspect of economic well-being in our analysis. First of all, we believe that the expansion of aggregate consumption and progress towards a more equal distribution are the most urgent and universal of the various economic goals of development. Other dimensions of welfare, although at first glance seemingly independent, can often be understood as instrumental to these goals. For example, employment is an oft-stated goal of development. To a great extent, however, the expansion of employment opportunities is simply a means to a better distribution of income or the expansion of aggregate consumption. Improvement of the balance of trade, to take another example, is frequently a means of maintaining the expansion of consumption. To be sure, those objectives can conceivably go beyond distributional or aggregate-consumption considerations, and the UNIDO methodology is sufficiently flexible to incorporate them as distinct objectives, but most often we believe that the aggregate-consumption and redistribution objectives will be broad enough to encompass balance-of-trade and employment considerations.

In addition, the UNIDO *Guidelines* accepts the propriety of including various special objectives that all too often are dismissed by professional economists because they are not based on the overt and manifest preferences of the "sovereign" consumer. Recognizing the social nature of preference formation, we consider it entirely appropriate that at times project formulation and evaluation will reflect policymakers' judgments with respect to people's needs even when these run counter to the desires of the population at large. Such a "merit want" is education for girls in traditional male-oriented societies.

Thus the UNIDO approach represents a compromise between the arguments tending to minimize the number of distinct objectives and the arguments tending to enlarge the number. In general it is believed that simultaneous consideration of the contribution a project makes to aggregate consumption and the contribution it makes to improving the distribution of consumption will suffice. But the methodology is sufficiently flexible to allow for the introduction of other dimensions of the quality of life, as these appear to be important in specific situations.

SETTING RELATIVE WEIGHTS ON OBJECTIVES: THE ROLE OF POLICYMAKERS

It is relatively easier to agree on the importance of taking account of the multiplicity of developmental objectives in project analysis than to agree on how to do so. In fact one of the principal concerns of the UNIDO *Guidelines* is to outline an operational methodology for simultaneously considering more than a single objective in formulating and evaluating projects. Ideally, policymakers would articulate the relative importance of various objectives by attaching numerical weights to the contributions to each. For example, taking aggregate consumption as the unit of account, income generated to the lowest quintile might receive an additional weight of 0.5, 2.0, or 10.0, according to the importance attached to achieving equality relative to the importance of increasing consumption overall.

As a practical matter, however, this ideal seems to be at best attainable only after a long time. It certainly does not appear to be a basis for immediate action. Therefore in contrast with the "top-down" approach of pre-assigned weights, the UNIDO *Guidelines* proposes a "bottom-up" procedure in which the weights are generated by the formulation and evaluation procedure itself. In brief, the UNIDO system enjoins the project formulator to take the initiative in preparing alternative designs, each primarily responsive to a different development objective. In the irrigation choice posited earlier, for example, the technician responsible for the project would prepare two alternative designs of the dam and distribution system, one emphasizing the expansion of aggregate consumption and (presumably) therefore allocating all or virtually all of the water to large-scale commercial growers, the other emphasizing redistribution of income and therefore allocating all or virtually all of the water to the small-scale subsistence peasants.

The next step is to clarify the implications of choosing one design or the other with respect to the relative importance of the two objectives. The UNIDO *Guidelines* employs sensitivity analysis to this end. Obviously, if a high enough weight is placed on the income of the peasants, the subsistence-oriented alternative will show up better in terms of national economic profitability. Conversely, if we put a sufficiently low premium on peasants' income, the market-oriented alternative will be the more profitable. At an intermediate value, called the "switching value" in the *Guidelines*,

the two alternatives are equally profitable. Hence choosing the subsistence-oriented design indicates an implicit weight higher than the switching value; choosing the market-oriented design indicates a weight lower than the switching values.

In the first instance, the alternatives are presented to policymakers together with the switching value. This is intended to clarify and facilitate choice by quantifying the implications of alternative courses of action with respect to the relative importance of different objectives. This exercise can be expected to offer a significant gain over traditional practice in several ways. First, it will provide a systematic framework for considering competing objectives, especially the objective for which there is in principle widespread support but in fact no highly concentrated politically powerful lobby. Second, it provides a quantitative focus for discussion and debate about alternatives. Third, it allows politically responsible and accountable officials to intervene in the process of formulation and evaluation at exactly the point where political value judgments must be exercised, for in the *Guidelines* approach it is the policymaker, not the technician, who resolves the conflicts between objectives. By contrast, traditional procedures allow the intrusion of conflicts between objectives in an *ad hoc* manner that usually blurs choice and responsibility and gives the technician a disproportionate role in resolving these conflicts in the same way that he might resolve the conflict between safety and economy in deciding the strength of a bridge or dam.

Even if the UNIDO approach did no more, it would therefore be a worthwhile improvement over present practice. But it holds out the hope of even greater improvement: After a number of projects have been formulated and evaluated in this manner, the range of switching values for each weight may become sufficiently narrow that, for all practical intents and purposes, it becomes a point, a single number. From that time forward, the bottom-up procedure can give way to a top-down procedure in which the technician formulates a single design on the basis of pre-assigned weights. The UNIDO approach therefore has the merit of starting with an operational procedure that is in itself a worthwhile improvement on present practice and is, moreover, capable of evolving into a reasonable facsimile of ideal practice.

In general, there will be at least two weights to deal with, which makes the methodology somewhat more complicated (but not unreasonably so) than the preceding summary indicates. In addition to the weight on

redistribution of income, there is a weight implicit in the "neutral" objective of expanding aggregate consumption. This weight reflects the relative importance of marginal additions to aggregate consumption now and marginal additions later. This weight enters into benefit-cost analysis as a rate of discount. To distinguish this rate of discount from other rates (such as the rate or rates that may be relevant for determination of commercial profitability in a cash-flow analysis), it is generally referred to as a "social" rate of discount.

The higher the social rate of discount, the greater the discount placed on marginal increments to future consumption relative to increments to present consumption. The *Guidelines* contains a lengthy discussion of the principles underlying the choice of a social rate of discount. By way of summarizing that discussion, it must suffice here to mention only three points. First, in general the higher the assumed rate of growth, the more pressing *at the margin* is the present relative to the future; the higher therefore is the social rate of discount. Second, in any case, the choice of a social rate of discount is a value judgment exactly analogous to the choice of a weight on the income of the poor relative to the income of the rich; market rates of interest, rates of "time preference" exhibited by, or imputed to, households, have only a tangential relationship to the social rate of discount. (The marginal productivity of capital has an important role to play in the analysis, but it enters into the determination of the social value of investment, not the social rate of discount.) Third, the social rate of discount cannot in general be meaningfully determined in the abstract. A sensitivity analysis turning on switching values is enjoined as the appropriate way of determining the social rate of discount.

Other weights will be introduced as specific situations require the consideration of other objectives. In general they, in common with the redistribution weight and the social rate of discount, reflect political value judgments that are meaningfully quantified not in the abstract, but through a sensitivity analysis turning on switching values. One of the more important of these "other" weights is the value of foreign exchange. Whenever the value of increments of foreign exchange exceeds the domestic market value of the goods to which a marginal unit of foreign exchange would in fact be devoted, it is a fair inference that foreign exchange is valued over and above its contribution to aggregate consumption. Such "over-valuation" reflects a political value judgment that is tantamount to a merit-want

objective of independence from the strings that inevitably attached to foreign gifts and loans, an objective that is called "self-reliance" for short in the UNIDO *Guidelines*.

SHADOW PRICES AND THE DIVISION OF LABOR BETWEEN THE CENTER AND THE FIELD

It should be noted here that the value of foreign exchange appropriate for calculations of national economic profitability may differ from the official values of foreign exchange even when self-reliance does not enter the picture as a separate objective. For many reasons official exchange rates may underestimate the value of foreign exchange, even viewed solely in terms of the aggregate consumption objective. The *Guidelines* indicates a procedure for calculating the appropriate value of foreign exchange relative to the aggregate consumption objective. In the context of aggregate consumption, this value is called a "shadow price" rather than a weight, to emphasize that no new value judgments are required in order to calculate it. Another shadow price of importance in many countries is the shadow wage, a wage rate that reflects the existence of unemployment, overt and disguised, endemic to much of the developing world. These shadow prices, as well as the weights reflecting value judgments, belong to the category called "national parameters" in the *Guidelines*. National parameters are distinguished by their simultaneous relevance to a large number of projects. This makes it necessary and appropriate to centralize their computation.

By contrast, other shadow prices are best left to field-level technicians to calculate. Take for instance the cement going into a concrete dam in an area in which there is a severe cement shortage accompanied by rationing and other forms of non-market allocation. In such a situation the market price of cement is likely to understate its value in terms of national economic profitability, and the market price must be replaced by a shadow price. But the calculation of this shadow price, and many of the shadow prices that enter into benefit-cost analysis, is most appropriately delegated to field-level planners who can take local conditions into account.

This is not to say that no general principles are necessary for calculating field-level shadow prices. On the contrary: Much of the discussion of applying the UNIDO methodology at the project level is devoted to

laying out a general rationale for computing those shadow prices that are assigned to individual project planners.

In addition, the project level planner bears the responsibility for making the estimates of benefits and costs meaningful. The *Guidelines* therefore devotes considerable attention to translating abstractions like "aggregate consumption" and "redistribution" into operational categories into which field-level planners can accommodate the consequences of the projects they analyze. Separate chapters are devoted to the measurement of direct aggregate consumption benefits, direct aggregate consumption costs, indirect aggregate consumption benefits and costs, and redistribution benefits and costs. The greater number of chapters devoted to the aggregate consumption objective reflects no greater importance for this objective, but rather a common set of principles for this and the redistribution objective. For both, the basic measure of benefits and costs is "willingness to pay," that is, the value of goods and services to individuals. The difference between the two objectives lies in the restriction of the redistribution objective to specific groups of disadvantaged people, defined in general either by income class or by region.

ACTUAL VS. OPTIMAL RESOURCE ALLOCATION ON THE BASIS OF SHADOW PRICES AND WEIGHTS

The UNIDO approach to benefit-cost analysis corrects existing market prices, both to reflect differences between aggregate consumption and private market values and to reflect significant additional dimensions of economic well-being that are not measured by the level of aggregate consumption. A basic tenet of the *Guidelines* is that all corrections to market prices—all shadow prices and weights—should reflect the *actual* allocation of resources, present and prospective, rather than an optimal allocation of resources. It is tempting to prescribe recipes for project analysis in the context of optimality, for such prescriptions are both more elegant and conceptually simpler. Indeed, were we writing a treatise that comprehended both the strategy and tactics of development, which—and this is the real sticking point—we could anticipate with real confidence would be put into effect throughout the economy, we might have yielded to temptation. But our goals are more modest and we think more realistic. We do not anticipate that the efforts of a handful of technicians and politicians concerned with project analysis can bring

about a wholesale reform of economic policy. And so we have taken "what is" and "what is likely to be" as the starting point for the calculation of shadow prices and weights, rather than "what ought to be."

One example will indicate the difference between correcting market prices on the basis of "what is" and correcting them on the basis of "what ought to be." We advise basing the shadow price of foreign exchange in terms of aggregate consumption on the actual (and anticipated) allocation of foreign exchange at the margin, even if an alternative allocation can be shown to be superior in terms of individual willingness to pay. To calculate the shadow price on the basis of an "optimal" allocation of foreign exchange would be appropriate only if one could reasonably anticipate that the necessary policy changes will in fact take place, and this appears to us to impute unrealistic power and influence to project analysts in bringing about changes in policy outside their area of immediate responsibility.² The UNIDO *Guidelines* avowedly reflects a *disequilibrium* approach to benefit-cost analysis; governmental power is assumed to be fragmented rather than concentrated so that the government is better thought of as divided against itself rather than as monolithically pursuing or capable of pursuing policies that can be meaningfully characterized as optimal.

SUMMARY: THE DISTINGUISHING FEATURES OF THE GUIDELINES FOR PROJECT EVALUATION

This is not the place to attempt a detailed, point-by-point comparison with alternative approaches to benefit-cost analysis.³ Rather it is probably more useful to summarize the distinctive features of the UNIDO *Guidelines*, the important points that we believe set it apart from other approaches and make it a superior vehicle for accomplishing the general purposes of benefit-cost analysis. First, as the title indicates, UNIDO's aim is to provide *Guidelines for Project Evaluation*, not to provide a comprehensive manual. Early on, the authors despaired of writing a set of detailed instructions capable of comprehending the problems of countries as diverse as Mexico and Cuba, India and Ceylon, Egypt and the Ivory Coast. Detailed manuals can only be written country by country, by individuals intimately conversant with the economic, social, and political structure of the countries for which they write. This is partly because the great variations in the quality and availability of data on which shadow prices and

weights rest, necessitate corresponding variations in the analytic framework. But it is more because the shadow prices and weights depend as much on institutional patterns as on technology and resources. The aim of the *Guidelines* is to provide a basis for writing comprehensive manuals, to direct thinking about projects along the lines that have been outlined in this brief essay and are elaborated in the *Guidelines* themselves.

The second distinctive feature of the *Guidelines* is the emphasis on the multiplicity of objectives relevant to project formulation and evaluation. Other approaches may bring in more than one objective, but this is customarily done in an *ad hoc* or peripheral fashion that hides the conflict between objectives and generally attaches second-class status to considerations other than the size of the economic pie.

Third, the *Guidelines* offers a practical approach to defining the weights that are the quantitative expression of the relative importance attaching to various objectives. The sensitivity analysis on which the analysis of projects turns has the twin merits of an immediate improvement in formulation and evaluation and the gradual approach to a superior system in which weights can be assigned prior to project design. It not only clarifies the nature of the political value judgments inherent in public investment decisions, it also allows—and indeed, obliges—responsible and accountable policymakers to participate in the decision process at exactly the point where these value judgments can be most effectively translated into action.

Fourth, and finally, the UNIDO *Guidelines* is based on the assumption that any methodology for benefit-cost analysis can have at best a modest impact on the overall framework of economic policy. This is, to be perfectly clear, to assume a relatively permanent state of disequilibrium, with all its accompanying suboptimality. It is to assume that overall economic policy reflects a division of classes and interest groups, rather than a consistent set of measures conceived and carried out by a monolithic government.

CONCLUDING COMMENT

An impartial and unbiased judgment on the UNIDO *Guidelines* is hardly to be expected from one of its authors. Naturally, I believe that the *Guidelines* represents a significant and worthwhile step forward in the art of project formulation and evaluation. Nevertheless, candor requires that I speak to the *Guidelines* limitations as well as its virtues. Candor is reinforced, I

hasten to add, by common sense. For nothing could do the *Guidelines* or, indeed, benefit-cost analysis generally, more harm than to claim more than is to be realistically expected, and to have these claims disappointed. The major limitation of the *Guidelines* is that, like any framework for project analysis, it deals with the tactics of development, not basic strategy. The *Guidelines* is not terribly useful for comparing a new steel mill with the expansion of primary education, or even indeed comparing the expansion of primary education with the expansion of university education. For these questions deal with basic issues of strategy that cannot be meaningfully reduced to one or a few numbers.

The appropriate realm of benefit-cost analysis is the comparison of alternative uses for given physical resources, or of alternative sources of supplying the same goods. The earlier example of a choice between commercial and subsistence utilization of irrigation illustrates very well the first kind of comparison. The second is illustrated by the comparison of nuclear and conventional sources of electricity. For some time to come, it appears sensible to restrict calculations of national economic profitability to comparisons of alternatives that fall within a single ministry's or agency's budget, and to rely on other instruments for coordination between ministries and agencies.

It may well be asked whether such modest gains are worth the risks of creating or exacerbating conflict that our methodology, with its emphasis on the multiplicity of objectives, appears to introduce. The position of the *Guidelines* is that conflict is created not by this or that methodology for benefit-cost analysis but by the paths along which economic development takes place. Muting conflict, which is the best that alternative methodologies (including the alternative of no methodology) offer, will naturally appeal disproportionately to those whose interests are best served by following customary and traditional forms of compromise. Dramatizing conflict will appear not as a cost, but as a benefit to those who have the ideals of equality and social justice on their side but who, lacking ways of translating these ideals into concrete terms, have traditionally received the worse end of the bargain.

Notes

1. Partha Dasgupta, Amartya Sen, and Stephen Marglin, *Guidelines for Project Evaluation* (New York: United Nations Industrial Development Organization, 1972).

2. For more discussion of this point, see Amartya Sen, "Control Areas and Accounting Prices: An Approach to Economic Evaluation," *Economic Journal* 82 (March 1972 Supplement): 486-501.

3. For a comparison between the UNIDO *Guidelines* and OECD's *Manual of Industrial Project Analysis in Developing Countries*, Vol.

II prepared by I.M.D. Little and J. A. Mirrlees (Paris: OECD Development Center, 1968), see Partha Dasgupta, "An Analysis of Two Approaches to Project Evaluation in Developing Countries," *Industrialization and Productivity*, UNIDO Bulletin no. 14, 1970, pp. 5-14.

A New Approach to the Economic Analysis of Projects

Anandarup Ray and Herman G. van der Tak

This reading, which first appeared in the World Bank/IMF publication Finance and Development, discusses the main features of a revised approach to cost-benefit analysis and shows how it differs from traditional World Bank practice.

Ray and van der Tak begin with a concise review of the basic concepts of project appraisal. Projects are judged in light of development goals. Economic growth has long predominated among these goals, but the issue of equity has become ever more compelling. Cost-benefit analysis is a method for weighing alternatives in terms of opportunity costs and their relative contribution to objectives. It is an instrument sufficiently flexible to allow the consideration of multiple objectives. Project appraisal (especially when sensitivity analysis is used) can illuminate as well as judge project proposals, and can permit a systematic consideration of tradeoffs among conflicting goals.

Traditional practice tends to confine appraisal to efficiency concerns. Formally, it accepts the Pareto principle that benefits are equally valuable no matter who receives them. This view does not fit a substantial part of recent thinking on development or the pronouncements of many public officials in developing countries. Countries that desire rapid growth may see investment as a more urgent objective than immediate increases in welfare. When this is the case, benefits that will be reinvested are more valuable than those that will be consumed. It is only sensible that an appraisal methodology should reflect this priority. Or a country

anxious to promote a more equal distribution of income will place more weight on benefits for low-income groups than for the rich. This should also be considered in the decisionmaking calculus. (This considerable potential for conflict in priorities is not rooted in any cost-benefit methodology but in the elusive notion of development itself. Ray and van der Tak are aware of the dilemma.)

Traditional World Bank project appraisal has often used ad hoc weighting, particularly in the pursuit of equity. Ray and van der Tak argue the superiority of a more consistent and systematic scheme for establishing weights. They introduce the idea of a "critical consumption level" as a benchmark for gauging the relative priority of benefits received by different groups. The same principle of benefit weighting can be applied to "basic needs" or other items judged worthy of special priority.

The reading concludes with a summary of the concept of a social rate of return, and a reminder that social cost-benefit analysis remains an "infant science." [Ed.]

The World Bank lends for projects that contribute to the development objectives of the borrowing countries—primarily faster economic growth and the alleviation of extreme poverty. The economic analysis of a project assesses its likely impact on the relevant development objectives by comparing the various ways in which the scarce resources required by the project might be used instead. These resources may include different types of labor and skills, land, imported and domestic equipment and materials, and so on. The costs

of the project are the foregone benefits which these resources would have produced elsewhere, which must of course be less than the project benefits if the project is to be a sensible one.

Cost-benefit calculations also help to identify the critical parameters of a project. In an agricultural project, for example, the key measures that determine the outcome, and therefore need to be closely examined, might be the yield per hectare, the labor-intensity of farm operations, or the expected prices for the project's output. This identification helps to improve the project design, or at least to indicate the chances of the project having its expected benefits. Tradeoffs between different policy objectives are analyzed by testing how a project's net benefits increase or decrease as, say, the project design is changed to give more benefits to poorer income groups.

The framework for cost-benefit analysis along these lines has been extensively discussed in recent years within and outside the World Bank, resulting basically in two types of improvements. First, some of the old concepts of analysis, such as the shadow exchange rate, have been redefined and in the process made more precise. Second, an attempt has been made to make the framework more relevant to policy objectives in developing countries, stressing the flexibility needed to adapt the analysis to the great diversity of situations to which it is to be applied. This article is concerned especially with this second aspect.

COST-BENEFIT ANALYSIS

The costs and benefits of a proposed project are always measured against an alternative situation—generally that of not proceeding with the project at all. Thus, the benefits and costs are those expected from the project over and above those expected without it. Net benefits to be realized over future years are given a present value and are expressed in constant prices (adjusted for purely nominal changes due to inflation) to demonstrate whether the total net benefits over the life of the project will be positive or negative.

Another approach, equivalent to the first, compares the return on the investment in the project with the return on investment at the margin in the economy, that is, the "opportunity cost of capital." When the economic rate of return on the project is above the opportunity cost of capital, the project clearly helps the economy; conversely, if it is below, the project will involve an outright waste of resources.

It is often thought that a project needs to be analyzed carefully only when it appears marginal. But a project with a high rate of return, of, say, 100 percent, is not necessarily an acceptable investment, since there may be better ways of designing the project. A highway may be designed according to different standards or it may be started later; an irrigation project may be designed to supply water thinly over a large command area or concentrated in a smaller area; there may be several hydroelectric sites or different techniques for generating enough power to meet the growth in demand, and so on. Project analysis attempts to ensure that the chosen option for a project is the best possible—not only in terms of its size, technology, and location, but also in terms of the ultimate beneficiaries and the quality of output. The analysis, in short, must demonstrate that the proposed project will create more net benefits to the economy than any other option. To be sure, the search for a better option may be limited by practical considerations, including its cost; but it is always wasteful to proceed with the project if a better option is known to be feasible. Since it is not sufficient for the calculation to show only that undertaking the project is better than doing nothing, it is necessary to define costs and benefits carefully in most cases.

The definitions of costs and benefits used in the economic analysis of a project depend on the national objectives that are to be included in that analysis. When the only objective is the maximization of the total income of the economy, then the costs are the reductions in income suffered elsewhere due to the project's use of scarce resources, and the benefits are the additions to the total income brought about by the project. If a second objective were to be included, say, the reduction of income inequality (the "equity" objective), then the project's effects on equality would have to be taken into account—an increase in income disparity in the country due to the project would be a cost, and a reduction a corresponding benefit. Another objective could be the alleviation of absolute poverty, as distinct from merely reducing the income gap between rich and poor. These last two objectives would involve weighting the income gains flowing to the poor more heavily than the gains flowing to the affluent.

An attempt to calculate the effects of a project on such broad objectives as growth, poverty, or equity, and to assign weights to them according to a country's socioeconomic preferences, poses difficult problems for economic analysis, since market prices do not necessarily provide a satisfactory basis for measure-

ment. Prices which do reflect the proper weights to be given to the various objectives are called accounting or shadow prices. If, for example, a unit of labor is used in a project, the resulting sacrifice in the economy's total income would be the shadow price of that labor, if maximizing total income were to be the only selected objective. If equity were also an objective, then a different shadow price would be used which would also take into account the project's effect on equity. To distinguish between these different types of shadow prices, the shadow prices related to the income objective only are usually called "efficiency" prices; by contrast, the shadow prices reflecting total income measured with differential income weighting are called "social" prices.

Not all objectives need to be, nor indeed can be, reflected in each cost-benefit analysis. Suppose that a country is not particularly concerned about reducing poverty, or that it can do so more effectively through means other than the project. It would then be proper to exclude poverty-alleviating aspects altogether from the design of the project, let alone from its economic analysis. On the other hand, if the alleviation of poverty were a prominent consideration, then it must be included in the analytical framework if systematic decisions are to be made about the relative merits of projects which have different effects on poverty. However, if the analysis tries to incorporate too many objectives—say, more than three—it may become too complex for practical use.

The issues addressed and the precision desired in the analysis tend to vary over the project cycle. The study of an irrigation project might begin with the choice of the areas to be irrigated, move on to the choices regarding the operation of the particular schemes decided within a project, and then proceed to alternative methods of cost recovery. The economic analysis of alternatives is likely to be relevant to all such decisions. Even though the analysis of project designs is bound to be rather crude in the early stages, it should still incorporate the relevant socioeconomic objectives.

THE TRADITIONAL APPROACH

Cost-benefit analysis has traditionally focused only on maximizing incomes (an objective variously referred to as the "economic," the "efficiency," or the "social surplus" objective). To be precise, the traditional approach is defined in terms of total real consumption of goods and services in the economy, rather

than of incomes, since the economic welfare of individuals is related to their levels of consumption rather than to their incomes per se. A project investment reduces the total goods and services available for current consumption but increases the level of consumption possible in the future. Projects also change the relative consumption levels of various individuals in the economy, both at a point in time and over time. In order to judge the worth of a project from the national point of view, it is necessary to aggregate the various gains and losses accruing to different individuals over different periods into a single gain/loss measure. For this, some rule or conventions need to be chosen to define how the different gains and losses can be compared.

The traditional practice has been to regard all gains and losses at a point in time to be equivalent, regardless of whether they affect the poor or the rich. The practice does, however, treat the gains and losses accruing in different periods differently—future gains and losses being discounted to make them comparable to changes in consumption during the current period. Once aggregate consumption is defined in this way, the cost-benefit analysis can proceed to measure the project's net impact on total consumption over time.

This traditional framework has been very helpful in organizing thought and focusing attention on the economy-wide changes in total income and consumption that result from a project. However, the choice of a discount rate for making changes in future consumption comparable to changes in current consumption can be a source of major inconsistencies. The lower the discount rate, for example, the more weight is given to future gains in consumption relative to sacrifices in current consumption, and hence the greater the importance given to savings and growth. A low discount rate—of, say, 2-6 percent—may be appropriate for cost-benefit analysis in a developing country which has a commitment to rapid growth. However, the opportunity cost of capital in such a country, reflecting the yield expected on investment, may in fact be much higher because the level of investment is low in relation to existing opportunities and available funds are invested efficiently.

PREMIUM ON SAVINGS

If the yield on investments in an economy exceeds the yield necessary to compensate people for lower current consumption, then the level of investment is clearly inadequate—a situation which is presumed to be

a key feature of most developing countries. In such a case, simply discounting future costs and benefits by the opportunity cost of capital, as in the traditional approach, gives incorrect results since consumption gains and losses in different periods are not properly compared. If, instead, the rate appropriate for discounting future consumption—the “consumption rate of interest”—is used, this will also lead to errors as it underestimates the productivity of investments and thereby causes additional investments resulting from the project to be undervalued. To reflect properly both the relative value of current and future consumption and the unsatisfactory level of investment, it is necessary to use the “consumption rate of interest” as the discount rate in combination with a special premium for adjusting the value of investment expenditures. Thus, if a 5 percent return is all that is necessary to compensate for a sacrifice of \$1 in current consumption, but if that \$1 when invested yields 10 percent, then investment at the margin should be regarded as twice as valuable as current consumption.

This introduction of a premium on investment, and thus on savings, requires the project analyst to judge how much of the income created by the project would be saved. Since the public sector and the private sector, and the different income groups within the private sector, save at different rates, one needs to estimate how the incremental income derived from the project is going to be distributed among the various beneficiaries. Great precision is not necessary in this estimation. A distinction between, say, three income groups in the private sector—the very rich, the very poor, and a large middle-income group—may be sufficient.

An investment premium makes investments more attractive in those public or private sector enterprises that reinvest a greater share of their profits productively. On the other hand, any gains derived by the poor tend to be penalized, insofar as these classes tend to save less of their income gains than the rich. Investments in heavy industries, such as steel and petrochemicals, and in revenue-generating utilities, such as power and telecommunications, are likely to become relatively more attractive. Large-scale mechanized farming and estate plantations will perhaps also be favored. In other words, the premium will tend to make capital-intensive projects more attractive and reduce the emphasis on employment generation. Higher taxes on consumption goods, on income, and on land will appear more desirable, assuming that the government uses the tax revenues productively. The allocation of

investment funds between private and public sectors may also be affected, insofar as these sectors have different propensities to reinvest and different levels of efficiency. If such differences are considered significant, they should be reflected in different investment premiums for the public and private sectors.

A primary purpose of the new cost-benefit analysis is to take proper account of the “scarcity of foreign exchange” faced by many developing countries. It is often thought that this “scarcity” is also allowed for in traditional analysis. However, the scarcity value of foreign exchange depends on the economic objectives it adversely affects. If the benefit of additional foreign exchange is that it permits higher levels of investment in the economy, then the scarcity of foreign exchange is reflected in the premium on investment. It has recently become clear that the so-called “shadow exchange rate,” or “shadow price of foreign exchange,” as used in traditional analysis, does not bear on the scarcity of foreign exchange in this sense. This “shadow exchange rate” is only a device for correcting the distortions in the relative prices of internationally traded and non-traded goods, and for that purpose it is also used in the new method.

There are practical difficulties, of course, with the use of a premium on investment. It is often hard to decide the proper size of the premium, and estimating the increases in income and savings of different groups from a project may be a demanding task. Would it then not be better to rely solely on qualitative judgments in this respect? The World Bank, for example, has always placed strong emphasis on financial viability, high levels of cost recovery, replicability, and other policies which directly or indirectly reflect concern about the scarcity of investable resources. Unfortunately, qualitative adjustments in project decisions rarely work satisfactorily. Suppose the economic rate of return of a project, measured without an investment premium, is marginally above the cutoff rate; can this project still be rejected if all of its gains are expected to be reinvested? It is clear that answers to questions such as these implicitly involve a quantification of the value of savings and investment. Such implicit, *ad hoc* quantification can, however, lead to grossly inconsistent project decisions.

INEQUALITY, POVERTY, AND BASIC NEEDS

Introducing the investment premium does not require any change in the basic economic objective of tradi-

tional cost-benefit analysis, which will still treat consumption gains or losses to different individuals equally. The premium focuses on the correct assessment of a project's impact on total consumption, but does not affect the concept of the costs and benefits that are being aggregated.

The concepts themselves, however, will need to be changed if concerns with issues such as employment, income inequality, and the alleviation of poverty are to enter into the economic analysis. Gains and losses to different income groups will then be weighted differently to reflect these concerns, by giving more value to benefits to the poorer groups. For this purpose it would be necessary to assess which income groups are expected to gain or lose from the project. A broad distinction between only a few income groups is likely to suffice in practice. An even simpler distinction of beneficiaries into only two groups, above or below a threshold level of poverty, would suffice if the reduction of absolute poverty is the desired objective.

It is sometimes thought that even though governments may be concerned with income distribution and poverty alleviation, they need not introduce such concerns into project decisions, but instead should rely on other instruments of policy. Even though most governments have many policy instruments available which could directly or indirectly affect equity and poverty among their populations, the majority of developing countries seem to have found poverty redressal or the alteration of income distribution very difficult. The redistribution of land, for example, is generally crucial to redistributing incomes in most of these countries; but effective land reform has often proven infeasible, and land taxes are notoriously difficult to administer. The imposition of progressive income taxes also has practical limits, especially if serious adverse effects on earning incentives are to be avoided. Moreover, reliance on indirect taxes, or on inflationary finance, would affect the allocation of resources adversely and tend to weigh more heavily on the relatively poorer groups.

In many developing countries, therefore, the introduction of equity or poverty objectives into project selection tends to be an important complement to other policy measures. It is usually easier to locate projects in backward areas or to design them for urban or rural poverty groups than, for example, to change the tax system or to redistribute assets directly through a national land reform. It is much harder to shift the distribution of existing assets than to direct the creation of

new assets in favor of the poor—although the allocation of public sector investments also has political constraints.

The current practice in the World Bank treats the alleviation of absolute poverty as a very important aspect of many of the projects it finances. In order to orient projects toward this goal, several informal rules of search are used in the identification stage, such as upper limits for the cost per job created, or for the acceptable cost per beneficiary. However, search rules are not an adequate substitute for a fully integrated analysis of the conflicts between objectives, such as more employment or income for the poor versus more rapid growth in output. In land settlement projects, for example, the question frequently arises whether to allocate small units to each settler and thus spread the benefits widely or to allocate fewer, larger units in the interests of higher productivity of land use. A rule restricting the cost per beneficiary may be counterproductive in such cases unless it is derived from a full analysis of the tradeoffs involved.

If poverty or equity objectives are introduced in the analysis then suitable rules must be specified for aggregating the various gains and losses accruing to different individuals into overall benefit and cost figures for each year of the life of the project. The decision-maker who rules on a project, or the advisor who recommends a project, must necessarily use a scheme for weighting the gains and losses of different income groups. The question for any particular country is then which type of weighting scheme is most realistic and relevant for this purpose? Should one choose the equal weights used in traditional practice or should one differentiate according to income groups? The answer to this question obviously depends on the specific socioeconomic priorities of the country for which the project is planned, and no single weighting scheme is universally applicable. But these priorities are usually not explicitly formulated, and the analyst is faced with having to deduce their relative importance.

It is, however, possible to test the plausibility of relative weights reflecting different policy objectives by analyzing various national policies. For example, equity is often an important aspect of taxation policy, and there is always an exemption limit for income taxes. Moreover, many governments run large subsidy programs for the poor. Such policies suggest that if a person is poor enough, then an extra dollar to him is valued more highly than an extra dollar of government revenue, and therefore there is a critical or break-even

point—the “critical consumption level”—at which marginal private gains are socially worth just about as much as marginal increases in government revenues. A person should not receive subsidies unless the level of consumption he can afford is below this critical level. If the country concerned is deeply committed to growth, as are Brazil, Ivory Coast, and Korea, for instance, then heavy weight is given to generating incomes for investment, and hence this critical consumption level should be very low. The cutoff point for subsidies might then be at an income level which is only, say, 25 per cent of the national average. Subsidies will thus tend to be restricted to the very poor groups in such countries. If, on the other hand, the country is more concerned with equity or with alleviating poverty, as are, say, Sri Lanka and Tanzania, the appropriate critical consumption level would be much higher, perhaps as high as 75 per cent of average income. The critical consumption level is a relative income measure in the country and is usually well above levels representing absolute poverty. It is widely used in practice, especially in the context of project-related pricing and cost-recovery policies.

The critical consumption level is one of the benchmarks for assigning distribution weights that reflect a country's policy priorities. There are many other tests that can be devised to determine the most reasonable weighting scheme for the country concerned. Generally speaking, assigning equal weights to different income groups, as in the traditional economic analysis, would appear to be appropriate only in exceptional cases. Some degree of differentiation between income groups, at least to take account of extreme wealth and extreme poverty, is usually likely to be more realistic.

The introduction of different weights for different income groups would counteract some of the effects of giving special weight to the generation of additional investment. Projects which lead to additional savings and reinvestment will still be favored, other things being equal, unless the benefits accrue to those below the critical consumption level. Labor-intensive operations and employment generation will be favored to the extent that the additional labor income accrues to the poor.

The differences between countries can be easily reflected in the analysis since the emphasis given to employment, equity, or poverty alleviation can be “controlled” by varying the critical consumption level: the lower the level, the less the importance given to such concerns. However, since the same differential

income weights and the same critical consumption level are to be used for all projects within a country, it is clear that *ad hoc* judgments are avoided by this method. The use of poverty or equity considerations on an *ad hoc* basis tends to give a “free license” to accept any and all projects that help the poorer groups. In contrast, the new approach demands consistency and discipline in project choice.

Another important objective for many developing countries is to meet the “basic needs” of their people. Definitions of basic needs vary, but the principal interpretation treats certain goods and services as basic needs or “merit wants” that should be satisfied as a matter of government policy, rather than being met through charity dependent on private preferences. The planners or policymakers decide therefore which needs are basic, and what quantity and quality of service should be provided. They fix the weights that determine the importance to be given to additional consumption of the goods or services which meet the basic needs of various (usually income) groups, and how soon these needs should be fully satisfied in relation to other objectives of growth and distribution. These specific basic need weights are a straightforward variation on, and complement, the more general distribution weights discussed above.

The economic rate of return of a project defined in terms of prices that incorporate distributional weights (social prices) may be called its “social rate of return.” It will frequently differ from that calculated on the basis of traditional efficiency prices. There is no built-in tendency for social rates to be higher than the traditional rates of return. The new approach is designed in such a way that the social rates will be higher only to the extent that any increases in consumption due to the project accrue to those below the poverty line, and will be lower to the extent that the project increases the consumption of the relatively affluent. Social analysis does not make it easier to justify projects, but it tends to justify different projects, that is, projects that favor the poor and/or increase the level of investments in the economy.

The rigid adherence to one particular set of weights, as in traditional cost-benefit analysis, appears too doctrinaire to be appropriate for all developing countries, or even for the same country at different stages of its development. In countries where the distribution of project benefits is important, the traditional way of analyzing projects is only a partial indicator of the

economic impact of a project and is not necessarily a reliable guide to project decisions. The new approach, on the other hand, focuses directly on the hard choices facing developing countries between growth and redistribution and is likely to improve the decisionmaking process. As the experience with social pricing in cost-

benefit analysis accumulates and the methodology is adapted accordingly, it is likely to become a widely employed tool of analysis, not only in the World Bank but also in other international and national institutions with responsibility for selecting projects which best meet the policy objectives of the country concerned.

The Emphases, Assumptions, and Arithmetic of the Three Methodologies: A Comparison

John D. Donahue

These methods of cost-benefit analysis are broadly similar in principle, in procedure, and—most economists agree—in the guidance they are likely to give on accepting, rejecting, or modifying a project. All seek to establish the net benefit promised by a given project design. Benefits are defined by reference to development objectives and are balanced against opportunity costs. Each methodology assumes economic distortions, disequilibria, and other malfunctions—problems serious enough to warrant the substantial effort that shadow pricing requires. Equally important is the argument that projects—shaped, when appropriate, by shadow prices—are more promising instruments for encouraging investment or equity than direct fiscal measures. Finally, the methodologies share the same mechanics of discounting and summarizing, and the power of each is enhanced by sensitivity analysis.¹

Yet there are still *three* basic manuals on cost-benefit analysis for development projects. What does this imply?

Cost-benefit analysis brings facts and values together. It establishes predictions of a project's impact and evaluates them in light of proclaimed goals and priorities to provide concise, organized information. So ambitious an exercise means pinning down some elusive aspects of both theory and reality. General economic principles must be rendered clear and specific and applied to estimates of economic fact. Options must be judged—consistently—by stipulated preferences. Prices must be imputed or derived when observed prices fail. All this involves a lot of numbers and some fairly elaborate arithmetic.

The Numeraire

Costs and benefits appear in different forms, including domestic and foreign currency spent, saved, or

earned; income gained or lost by the wealthy, the destitute, and the government treasury; costs and benefits now, next year, or in 20 years; resources used that, without the project, would be consumed immediately, invested in some other way, or left idle; and benefits that are saved and invested or spent on consumption.

These categories are not immediately comparable. Nor—except occasionally and more or less by chance—are they equally valuable. The basic strategy for coherent and consistent allocation decisions is developing techniques for comparing costs and benefits of different forms, for different groups, occurring at different times. The cornerstone of this strategy is a common unit, a standard of value. In cost-benefit analysis—and quantitative analysis in general—the common unit is called the *numeraire*. In financial analysis, money is the common unit. But for economic and social cost-benefit analysis, money alone may not serve. Then the numeraire must be deliberately stipulated.

A system for valuing inputs and outputs begins with a numeraire and proceeds with rules for expressing the value of various kinds of costs and benefits in terms of this standard. Little and Mirrlees nominate as numeraire “uncommitted government income measured in terms of foreign exchange.” (This is a simplified statement; their full definition is more qualified and precise.) Other resource flows (for example, government income tied to a given use, private savings, and consumption by the rich or the poor) are valued relative to freely spendable public revenues. Little and Mirrlees select this standard to reflect the assumed priority on funds under public control, and also because public officials can presumably appreciate the value of convertible public funds and the relative value of other resources.

The UNIDO *Guidelines* proposes a broader numeraire: aggregate consumption. Costs and benefits are valued in terms of consumption. For example, the worth of investment is determined by the discounted value of the future consumption the investment will allow (minus, of course, the current consumption that the investment replaces).²

Economic Analysis of Projects follows Little and Mirrlees' lead, and Squire and van der Tak's numeraire is "uncommitted public income measured in terms of convertible currency," discounted and expressed in domestic currency units.³

In principle, anything can serve as a numeraire as long as plausible conventions can be devised for comparison: A unit of private investment is equal to .8 or 1.2 units of the numeraire, a unit of consumption by the lowest income group is worth .5 or 2 units, and so on. In practice, the numeraire is itself a category of special concern. Its role is to capture as broad as possible a range of costs and benefits and to supply a standard of value meaningful to decisionmakers.

Foreign Exchange

Foreign currency is often a special sort of scarce resource for developing countries, particularly for those that depend heavily on international trade. Convertible foreign exchanges can be transformed into almost any good or service. Market doctrine holds that a scarce and widely useful resource should carry a high price—in this case, a high exchange rate with domestic currency. The high price should serve to allocate foreign exchange to whomever can make the most productive use of it.

But nearly all countries "manage" their exchange rates (to the chagrin of many economists), and the market for foreign currency can be grievously distorted. Scarce foreign exchange is rationed, not by price, but through import licensing regulations and other non-market arrangements. The official domestic price of foreign currency can have little relation to its value, either in terms of its potential "productivity" or of the domestic resources that must be sacrificed to obtain it. Foreign goods are rendered artificially cheap (for those who can get them), and market signals may encourage using more imports in projects than a clear view of national economic interest would suggest. (Note that this concern with the scarcity value of foreign exchange carries considerably less force for some development assistance projects.)

Project evaluators have generally recognized the problem of undervalued foreign exchange, and shadow exchange rates have long been used.⁴ The three methodologies here all propose systematic ways to account for distorted exchange rates and the consequent gap between domestic and world market prices.

The UNIDO methodology, like many traditional approaches, uses a shadow exchange rate. This rate functions as a correction factor and sets the shadow prices of foreign commodities on a level with the prices of comparable domestic goods and services. The UNIDO shadow exchange rate for a given country is derived through an equation that begins with the total "bundle" of items that it buys on the world market, and then computes a weighted average of the difference between the domestic prices and world market prices of imports and exports. Applying this shadow exchange rate to traded inputs and outputs shows the real cost of using imports (and the real benefits of producing exports), thus offsetting any bias in project decisions resulting from artificially cheap foreign exchange.

Little and Mirrlees' proposal for equating domestic and international prices departs significantly from traditional methods. The heart of the Little-Mirrlees system of shadow pricing is valuing project inputs and outputs at *world market prices*. This basic strategy is also adopted, with only minor adjustments, by Squire and van der Tak.

Traded goods enter cost-benefit calculations at "border prices"; that is, the prices that prevail on the world market, with adjustments made for transport costs to or from the border. Nontraded goods and services (such as electric power and construction) are broken down into *potentially* traded goods and unskilled labor. Unskilled local labor, a special category of inputs, is valued with its own shadow price. In the Little-Mirrlees methodology, this breakdown of inputs and outputs continues until every item fits into one of two categories: traded goods and unskilled labor. Squire and van der Tak's World Bank methodology differs slightly. After the first breakdown, nontraded goods and services are valued with "conversion factors" that equate them with the international prices of comparable items. Squire and van der Tak also use a *standard* conversion factor (which amounts to a shadow exchange rate) when the longer process is not worth the effort.

These ways of correcting for discrepancies between domestic and world prices are controversial and can be complicated. The details are a concern for the special-

ist, but the basic difference in approach *can* make a difference. While the Little-Mirrlees and the Squire-van der Tak methodologies revalue domestic inputs and outputs *down* to world market prices, the UNIDO approach adjusts the prices of imports and exports *up* to domestic prices. These differences influence net present value calculations and make it misleading to compare one project design evaluated by the Little-Mirrlees approach with another design analyzed with the UNIDO methodology.

Investment versus Consumption

For developing countries, one of the most pressing problems of resource allocation is the primal dilemma of current consumption versus investment. Development demands investment, and investment resources can be had only at the sacrifice of consumption—savings, either domestic or foreign. (Drawing on foreign savings through international borrowing is a topic all its own.)

Domestic savings can be, like foreign exchange, a “resource” whose value is not fully captured by the market. A common concern in developing countries is that the savings rate is inadequate to support an acceptable level of investment. Savings can be directly increased, of course, through taxation. But this strategy has its problems in many countries, and planners may look to project selection as an indirect means of boosting savings. In this case, they favor projects that route a large part of their benefits into further investment rather than current consumption. All three methodologies provide the mechanics for expressing this priority in quantitative terms.

Little and Mirrlees devise a measure for putting a premium on public investment funds relative to consumption. This number is set through political judgment and enters into the shadow price of unskilled labor. A high value for this number tends to discourage labor-intensive projects that boost workers’ consumption at the expense of savings.⁵

The UNIDO *Guidelines* incorporates a “shadow price of investment.” This weight represents the productivity (and thus the opportunity cost) of investment resources. Since the UNIDO numeraire is aggregate consumption, the shadow price of investment is defined as the present (discounted) value of the future consumption that investment generates. This amounts to a special priority on investment as long as productivity exceeds the discount rate.⁶

While Squire and van der Tak’s *Economic Analysis of Projects* has no explicit investment premium, it incorporates policy concerns to render much the same effect. Recall the numeraire, freely spendable public income. Assuming that the government will favor investment when investment is called for (as Squire and van der Tak must and do assume), then to stipulate that a unit of consumption is worth only .5 or .8 units of the numeraire is to use a de facto investment premium.⁷

Like any weight used in cost-benefit analysis, an investment premium is a value judgment. None of the methodologies *require* a high value for investment relative to consumption. They just set up the equations for specifying priorities, while judgment and political choice must fill in the blanks.

Unskilled Labor

Shadow wage rates have long been used in project appraisal, and all these methodologies offer conventions for specifying labor costs. These procedures are rooted in the basic logic of each approach. Putting people to work on a project sets off a whole chain of economic effects. A central factor is the opportunity cost—the benefits lost when the new worker abandons whatever he was doing before coming to work on the project. Additional costs, however, are often attendant upon employment creation and must be paid by the worker or by “society”: transportation to the project area and relocation costs, new housing, social services, higher costs of living. These incidental costs can be important when labor is shifted from a rural to an urban setting. At the same time, there are benefits associated with new jobs. In determining shadow wage rates these can be taken as “negative costs”: Training and experience for workers, income redistribution, and mitigation of poverty can be seen as direct benefits of employment, beyond the project’s net output. Finally, a positive or negative value might be attached to work itself.

Several factors can contribute to a discrepancy between the market wage and the real net costs of hiring unskilled workers for a project. Mandated minimum wages may overstate the opportunity cost of unskilled labor. Public requirements to provide workers with social services—particularly for urban jobs—can make wages *understate* real labor costs. Concerns for redistribution or the intrinsic value of work are essentially non-market values that market wages cannot capture. The rationale for shadow pricing labor is rooted in these issues. Facts (about opportunity costs and public

commitments to provide supporting services) and values (concerning the priority of increased consumption at different income levels, the relative worth of present and future consumption, and the nobility—or repugnance—of labor) are combined, weighted, and committed to numbers in order to derive shadow wage rates.

The UNIDO formula for the shadow wage rate focuses on changes in both current and future consumption resulting from new employment. The first factor is the direct loss of output caused by drawing workers away from other occupations. The second is the loss of *future* consumption due to the employment-linked commitment to current spending rather than investment. The final, partly offsetting entry is this same increase in the workers' current consumption.⁸

Little and Mirrlees (and Squire and van der Tak substantially accept this formulation) devise a shadow wage equation different in form but essentially identical in the factors it considers. The basic opportunity cost, plus direct and indirect incidental costs, are adjusted by a weighted correction factor that counts some proportion of this commitment to current consumption as a social benefit rather than a cost.

Once again, the outcome of the arithmetic depends on the specific facts and values of a given situation. The shadow wage rate for a country or a region, derived through any of these methodologies, may be higher or lower than the market wage.

Discounting

The discount rate is a crucial variable in cost-benefit analysis. This rate is a weight on present costs and benefits relative to those occurring in the future. A high discount rate works against projects that require heavy initial investments, even if promising a steady stream of benefits in later years. A low discount rate removes this bias, but at the same time makes the list of acceptable projects longer and can complicate problems of choice. As suggested earlier, a discount rate can be rooted in either or both of two related concepts, *i.e.* based on consumption and the other on production.⁹

A *time preference* basis for discounting derives from the assumption that a given increase in consumption is less important for richer individuals (and communities) than for poorer ones. If continued growth can be expected—if, that is, in the future everyone will be richer—then future benefits and costs should be accorded less weight than more urgent ones. *How much* less depends both on expected growth and on the extent

to which new additions to well-being diminish in importance at increasing levels of consumption (the "marginal utility of consumption," in economists' terms).

An *opportunity cost* discount rate is based on the concerns discussed above in connection with investment premiums. If invested resources can, on average, generate a certain return each year—say, 10 percent—then the cost of using resources for a project is (at least) the forsaken opportunity to gain 10 percent annually in some "average" alternative use. Thus, net benefits should be discounted at this rate, since only gains in excess of 10 percent are real gains attributable to the "above average" productivity of the project in question.

The *Guidelines* uses a single rate for adjusting future resource flows, the "social rate of discount." This rate is fixed by a political value judgment of society's time preference: the priority of present versus future consumption. (The UNIDO methodology incorporates opportunity cost concerns through the shadow price of investment.)¹⁰

Little and Mirrlees begin with a time preference rate, the "consumption rate of interest," but judge that this in itself is an inadequate discount rate for social cost-benefit analysis. They go on to develop an "accounting rate of interest," defined as the rate of fall in the value of their numeraire, uncommitted public income. Another way of looking at the ARI is as that discount rate which, when applied to all project proposals, equates acceptable projects and investible funds.¹¹

Squire and van der Tak adapt the idea of the ARI to make it easier to derive. Like Little and Mirrlees, they start from a time preference rate and then adjust it by the premium on public investment funds and the marginal productivity of invested resources.¹²

The Political Context

Social cost-benefit analysis is a structured sequence of procedures for organizing and informing choice. It can potentially support—though never supplant—the political decisionmaking process. An appraisal scheme makes little sense apart from the institutional arrangements for putting it into effect, and the texts discussed here include assumptions and proposals concerning the organizational context of social cost-benefit analysis.

Little and Mirrlees envisage a Central Office of Project Evaluation (COPE) which "should be a power-

ful and central part of the planning system."¹³ COPE would command both the technical competence and the political mandate to undertake authoritative appraisals of project proposals. It would adapt the basic Little-Mirrlees methodology to fit the country's special circumstances, including setting a consumption rate of interest and fixing the value of different categories of resource flows relative to the Little-Mirrlees numeraire, freely spendable public income. Based on this weighting scheme, COPE would provide guidelines for shadow wage rates. Along with matters of value and judgment, COPE would also be responsible for technical chores, such as distinguishing traded and nontraded goods, determining border prices, and deriving the accounting rate of interest from the consumption rate of interest. Little and Mirrlees also see COPE in a broader role as a voice for economic rationality within the government. Beyond the tasks of project appraisal, the COPE professionals would be able and eager to point out ill-considered policies concerning taxes, subsidies, and trade, and may contribute to edging the country toward a more sensible and efficient economic structure.

The UNIDO *Guidelines* depicts a similar, though less powerful organization for carrying out cost-benefit analysis. A Central Planning Organization (CPO) would, like COPE, prepare country-specific versions of the methodology and oversee its implementation. The CPO is seen as an intermediate institutional layer between the top levels of government and operating development agencies. It is charged with "articulating political choice as it performs the technical function of co-ordination."¹⁴

Economic Analysis of Projects has a less explicit treatment of institutional arrangements. Given that it is addressed largely to the World Bank and other international agencies, detailed recommendations for structuring domestic decisionmaking institutions may be inappropriate.

Closely related to the political context is a critical aspect of social cost-benefit analysis, one of the few areas where the methodologies clearly differ. Social cost-benefit analysis requires that social values be articulated and then translated into clear, quantified parameters. Who does the articulating, and how does the translation work?

Little and Mirrlees propose what has come to be called a "top-down" approach. COPE, perhaps in consultation with high-level officials, would specify priorities and commit them to numbers, which it would

then pass down to project designers and evaluators.

Marglin, Sen, and Dasgupta are skeptical of this strategy, and propose for the *Guidelines* a "bottom-up" mechanism for setting weights. The key to this approach is a special sort of sensitivity analysis, testing each of several alternative project designs in terms of different values for the discount rate, distribution weights, and so on. These alternatives would be submitted to political decisionmakers. The choices made would implicitly specify the numbers, which could be further tested, refined, and eventually used from the beginning of project design.

Squire and van der Tak are again less explicit, but it is appropriate to call theirs a "side-to-side" approach to fixing values. They assume a large measure of joint responsibility between national and international agencies for project design, choice, and evaluation. Thus weights and judgments should be worked out collaboratively and reflect the objectives both of the national government and the lending agency.

Notes

1. This can be only a survey of these approaches to appraising a project. To master the mechanics, one must read the three books carefully, after having acquired a taste (or at least a basic tolerance) for economic theory and quantitative methods.

2. Partha Dasgupta, Amartya Sen, and Stephen Marglin, *Guidelines for Project Evaluation* (Vienna: United Nations Industrial Development Organization, 1972), pp. 39ff.

3. Lyn Squire and Herman G. van der Tak, *Economic Analysis of Projects* (Baltimore: The Johns Hopkins University Press, 1975), p. 67.

4. See the excerpt in this volume from Gittinger's *Economic Analysis of Agricultural Projects* on shadow prices for foreign exchange.

5. I.M.D. Little and J. A. Mirrlees, *Project Appraisal and Planning for Developing Countries* (New York: Basic Books, 1974), pp. 246-57.

6. The reason for this becomes clearer below when the UNIDO "time preference" discount rate is explained.

7. See Squire and van der Tak, *Economic Analysis of Projects*, pp. 60-73.

8. Dasgupta et al., *Guidelines*, chapter 15.

9. See the introductory essay to this volume, p. 1.

10. See Dasgupta et al., *Guidelines*, pp. 164-68.

11. Little and Mirrlees, *Project Appraisal and Planning*, pp. 73ff.

12. Squire and van der Tak, *Economic Analysis of Projects*, pp. 113-16.

13. See I.M.D. Little in "Proceedings of the Symposium," in *Social and Economic Dimensions of Project Evaluation*, edited by Hugh Schwartz and Richard Berney (Washington, D.C.: Inter-American Development Bank, 1977).

14. Dasgupta et al., *Guidelines*, p. 20.

PART III

Critics and Skeptics

There are enough things wrong with observed prices to make one's hair stand on end. . . . The only good thing one can say about market prices is that they are usually better than the alternatives—prices that are derived rather than observed.

R. N. McKean
"The Use of Shadow Prices"

The government is part of the class and interest struggle. . . . Their weighting of social objectives does not represent some sort of attempt at synthesis of the national interest, but rather primarily the interests on which they depend for their power.

Frances Stewart
"Social Cost-Benefit Analysis
and Class Conflict"

Whether some economists have a mental block, or a becoming if uncharacteristic modesty when it comes to costing their scarce selves, may be a whimsical speculation. But only when their time is treated as a scarce resource can good decisions be made about optimal levels of complexity in project selection.

Robert Chambers
"Simple Is Optimal"

The actual use of cost-benefit analysis within AID deviates substantially from that which its founders envisioned and from the theoretical requirements for correct analysis.

Kenneth Jameson and Laurel Worthington
"Inside Cost-Benefit Analysis in AID"

Part I brought the fundamental principle of wise resource use together with the context of project design and analysis. Sassone and Schaffer, Gittinger, and Delp outlined structures for cost-benefit analysis and suggested ways to exploit these structures to help inform decisionmaking. Part II covered much the same ground from a different perspective, exploring the context and the intent of project appraisal in greater theoretical depth. More ambitious methods for valuing costs and benefits were introduced and explained.

The readings in Parts I and II present essentially the same line of thought on the purpose of cost-benefit analysis. Designing development projects is seen as a series of decisions. Better informed decisionmaking is a step toward better projects. Development objectives can be elusive and unclear. Ingenuity and care are needed to translate these objectives into workable criteria and to bring them to bear on choices of resource allocation. The readings in Part II assert that market prices are potentially misleading measures of social

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costs and benefits and argue that the efforts required to derive and interpret better indicators of value are both promising and warranted.

There are other arguments. Critiques of cost-benefit analysis—of specific approaches and of the enterprise itself—constitute nearly as extensive a literature as do presentations of its theory and practice. Four samples are offered here.

R. N. McKean begins this section with a warning against undue enthusiasm for shadow prices. Much may be wrong with market prices, he concedes, but the "real" value of a commodity is notoriously difficult to determine, and prices set by the market have at least the virtue of being directly observable. McKean is uncomfortable with the idea of departing from the "reality check" of market prices. He suspects that shadow prices tend to be oriented to the "reality" analysts desire rather than to the best that can be done with what exists. There are, he admits, certain circumstances where derived prices are useful and even indispensable to cost-benefit analysis. McKean ends up further from the enthusiasts in spirit than in actual advice on the problem of valuation. His basic recommendation is for a lively awareness of the uncertainty, contingency, and expense of shadow prices.

Frances Stewart has a somewhat different objection. As earlier readings established, in order to identify and place values on costs and benefits, development objectives must be made clear. *Someone* must articulate these objectives, and the authors of each methodology introduced in Part II—from conviction, by default, or in view of the institutional structure they assume—leave this task largely to governments. Stewart takes issues with this assignment. Societies are not homogeneous collections of uniform individuals. They are made up of different groups, living in different circumstances and with different and usually conflicting interests. Government officials originate in particular groups in the class structure and tend to share the interests of their classes. The objectives that officials embrace, Stewart states, will seldom conform with the interests of "society" and will likely be especially at odds with the concerns of the poor and disadvantaged. Stewart sees social cost-benefit analysis as at best an

inadequate attempt to subject project decisions to social criteria and at worst as a sophisticated diversion from the realities of class struggle.

Robert Chambers objects to the complexity of social cost-benefit analysis, which he views as a needlessly sophisticated methodology potentially damaging to the goal of designing and implementing projects that will attend to the rural poor. Development efforts—particularly when external donors are involved—often carry a built-in bias against small, dispersed projects. Chambers suspects that rigorous requirement for project appraisal may reinforce this bias. He seeks a solution in simple, straightforward methods for judging project alternatives, accompanied by major changes in the institutional context of project design and selection. Chambers stresses an important point: Cost-benefit analysis can put heavy demands on scarce supplies of skilled manpower. The quality and relevance of the information it produces must justify the costs of analysis.

The final reading takes a special perspective. Kenneth Jameson and Laurel Worthington critically examine the requirements, the practice, and the prospects of cost-benefit analysis in the Agency for International Development (AID). Their article is prefaced by sections on economic analysis from AID's handbooks. While the requirements are generally flexible, stressing good sense rather than rigid adherence to any single approach, Jameson and Worthington discover and discuss some potentially important ambiguities in the AID guidelines.

Their second section (summarized here) surveys the way economic analysis was actually used in a sample of 110 AID projects approved between 1970 and 1976. Jameson and Worthington argue that the task cost-benefit analysis is meant to serve is not an urgent concern of AID project designers; scarce resources are not being rationed among competing projects. Seconding Chambers' point, they note that complex appraisal techniques have the potential to worsen some chronic institutional ailments. But they conclude that cost-benefit analysis can nonetheless support a very real and urgent AID endeavor: designing projects that make sense and work well.

The Use of Shadow Prices

R. N. McKean

A common concern characterizes designers of productive systems and consumers pursuing satisfaction: decisions to substitute one thing for another. Economic theory is built around the assumption that different combinations of resources can generate the same output (for producers) or level of well-being (for consumers). The combination that is actually chosen is determined by a sequence of decisions to substitute—decisions shaped by relative prices.

Seen this way, attention to prices, as proxies for value, lies at the heart of project design. A good project is one that collects productive resources into their most useful arrangements. Attention to profitability, guided by financial analysis alone, will point out to designers the best configuration—if the prices are right. The readings in Part II, and the systems of cost-benefit analysis they reflect proceed from the contention that observed prices can be very wrong. Market distortions, external impacts, lopsided income distributions, and those dimensions of welfare that elude markets can create a gap between the signals and incentives of markets and the urgent demands of development. This gap, proponents contend, must be bridged by estimating shadow prices that better reveal priorities and tradeoffs, and employing these prices when appraising projects that take a public perspective.

McKean urges caution. This article was written for economists and assumes some familiarity with the theory and jargon, but its main point is simple: Shadow

prices rest on facts and values. Facts, especially facts about the future, tend to be uncertain. Values, especially social values, tend to be ambiguous. Shadow prices are contingent—and costly. Be careful. [Ed.]

In any industry it is possible to substitute some of one input for amounts of others in order to produce particular outputs. H₂, S, and O₄ go together in fixed proportions to produce sulphuric acid, yet sulphur can be substituted for oxygen in limited amounts if a firm reallocates its effort, being less careful in caring for inventories of sulphur and more careful in preventing “waste” of oxygen. Also it is possible for consumers to substitute one product for others in attaining a given level of satisfaction. Even Robinson Crusoe had to reckon, either explicitly or implicitly, with such substitutions. The marginal exchange ratios or rates of substitution among items—inputs to either production or consumption—can be regarded as ratios of prices.

When prices are explicitly used to exchange items freely, they are called market prices. If gasoline is thirty cents per gallon and kerosene is ten cents per gallon, these prices tell one that a gallon of gasoline can be obtained by sacrificing three gallons of kerosene. When the prices are *implicit* in exchanges that should be made to maximize a particular objective function (or to minimize a cost function), they are called “shadow prices.”¹ Such exchange relationships emerge from the shadows if one minimizes the cost of providing a specified number of nutrients in a daily diet. A sequence or family of shadow prices emerges if one traces out a combined production-possibility schedule (maximum Y for each amount of X to be produced)

Excerpts from Roland N. McKean, “The Use of Shadow Prices,” in *Problems in Expenditure Analysis*, Samuel B. Chase Jr., editor. Copyright (c) 1968 by the Brookings Institution, pp. 33-52. Reprinted by permission.

from individual production-possibility sets. Such a sequence also emerges when one derives a production-possibility schedule in terms of values rather than physical commodities—if one adopts a particular value structure or preference function.

Government expenditures are group decisions—that is, choices that affect many persons. This is not to say there is such an entity as a group that makes decisions. Choices are made by individuals—in government, by individual senators, congressmen, officials, employees, organization members, voters, and so on. But each person, in taking his stand, takes into account the wishes expressed or sensed, the rewards offered, and the penalties threatened by others. Thus individuals make decisions, yet those choices are by no means independent of other persons' views.

Choices about government expenditures, then, are "group choices" for which there is no ultimately correct preference function—choices whose preferredness cannot be subjected to any *ultimate* test. A corollary of the proposition that group choices cannot be subjected to any ultimate test is that there is no uniquely correct set of prices or tradeoff ratios. If I am dictator, one set of tradeoffs is appropriate. If you are dictator, a different set is correct. If we agree to abide by the results of majority rule, whatever preference function (or family of functions) this implies—if it could be identified—would call for another set of exchange ratios. If we agree to accept the results of voluntary exchange starting with a given wealth distribution, still another set of shadow prices becomes correct. Actually, any government is guided by a complex mixture of rules, constraints, and discretionary authority. There is always an inherent uncertainty about the preferences implied by a collective decision-making process, about the preferences of any subaudience to which an analysis might be directed, about the constraints that should be taken as given and those that should be regarded as negotiable, about the technological facts and substitution-possibilities, and so on. In the face of such uncertainties, one has an even murkier perception of the values that should be attached to alternative outcomes and of the tradeoffs that are appropriate.

Whatever preference surfaces and shadow prices are used, it should be kept in mind that prices play a pervasive role in economic analyses of federal expenditure programs. Their general function is to provide appropriate substitution ratios enabling an economy to achieve efficiency, but prices perform this function at

all stages of analysis—not merely in whatever final exhibits are presented to higher officials. When benefit-cost analyses are made available to Congress, for example, they usually contain estimates of costs and gains for one design of the Hungry Horse project, one design of a cross-Florida canal, one or perhaps two proposals for research and development (R&D) on oil shale, one or at most a few alternative missile forces. The estimates resulting from the prices embedded in these analyses are supposed to help one decide whether or not to go further in substituting missiles for aircraft, R&D on oil shale for R&D on coal, irrigation projects for canal facilities.

In earlier stages of the analyses, however, alternative designs for each proposal are considered. In these earlier stages, prices are supposed to reveal appropriate substitution ratios among cement and gravel, labor and earthmoving equipment, alternative processes for extracting fuel from oil shale, manpower and check-out equipment in missile systems, warhead size and guidance mechanisms, and so on. The substitution possibilities at these early stages are extremely important, for efficient choices are not reached by comparing well-designed canal proposals with stupidly designed irrigation proposals or well-designed missile forces with stupidly designed aircraft systems. In short, the role of prices is to serve as appropriate substitution ratios among inputs, intermediate outputs, and end-items in the whole sequence of choices—designing alternative systems, redesigning the alternatives, and comparing the alternatives in the narrower menu of proposals that is finally presented to higher authorities.

PARETO OPTIMALITY AND LIMITATIONS OF MARKET PRICES

Let us assume initially that by unanimous agreement government is to seek "Pareto optimality" or, as it is often referred to, "economic efficiency"—that is, the results that would obtain if each person were made as well off as possible, as *he* perceives *his* well-being, without making anyone else worse off, as *he* sees *his* well-being.² There is, of course, a whole family of Pareto-optimal points, one for each initial distribution of wealth. Let us assume that the government seeks the particular subset of efficient points implied by the distribution of wealth as it will be affected by the going tax structure and the expenditure choices.

It should be repeated that there is nothing sacrosanct about Pareto optimality. There is nothing illogical

about my not wanting individual X to maximize his utility as *he* sees it. Indeed, if we are candid, economic efficiency in this sense is no one's first choice, for each of us would prefer to distribute wealth, encourage the use of some products, and discourage the consumption of others, according to his own fancy.

But, having made the assumption that the government seeks Pareto optimality, one can make some observations about ideal price ratios. In effect it will be assumed *initially* that the government is a huge industry catering to consumers, accepting consumers' valuations, and trying to attain economic efficiency in the usual sense.³ (Naturally, if government is conceived of as a separate economy like that of another planet, everything changes.)

First, a few words about market prices. There are enough things wrong with observed prices to make one's hair stand on end. Most of the time they are defective representations of the appropriate substitution ratios. The only good thing one can say about market prices is that they are usually better than the alternatives—prices that are derived rather than observed. The reason is that markets provide an enormous amount of information at a relatively low cost, even though the information is still short of being perfect.⁴ This information has some relevance as long as one's preference function gives some weight to the desirability of having voluntary exchange. Markets put millions of persons into the business of providing information about substitution possibilities. Markets induce millions of people to adjust their purchases and sales to prices, so that those prices reflect (approximately) what an extra unit would be worth to all users. Because of market imperfections, there are no doubt more appropriate exchange ratios in principle, but in most cases it would be extremely expensive to acquire the improved information. Therefore, as the shortcomings of market prices and the possibilities of deriving shadow prices are discussed, one thing should be kept in mind: The existence of defects in market prices does not mean that some derived price or alternative procedure would automatically be better.

Imperfect Markets

Market prices may fail to reflect appropriate substitution ratios for several reasons that are discussed in the literature on the theory of second-best.⁵ Sometimes it is especially difficult to perceive what is second-best—the best one can do, given various constraints.

For example, it is obvious that market imperfections alone cause prices to deviate from marginal cost. Suppose the price of A is higher than marginal cost, where marginal cost means the market value of resources used to produce A.⁶ To reflect appropriate substitution ratios, should the price of B to consumers also be higher? The answer is yes, if one could control those prices (and there were no other commodities and no other distortions and the controls had no side effects).

But should a benefit-cost analyst, who cannot control market prices, use a higher-than-marginal-cost price for B or a lower-than-observed price for A, in the analysis of policies producing or employing A and B? It depends. If the government project would produce or consume marginal units of A without affecting the monopolist's output of A, the marginal units would be provided to or taken from consumers of A. The marginal value produced, and the marginal cost in the sense of the value sacrificed by pulling a unit of A from consumers, would be measured by the observed price of A. The same statements would be true for extra units of B produced or employed by a government project. If, however, the project's production of A simply reduced the monopolist's output, he would release resources, and the project's output would really be the alternative value that these resources could produce, that is, the marginal cost in the sense of the market prices of the resources released. Or, if the project's purchase of A simply increased the monopolist's output, he would hire resources, and the sacrifice to the economy would be their alternative products, that is, the marginal cost of the inputs. In these circumstances, to use the observed prices of A and B would distort the true substitution ratios.

In fact, a project's production of A would in part increase the amount of A consumed and in part release resources to other uses; and a project's consumption of A would deprive consumers of some units but to some extent induce the monopolist to expand his output. Thus to accept the observed prices for a benefit-cost analysis (prepared with economic efficiency as a criterion) would not be completely correct. If one considers other situations, there are similar difficulties in choosing correct substitution ratios. If the government project would yield or employ inputs to the production of A and B, or an input used by numerous monopolists with diverse ratios of output-prices to marginal costs, the observed prices of those inputs would certainly not be fully appropriate in benefit-cost analyses.

Other Constraints on Resource Use

If unions restrict entry so that the price of electricians' services is above its value in competitive equilibrium—if entry into the field of medicine is hampered so that the value of doctors' services is higher than it would be with free entry—should lower prices for these services be employed in benefit-cost analyses? (Some government programs might involve producing medical services as outputs, and others might involve using them as inputs. In either instance, the matter of prices or substitution ratios would come up.) The answer is no—if the government's action would make more of these services or less of these services available to consumers. If that were true, the marginal evaluations of consumers should be used. It does not matter whether it is God or man that imposes the restriction on supplies. What matters is whether or not the restriction is expected to be binding. Needless to say, if the restriction is about to be ended, then consumers' marginal evaluations—marginal cost in the sense of value sacrificed by using another unit—will go down, affecting the substitution ratios that will be appropriate thereafter.

The same argument applies to restrictions on imports, as in the case of petroleum products, lead, or zinc. What is sacrificed by employing units of these ingredients in a project and what is gained by producing extra units in some program? If import quotas are to continue unchanged, the incremental values under discussion are the users' marginal evaluations in the going circumstances. Whether or not the quotas stem from acceptable reasons—for example, values consciously attached to self-sufficiency—is irrelevant. The relevant issue is whether the restrictions are to persist. Of course, if a change in the quota situation is expected, or if the project itself would somehow bring about a change, then the relevant prices would be something else. (If the discussants of a proposed project wished to call attention to quotas they disapproved, they might want to use adjusted prices for tactical reasons. But that is a use of benefit-cost analysis that is off-limits in this paper.)

Price-Support Programs

Where subsidies exist for the production of certain items, similar arguments apply—as long as the output is offered for sale, and consumers are free to adjust at the margins. Again, whether God or man's mistaken calculations expand supplies, the value of the marginal unit (as long as we seek Pareto optimality) is what

consumers are willing to pay for it. The subsidies may exist because a group of persons who receive side-benefits join forces and contract to subsidize an industry. The subsidies may exist because a majority of voters believe there are spillover benefits and therefore condone government subsidies. Or the subsidies may exist because producers' pleas are such a nuisance that voters would rather subsidize than resist. The underlying reason is immaterial—what matters is whether the subsidies are expected to persist.

*Anticipated Changes
in Supply and Demand Conditions*

Perhaps it should go without saying that observed prices are inappropriate if a benefit-cost analysis pertains to the coming decade and price-ratios are expected to change in a predictable manner next month. To get the most from resources (with a given value system) one should use the substitution ratios that are appropriate at the time the substitutions are to be made. One should not make choices today in accordance with circumstances in 1850 any more than he should make choices in the United States on the basis of substitution ratios on Mars. This, too, turns out to depend on the costs of information and therefore to call for heroic judgments. Markets generate a great deal of information about current substitution ratios and, through future markets, some probabilistic information about a few substitution ratios several months hence. But the cost-per-unit of high quality information about substitution ratios five years from now is usually like the per-unit cost of Holy Grails: It is very high. Supply-and-demand conditions for many items—such as water, the rare earths, recreational facilities, particular skills, and automation equipment—are likely to change drastically in the years ahead. But how far to go in adjusting current prices for purposes of evaluating federal programs will depend on judgment about the costs and gains from seeking the improved information.

A special case is the situation in which the government's program is itself expected to alter prices. A program might, for example, use such a lump of fissionable material, or produce such a lump of power, or yield such a large technological advance that it significantly affected the prices of the items involved. In deciding whether to substitute the program for other activities, one should include as benefits whatever people are willing to pay for those lumps, whether large or small. In deciding whether to make subsequent substitutions among fissionable materials, power, and

other items, the new prices would indicate their new marginal evaluations. Again, of course, information costs are the key to decisions about the prices to be put into benefit-cost analyses.

Unemployed Resources

Observed prices are also misleading when at the going price part of a resource is involuntarily unemployed. There is no need to go into the theory of unemployment here; inputs are sometimes idle yet would be employed if aggregate demand ceased falling or rose. In such circumstances the sacrifice entailed by using those inputs is not reflected by observed prices and may be virtually zero in the case of manpower. Should the benefit-cost analyst insert an adjusted or shadow price wherever a government project would employ such inputs?

The answer depends on the real-world situation *at the time the input would be used*. Unemployment today does not necessarily imply unemployment two years from now when the project would be completed. It does not strike me as reasonable, particularly in this latter half of the twentieth century to assume that mass unemployment will persist year after year.⁷ If a depression exists and a project would begin shortly, it might be appropriate to charge a zero price for manpower during the first year of the project, though as a general rule comparisons of alternative proposals are likely to be more accurate if ordinary levels of employment are assumed. In the evaluation of some projects, such as training programs for new or underprivileged immigrants, it may be appropriate even during prosperity to assume a low level of employment. Again, unfortunately, the answer will be different for different analyses; these principles provide general guidelines but not specific guidance.

External Effects

Another phenomenon that casts doubt on the use of observed market prices is the existence of external effects. If an action uses up valuable resources but the owner's voluntary consent is purchased, the sacrifice is "internalized."⁸ If an action uses valuable resources, but no one's consent is purchased, the sacrifices caused by the action will not be fully recognized; there is an external cost. Similarly, if a benefit is produced but no price is charged for it, the benefit will not be fully recognized; there is an external gain.

Why should such things happen? Sometimes they happen because of the legal framework—for example,

ocean fishing rights are not assigned to anyone in particular. Sometimes they happen because the contracting costs would be too high in relation to the gains⁹—for example, purchasing the consent of householders who do not like throwaway papers or handbills thrown on their lawns.¹⁰ In many instances externalities persist because the effects have "public-good" (or "public-bad") characteristics. That is, it is expensive to exclude nonpayers from reaping benefits so that a price of admission could be charged—or, in the case of the public "bad," expensive to exclude those whose consent to suffer costs is not purchased. If someone eats an apple, others are automatically (that is, costlessly) excluded from eating the apple. If someone listens to a concert, however, others can be excluded so as to charge a price of admission only if special barriers are erected. If a glue factory emits noxious odors, persons whose air-space is being used without purchasing their consent cannot be excluded except at enormous cost. Sometimes it turns out to be economical to erect the barriers and charge admission, but often the costs of excluding those who do not enter the agreement and of policing it are too high. In most instances, mixtures of exclusion cost and contracting cost keep effects from being internalized.

Now, to achieve Pareto optimality, external effects should be taken into account—whenever the gains from doing so exceed the costs. When markets are economical—such as the sale of garbage to pig-farmers—the transactions provide information¹¹ about what consumers are willing to pay for the item and what the costs or alternative gains are—and simultaneously the markets eliminate the externality. When markets are uneconomical, questions are left up in the air because the worth of external benefits and the size of external costs are usually uncertain, precise determination of these magnitudes being infinitely expensive (that is, impossible) and improvements in the quality of estimates being of uncertain value. Government may or may not decide that intervention would be worthwhile.

But our problem here is not whether to intervene because of externalities; it is whether, in choosing among alternative projects or actions, to modify observed prices of inputs and outputs so as to allow for externalities. In this situation officials are not setting up markets; they are not concerned with the costs of exclusion and contracting. They are simply concerned with whether to use one set of prices or another set of prices in preparing or interpreting a benefit-cost analysis—that is, in evaluating alternative actions.

Real-life government officials will decide on the basis of their own preference functions and the gains and costs they feel. The result will rarely be an all-out effort to achieve Pareto optimality.

But in terms of Pareto optimality what should be done? What are the costs of taking externalities into account in choosing among irrigation projects or training programs? The costs seem to be the opportunities foregone in preparing and refining estimates. And the gains, it should be stressed, should allow for uncertainty about the estimates. They may be of such low quality as to have a negative value. (Misleading estimates are not hard to imagine; we do not know whether certain prison or training or recreational facilities increase or reduce juvenile delinquency.)

Suppose vaccinations were one of the outputs of a government project. The observed price would hardly reflect the full incremental value, since it would not include the value of each vaccination to all other citizens. Should the benefit-cost analyst adjust the free-market valuation to allow for external impacts? It depends upon what it would cost to get information of various qualities and therefore information having various values. If a government official judges that an estimate worth more than the cost can be prepared, he should undertake to allow for the external effects. In the case of vaccinations, many of us judge that it would be economical to allow for the external benefit and estimate a shadow price. But note that cases must be considered on an *ad hoc* basis, for the decision rests on judgments about the worth of unknown bits of information and the costs of a sequence of probes for information. Note, too, that since subjective judgments must be made, legitimate disagreement may ensue.

To repeat, the choice regarding derived or adjusted prices seems to hinge on the costs and value of extra information about external effects. Officials must decide how far to go in estimating what people would pay for incremental smog-control or noise-abatement, and what the derived value of smog- or noise-creating products should therefore be. Such decisions depend upon the costs and worth of alternative degrees of refinement in preparing the estimates. (I see no way to compare these costs and worths except on the basis of a personal judgment followed by a sequence of information searches and more personal judgments. Yet these are judgments that we cannot sidestep.) This is not a very helpful conclusion. It gives no operational guidance. Yet in my view it is better to offer a correct but general

statement about the way to look at the choices than to offer specific guidance that is incorrect.

It may appear that there is another category of products for which we need shadow prices—products produced by government that are not sold through markets. Clearly government programs can produce many items of value—such as defense capabilities, the saving of lives, improvements in race relations, better maintenance of law and order, a greater degree of equity, noise-abatement, and court decisions—for which there are no markets. These items are of value, for many people are willing to pay for increments in output. There are no markets, for it is evidently uneconomic to define rights to the products, police the rights set-up, exclude nonpayers (in some instances), transfer these rights, and so on. Moreover, government programs can produce many items of negative value—such as loss of life, impairments of race relations, deterioration of law and order, inequities, noise, and bad court procedures and decisions—for which there are no markets. Throughout the process of producing these positive and negative values, substitution possibilities are pervasive. Since there are no markets, what about shadow prices?

Actually, the matter has already been discussed. These impacts are in reality our earlier acquaintance: externalities. If the Los Angeles government bought permission from householders to use their sound-space by banging trash cans together early in the morning, it would be like their purchase of the oil company's permission to use the fuel in the vehicles. There would be no externality. Or, if householders paid extra to have the trash collected very quietly, there would be a different distribution of wealth but again no externality. But a market for this noise-abatement is too expensive to be worth operating, and the noise is inflicted without anyone having the option of agreeing to a fee.

Similarly, if government could economically exclude nonpayers and sell the spillover benefits from vaccination, they would no longer be spillovers, for the result would be like selling any other product. People would adjust to their best positions in the light of all costs and gains. No benefits would be created that people did not voluntarily buy. Again such marketing arrangements would be too costly, and the economy is left with externalities. Hence, "goods" or "bads" for which there are no markets turn out to be externalities. As noted earlier, whether or not to impute shadow prices, and how far to go in refining estimates of such prices, depends upon heroic judgments about the value

and cost of acquiring such information. In my view, the analyst and government should at least take the almost costless step of describing the principal external effects. In some instances it is worthwhile to make specific estimates and in effect to introduce shadow prices showing the tradeoffs between, say, vaccinations and noise abatement. In other instances, the cost of producing estimates and shadow prices may exceed their value (in view of their quality).

Many persons may feel that this discussion grossly exaggerates the cost of information, for they visualize correctly that a hundred thousand dollars would buy a lot of numbers. But cost depends on the quality of the output that is being considered. Even for an output like Minuteman squadrons, it would cost little to provide some sort of shadow prices, yet it might be infinitely costly to prepare appropriate ones. Similarly it would not cost much for me to build "a" chair or to write "a" short story; yet it would cost a great deal for me to build a good chair, and the cost of my writing a Somerset Maugham story would probably be infinite. As stressed repeatedly, what to do depends upon one's judgments about the cost and worth of the alternative results.

MARKET PRICES AND NONMARKET VALUES

In reality, government officials attach values to many items that are customarily omitted from the individual's list of products. For example, officials may attach greater value to additional economic growth than is implied by individual choices. They may attach high values to self-sufficiency, cohesiveness or discipline, or certain redistributions of wealth. Such values may be sanctioned by a majority of the voters. In addition, even with democratic procedures, officials end up with some discretionary authority, and they are likely to introduce additional aims that may or may not be condoned by controlling coalitions of voters. For instance, through the actions of numerous officials, a value may be attached to having relatives on the payroll, carrying out pet schemes, subsidizing particular religions, developing Alaska, controlling certain prices, or having more personal convenience.

There is nothing wrong or right about these values from the economist's point of view, any more than there is anything wrong or right about a taste for oranges or castor oil. In some instances one may regard these various preferences as introducing constraints that prevent the attainment of the usual production-possibility boundary (or alter the particular point that is

attained). Or one can view them as constraints that depart from consumers' evaluations and alter the boundary. In that case one has to redraw the boundary to allow for these constraints. The more general way of thinking about the matter is this: these values may simply introduce other items that can be produced by sacrificing alternative outputs, items that are not usually considered when discussing the Pareto-optimal boundary, but items that need be no more foolish than any other element in individuals' utility functions.

There are complications, of course. For one thing, such valuations are thrust upon large blocs of persons without the fine discrimination and voluntarism that markets permit. If the majority or a dictatorial clique sets a high value on economic growth, it is different from allowing each individual to buy \$5, or \$1000 or \$0 worth of economic growth. Since compulsion for some individuals is involved, it is a far cry from Pareto optimality in the usual sense. But the revised set of values and constraints does imply some sort of production-possibility boundary.

For another complication, the process may result in inconsistent valuations. One part of the government may make choices implying that positive values are attached to agricultural products, while another may make choices implying that zero or negative prices are attached to them. Also, the introduction of these values at different levels and in different portions of government may sometimes imply "nontransitivity"—for example, a preference for A over B, and for B over C, yet for C over A.

The most fundamental complication is the absence of markets for the items concerned. There are no explicit bids to buy and offers to sell units of economic growth, national self-sufficiency, placements of relatives on the payroll, the development of Alaska, and so on. Government cannot simply raise its bids for such items and find that market prices adjust so as to reflect these valuations. Since there are no markets for these items, the observed prices for various inputs do not necessarily reflect the values attached to these final items. In principle, therefore, many observed prices would be incorrect in analyses intended to help decisionmakers maximize whatever modified preference function is implied. If governing officials in a nation, underdeveloped or otherwise, attach a high value to economic growth, their judgment presumably implies that the price of steel facilities, one type of investment, should rise relative to the price of bowling alleys, another type

of investment. Similarly the appropriate exchange ratios among investments shift about in a consumer-oriented economy if the demand for airline service increases relative to the demand for railway service. But in the mixed economy under discussion here, and the kind we live in, observed market prices do not necessarily indicate the appropriate substitution ratios.

WAYS OF DERIVING SHADOW PRICES

The use of programming techniques to solve maximization problems highlights appropriate tradeoffs or substitutions, and for this reason the concept of shadow prices has been developed mainly in connection with linear programming. However, the imputed prices derived through programming techniques are no more appropriate than the assumed preference functions and technological interrelationships that underlie them. Such calculations have turned out to be relatively successful in connection with blending problems for which the objective function and the interrelationships could be specified with confidence and completeness. For entire economies or sectors of economies, however, it is almost impossible to conceive of complete and appropriate preference and production functions. As one might expect, therefore, programming and econometric models do not so far have a good record when used to make predictions.¹² By the same token, the shadow prices generated by such models can hardly be regarded as promising substitution ratios to use in evaluating alternative government actions. Shadow prices from a pretend-economy have a good chance of being no more relevant than shadow prices from the economy on Mars.

Another method of imputing prices is to take over price relationships observed in markets for similar items or in markets for the same items in other countries. For example, in trying to value a public beach or recreational facility, one often resorts to using the prices that people pay for similar beaches or facilities that are operated commercially. A major difficulty in using this approach is determining how similar these items are. A slight difference in location, sand, water currents, popularity with others, adjacent services, and so on, can make a great difference in what individuals are willing to sacrifice for the use of a particular facility. Some products, restaurants, and recreational ventures succeed, while others fail because of slight and hard-to-discern differences. The appropriate prices of

even close substitutes like butter and oleo may vary considerably. Similarly, for well-known reasons, the correct prices of the same item in different countries may be far apart. For the purpose of exploring a technique, it may be useful to insert a few US prices in computations for an underdeveloped economy, but for evaluating alternative policies seriously, the adoption of prices generated in another economy has severe disadvantages that should be weighed against the gains. The hazards of producing misleading evaluations are great indeed.

A third method of deriving what I am calling shadow prices is to determine the prices implied by other governmental choices. In procuring equipment that saves lives, military officials and congressmen are expressing a willingness to spend so much but not more to save a life. Similarly, health policies, safety regulations, and features of highway construction imply a willingness to incur some cost to save a life. Tradeoffs of a less serious nature are implied by most government decisions. The number and type of elevators installed, the number of typists hired, the duplicating services available, the percentage of tax returns checked—all reflect decisions about possible substitutions between one input and other inputs or between one service and other services. When one concludes that government is spending too much on A (buildings) and too little on B (salaries), he is pointing to an implied substitution ratio and is suggesting that the government has failed to stop at the correct ratio. People often object to rules-of-thumb in government agencies (and in universities and other organizations) that prevent appropriate substitutions.

A final catch-all means of deriving shadow prices is the adjustment of market prices to allow for considerations that are not reflected in those market prices. That is, taking observed prices as the point of departure, one might make adjustments to allow for the estimated effects of externalities, anticipated changes in import restrictions, anticipated changes in domestic restrictions, monopoly elements, anticipated changes in subsidy programs, the effects of price-support activities, and expected changes in supply-and-demand conditions in general. Again, however, the information costs are formidable. The imputed values of externalities are not subject to market tests, changes in supply-and-demand conditions are inherently uncertain, and the impacts of removing restrictions are hard to gauge.

The purpose of this section is not to damn the use of imputed or shadow prices. It is merely to emphasize

that using them, like adopting almost any other action, does not amount to enjoying a free lunch. There are costs associated with whatever direction one takes in seeking correct substitution ratios.

Notes

1. An excellent standard treatment of the concept is in R. Dorfman, P.A. Samuelson, and R.M. Solow, *Linear Programming and Economic Analysis* (McGraw-Hill, 1958), various pages. For a clear elementary presentation of the idea (although the term "shadow price" is not used), see A.A. Alchian and W.R. Allen, *University Economics*, 2d ed. (Wadsworth Publishing, 1967), pp. 165-74.

2. See T.C. Koopmans, *Three Essays on the State of Economic Science* (McGraw-Hill, 1957), pp. 41-66, or Dorfman et al., *Linear Programming*, pp. 390-416. To achieve Pareto optimality, many conditions have to be fulfilled, but the following statement may clarify the general notion: A voluntary exchange between two persons which affects no other person leads the economy "closer to" Pareto optimality, for it makes one or both of the individuals better off, in terms of their individual preferences, without making anyone worse off.

3. The difficulties associated with public goods—those for which it is costly to exclude nonpayers so as to get information about consumers' subjective values—will be considered in connection with externalities and goods for which there are no markets. The choice of prices to be used in such cases depends upon making judgments about and weighing the gains from having better information against the costs of acquiring it.

4. See later discussion based on the work of Harold Demsetz. In fact, my indebtedness to Demsetz is too pervasive for me to insert

acknowledgments at many of the places where they would be appropriate.

5. This topic was prompted by R. G. Lipsey and K. Lancaster, "The General Theory of Second Best," *Review of Economic Studies* 24 (1956-57): 11-32.

6. Rather than the utility foregone by giving up a unit of A.

7. "Moderate" amounts of unemployment, although it may sound callous to say so, are often more valuable than alternative uses of the resources. The "idle" are often seeking information that has more value, both to them and in terms of Pareto optimality, than would the jobs at hand. And the fact of unemployment sometimes produces information of value—that a location or occupation should have fewer resources devoted to it.

8. Not only contracts and markets, but also the possibility of lawsuits for damages, can internalize what would otherwise be externalities.

9. See H. Demsetz, "The Exchange and Enforcement of Property Rights," *Journal of Law and Economics* (October 1964), pp. 11-26.

10. There is no public-good characteristic, or cost of exclusion, involved here. Only contracting costs would be entailed.

11. For many of the ideas here I am especially indebted to Armen A. Alchian and Harold Demsetz for discussions of the costs of acquiring information. The fundamental issues are discussed by Demsetz in "Some Aspects of Property Rights," *Journal of Law and Economics* (October 1966), pp. 61-70.

12. See Carl Christ, "A Test of an Econometric Model for the United States, 1921-1947," Conference on Business Cycles, National Bureau of Economic Research, 1951 (based in part on earlier work of Andrew W. Marshall), and Harold J. Barnett, "Specific Industry Output Projections," *Long-Range Economic Projection* (Princeton University Press for National Bureau of Economic Research, 1954).

A Note on Social Cost-Benefit Analysis and Class Conflict in LDCs

Frances Stewart

"The rationale of the system described is that of estimating those prices which would prevail in the economy if it were to operate so as to maximize society's ends" (Little and Mirrlees, p. 72).

"The approach of social benefit-cost analysis is aimed precisely at systematizing the complex problems of project planning from the point of view of the society or the nation" (UNIDO Guidelines, p. 12).

"Project analysis is designed to permit project-by-project decisionmaking on the appropriate choices between competing uses of resources, with costs and benefits being defined and valued, in principle, so as to measure their impact on the development objectives of the country" (Squire and van der Tak, p. 17).

Any system of prices, observed or derived, reflects the interplay of subjective preferences and technical possibilities for exploiting and substituting resources. The systems of shadow pricing introduced in Part II start with the proposition that market prices can be untrustworthy guides to efficient resource use and to the relative social priority of economic activities. Shadow prices are meant to correct market prices where they fail in their efficiency functions, but also (in social cost-benefit analysis) to redefine efficiency in terms of social objectives. A rather urgent question must be dealt with: What are social objectives and where do they come from?

The system-builders give broadly the same answer—from the government. Public authorities are best placed to articulate the development objectives that should guide analysis and shape project design.

Frances Stewart challenges this mechanism for determining social values. She insists that government

preferences fail to reflect the objectives of whole societies and are usually far from the interests of the poor. She thus objects to the conceptual core of social cost-benefit analysis.

Proponents of social cost-benefit analysis pronounce the market an inadequate—even perverse—mechanism for giving direction to society's productive energies. This judgment is substantially at odds with classical capitalist precepts, but Stewart sees it as a half-hearted measure. In her view a more effective and less round-about approach would be to eliminate the causes of the gap between private profitability and social priorities. She suspects that social cost-benefit analysis, addressed to the symptoms of social ills, is likely to be a futile and ineffective diversion. [Ed.]

Social cost-benefit analysis is a technique of project evaluation designed to ensure that projects are selected in accordance with their *social or national* profitability. The two terms appear to be used interchangeably by most analysts. As UNIDO puts it, "the object of social choice is to maximize social gains,"¹ and this will be achieved by selecting projects according to their *national economic profitability*. The UNIDO Guidelines are intended to describe the rules one has to apply to arrive at national economic profitability. Similarly, the Little-Mirrlees Manual is concerned to "produce a practical method of analysis which could be systematically applied and which would, we believe, measure social benefit better than a profitability analysis."²

In developed countries techniques of social cost-benefit analysis (SCB) were originally introduced, and have since been mainly used, for evaluation of projects

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in the public sector, in which the output is largely unmarketed, and for which therefore some method of choice, other than the market, is essential. In contrast, the techniques as developed for LDCs³ are mainly concerned with *marketed* inputs and outputs.⁴ Here the techniques are not primarily concerned to measure the normally unmeasured (though some attempt is also made to allow for various externalities), but to correct the measures provided by the market so that they coincide with social and not simply private valuation. Shadow prices⁵ are to be used, which measure the social costs and benefits associated with different projects, and then social welfare may be maximized by maximizing the net present value of the stream of benefits, net of costs.

Although it is possible—as shown by the vast amount of literature on these questions—to disagree about the precise methodology of SCB (for example whether it is better to use world prices and a shadow wage rate or domestic prices and a shadow exchange rate; how one should take externalities or risk into account), it might seem difficult to object to the *intention* of SCB and, taken *very* broadly, its methodology. As Layard puts it:

The basic notion is very simple. If we have to decide whether to do A or not, the rule is: Do A if the benefits exceed those of the next best alternative course of action, and not otherwise. If we apply this rule to all possible choices we shall generate *the largest possible benefits*, given the constraints within which we live. *And no-one could complain at that.*⁶

It would seem *logically* perverse to object to maximization of benefits, or maximization of social welfare, as the aim of social choice. It also appears obvious that, in many developing countries, market prices do not correctly represent social evaluation of the resources used. For example, wages in the modern sector often exceed the opportunity cost of labor. Heavy and uneven protection means that domestic prices overstate the foreign exchange costs of resources used. Unsatisfactory income distribution makes market demand a poor guide to social gains. One could go on. The simple point, which is the basis of the need for SCB, is that it is difficult to claim that market prices produce the correct results.

All this seems unexceptionable: as Layard says, “no-one could complain at that.” But the argument has skated over a major problem and raised a central puzzle. The puzzle is why, for marketed inputs and output, market prices, if incorrect, should not be altered, rather

than using incorrect prices and relying on SCB to bring about the correct results. After all, a change in market prices affects all projects; SCB normally only affects a minority of cases. The problem arises in the definition and derivation of *social welfare*, *social objectives*, and *social costs* (all concepts which are logically related). Or, put in Layard’s terms, what do we mean by “the largest possible benefits”? Light is shed on the puzzle from further analysis of the problem. We shall therefore discuss this first and return to the puzzle at the end.

The benefits of a project, that is its contribution to social welfare, can only be assessed once one knows what social objectives are and what weight is to be attributed to them. Suppose one is comparing two projects, both of which involve spending the same amount of foreign exchange, and which have the following consequences (as illustrated in table 1). It is at once clear that the figures, as they stand, comparing the projects are incommensurable. Market prices would give one set of values and one solution. SCB experts might argue that this should be rejected as giving insufficient weight to, e.g., urban employment, or savings. SCB analysis would therefore give its own weighting, as shown in shadow prices. These prices are in part derived from (relatively) value free facts. But most of the shadow prices of SCB depend on values as well as facts. Thus it may be a known fact that employment of an additional urban worker will, indirectly, reduce agricultural output by a known (in physical quantities) amount, but valuation of these physical quantities, in terms commensurable with other items in the calculation, or of the effects on consumption and savings of an extra urban employee, all depend on values as well as facts.

It is here that the key question arises. In any society there are individuals, groups, and classes with different interests and objectives.

Differences in objectives and their weighting, here described as values, arise from differences in tastes and differences in interests. Differences in tastes (which form the basis of much of the analysis of individual and social preference in welfare economics) suggest an individualistic analysis, in which each individual is regarded as having a set of preferences, and the task of the social welfare function is to produce a set of orderings consistent with the individual orderings.⁷ In contrast, differences in interests suggest a class analysis; individuals’ differing interests arise in large part from their membership of a class, i.e., from their relationship to the modes of production, because, e.g., they

TABLE I

Consequences	Project A	Project B
Output	+ 10,000 shoes p.a.	+ 100,000 bushels of wheat p.a.
Employment:		
urban	+ 100	
rural	—	No additional employees. Extra utilization of employed and self-employed.
Incomes:		
urban middle class	+500 Rs	+50 Rs
urban working class	+1,000 Rs	—
rural landlords	—	+1,000 Rs
rural peasants	—	+500 Rs
Savings:		
urban	+100 Rs	—
rural	—	+500 Rs

NOTE: Figures are (obviously) fictional.

are peasants, or because they are industrial workers—not because of their unique characteristics as individuals. Not all relevant classifications are strictly economic. For example, generations may, for some purposes, form a common interest group, so may bachelors, or large families. A class, or interest group, may be defined as having common values. The preference ordering of any individual is then an amalgam of his individual tastes and his preferences as determined by his interests, i.e., as deriving from membership of one or more interest groups. Since individual tastes are themselves largely determined by environment, and indeed by the class to which individuals belong, the distinction between tastes (individually determined) and interests (class determined) can be overemphasized.

To each set of values, there corresponds a set of shadow prices—i.e., those prices which would contribute most to the objectives. If used for project evaluation, a different set of projects would be chosen according to whose values, and hence which shadow prices, were being used. The choice between project A and B above illustrates the point. The weighting given to the different consequences of two projects, and consequently which project gives maximum benefits, depends on whose values one is taking, as illustrated in table 2.

The absolute value of the figures in the table is arbitrary and unimportant. But the sharp difference in ordering is not. It shows that to select projects in such a way that net benefits are maximized is meaningless as a

criterion of selection, until one has defined whose benefits one is talking about. Conflicts which arise depend on the extent to which different interests are differently affected by the projects being compared, and the extent to which the weighting of different classes does in fact differ. In the above example, though the figures differ, the ordering of all the urban classes is the same, and so is that of the rural classes. But it would be easy to devise examples in which the ordering of, e.g., the employed urban and the unemployed urban differed. Some overlap of interests has been allowed for in attributing the weights. For example, it is assumed that the urban middle classes have some interest in maintaining urban employment and working class incomes (so as to reduce threats of various kinds from the unemployed upon their security and conscience), and that the urban unemployed have some interest in maintaining rural (peasant) incomes and employment, because this represents an alternative opportunity for them, and because they have family interests in the rural areas. Obviously, the weighting differs from society to society and depends on the links between different parts of the productive structure—which is a product of the history of the political economy.

The table has chosen one class structure to illustrate potential conflicts. Other class structures are possible. So are other dimensions of conflict. For example, different generations (both among those alive, and also among those not yet born) have different interests and objectives. Race, religion, tribe, and caste provide other possible sources of conflict. Whatever dimension is chosen it is clear that weighting attributed to different

TABLE 2

Weighting given: by to	Urban			Rural	
	Middle class	Working class		Landlord	Peasants
		employed	unemployed		
Employment:					
urban	10	10	70	—	10
rural	—	5	5	—	10
Incomes:					
urban middle class	65	—	—	—	—
urban working class	5	85	20	—	10
rural landlord	—	—	—	70	—
rural peasants	—	—	5	—	60
Savings:					
urban	20	—	—	—	—
rural	—	—	—	30	10
Weighting chosen to add up to 100.					
Value of project* according to:		A		B	
Urban middle class		40,500		3,250	
Urban working class:					
employed		86,000		Zero	
unemployed		27,000		2,500	
Rural landlords		Zero		85,000	
Rural peasants		11,000		35,000	

*Assuming weighting is calculated so weights may be applied by straight multiplication of values given in previous table.

objectives depends on the characteristics of those making the valuation. There is no objective function or social welfare function independent of a *prior* weighting decision: This prior decision, which since it is prior cannot emerge from the social welfare function itself, is that of how to weight the weightings among conflicting classes, groups, or individuals in society.

Methods of SCB do, of course, recognize the need to elucidate social values. The UNIDO Guidelines spend some time in describing the equi-welfare curves that enable one to arrive at the (socially) correct weighting of different objectives.⁸ But this attempt misses the point since there is no single set of curves, but a number of sets according to whose valuation is being used. The problem is really not one of information at all, though lack of information may misleadingly make it appear so.

There is a connection between this problem and the debate, starting with the Kaldor-Hicks criterion,⁹ as to what constitutes an increase in economic welfare: If one could unambiguously define an increase in economic welfare, this definition would provide a basis for SCB. Indeed the Kaldor-Hicks criterion provides the explicit basis for exercises in SCB which do not use distribu-

tional weights.¹⁰ However, none of those contributing to the debate succeeded in this since the criteria depend on the assumption that the question of distribution of costs and benefits has been dealt with satisfactorily, *independently* of the criteria,¹¹ and it is precisely this question of distribution that lies at the heart of the problem of definition of social welfare.

Subsequent attempts to replace the rather crude (and sometimes inconsistent¹²) bribery/compensation criteria with a social welfare function,¹³ that in theory ordered all social states (like the UNIDO equi-welfare curves) failed to provide a solution to the question. They failed in two respects: First, purely logically Arrow showed that it was impossible, on quite unrestrictive assumptions, always to produce a *consistent* ordering. Moreover, and of greater relevance for our purpose, advocates of social welfare functions never clarified the key question with which we are concerned, namely, *who* should determine society's preferences, which as we have seen is crucial to the outcome.

However SCB is only meaningful if social values are established. Hence despite the manifold and well-established difficulties, advocates of SCB require a method of establishing values. Both LM and UNIDO

solve the problem by looking to the Government to establish the values. They do so in two ways: by asking them directly, and by performing a sort of revealed preference exercise on the Government's choices, deducing the values it places on different objectives by its decisions on projects differently affecting the different objectives.¹⁴

There is an information problem about ascertaining the government's values, especially since governments are not monolithic, not consistent, and circumstances change. The revealed preference approach poses particular problems because behavior alone does not reveal the assumptions about constraints, and the actions of others, that were being made, when the observed decisions were made.¹⁵ For example, governments may act in one particular way, not because that is their preferred course of action, considering their own action in isolation, but because they assume (rightly or wrongly) that by acting in this way they will induce certain behavior in others. Hence, their action does not reveal their preferences as between possibilities open to them, as the theory of revealed preference assumes, but rather it constitutes an amalgam of preferences and assumptions about the consequences of action. However, though these are major problems in ascertaining government values, they are not of central concern here. Here we are concerned with the principle of taking government decisions and values to represent social values.

We have argued above that there is no correct weighting of conflicting values, and no objective definition of social welfare. To use government values may be justified in two ways: One is simply by definition, defining social welfare and social values as what the government wants. This either means that governments, like kings of old, and the Pope of new, can do no wrong, or that social welfare loses its prescriptive value. Few would accept that governments can do no wrong (more, perhaps, that governments can do no right). If this is the basis of SCB then it is a weak one. But if we accept that governments are not necessarily right, and persist in claiming that social welfare is by definition that which governments want to maximize, it is perfectly possible to question social welfare maximization as an aim. To return to Layard's quotation: If maximization of benefits means maximization of benefits as defined with reference to government objectives, then we may certainly complain about that.

Much of the above may be agreed on. But it may be argued that decisions have to be made: While it is true that it is impossible to draw up a "correct" social

welfare function, governments represent the whole community and are in the best position to fulfill an impossible task—to draw up or elucidate a sort of general will, from the mass of conflicting interests. This is the second type of justification for using government values, and depends on a theory of governments as being above the fray, impartial, if sometimes misguided, brokers between the different interests in society. Governments are assumed to resemble Plato's Guardians (the UNIDO Guidelines actually refer to them as "guardians of public policy"), whose only concern is the good of all.¹⁶ Here the earlier distinction between differences in values arising from differences in tastes, and differences arising from differences in interests becomes important. While it may be reasonable to expect governments to decide how differences in tastes, based on individual differences, may best be resolved, it is not reasonable when it comes to conflicts in interests. Suppose, for example, some people would like their policemen to be dressed in blue, others in red, and yet others black, and all agree that a *single* color is to be preferred. Choice of color, it might be argued, can be left to the government, since a decision must be made. But when we come to differences in interests this is not so, because the government itself is part of the class and interest struggle. Representing a single interest (or an alliance of interests), their weighting of social objectives does not represent some sort of attempt at synthesis of the national interest, but rather primarily the interests on which they depend for their power.¹⁷

There are two distinct, but related questions; both need different treatment in conflict or class societies and in no-conflict homogeneous societies. The first question is the conceptual one: that measurement of benefits (or social welfare) generated by a project cannot be separated from the distributional consequences, and that there is no single correct measure; the measure depends on the point of view adopted. The second question is pragmatic: Accepting that we cannot establish a uniquely correct "social" view, should we turn to the government, as *deus ex machina*, to do the impossible and provide one? While this would be a reasonable line to take if governments were disinterested arbiters, in a class and conflict society, where governments are part of the system, taking government values to represent "social" values means taking the views of the particular class constellation represented by the government. In homogeneous societies both problems tend to disappear: The conceptual question, which essentially arises out of the problem of how to weight the

interests and views of different parts of society, disappears where there is no conflict. The general will can then be identified as the will of all. Similarly in such societies, governments can be argued to be the best interpreters of social values. This is to say no more than that it is easy to identify what to do in homogeneous societies. But in conflict societies, the problem becomes acute: Conflicts mean that there is a problem in identifying social values, while in such societies governments generally are actively engaged in the conflict. Social cost-benefit analysis, in so far as it implies that social welfare maximization or national welfare maximization is meaningful (and also possible) in conflict societies, is highly misleading, and sometimes dangerously so, since it dresses up one set of activities—those of taking the objectives of one section of society, normally those represented by the government, and showing how they may be more efficiently fulfilled as another, that of maximizing the benefits to society. The former being a meaningful (and possible), but for many an undesirable, objective; the latter being meaningless and therefore impossible, though desirable.¹⁸

One way of defending SCB from these charges is to argue that SCB merely provides the technology or methodology of rational decisionmaking. There is no need to take government values. One can, if one likes, take any values one likes: one's own, those of the political opposition, etc. SCB does not claim to provide a unique or objective assessment of the net benefits of projects, but simply a method of assessment which will give different results according to the assessor. While this is in one sense true, it is a specious argument for three reasons. In the first place, the manuals are explicitly addressed to governments: "The Government requires a methodology for comparing and evaluating alternative projects. . . . This volume is concerned with the formulation of such a methodology."¹⁹ Secondly, the language adopted suggests, if it does not imply, the objectivity of the analysis, as if there were a well-defined social welfare function, which correctly represented *the* interests of the society. Thus the Guidelines argue²⁰ that "projects should therefore be formulated and evaluated in such a way as to single out for implementation those that contribute most to *the ultimate objectives of the country*" (my emphasis). The Guidelines show how to arrive at "the optimal welfare point."²¹ In the third place, the way in which a set of values is translated into shadow prices depends on the power of the decision-

maker.²² If the volumes were really intended to provide a general decisionmaking framework for any individual or class, then this area would require serious attention. In fact, it is ignored, and the only power limitations discussed are those of the government.

Regarding SCB as a method of translating government objectives into reality brings us back to the puzzle mentioned earlier: If that is the correct view of SCB, why does the government not use more direct means, particularly the price and tax system, to achieve its objectives. One reason why SCB is used is that for some things it is a more efficient instrument than other possibilities. The price and tax system may not be able to discriminate as finely (in time or by commodity) as project selection. For externalities, the price system tends to be a clumsy instrument, which is why SCB was initially devised in developed countries to deal with those cases where prices do not operate at all, or efficiently. But SCB for developing countries is intended to deal with marketed outputs, where, often, the price system does present an efficient alternative. Indeed since it is likely that SCB will only deal with a minority of projects, the price system, which extends to all projects, would seem to be a more efficient instrument. The SCB analysts are aware of this puzzle and pose and answer it in the following terms:

One could, of course, retort by asking why if the guardians of public policy do not like the income distribution (e.g., if they disapprove of the existing inequality), they do not reform it directly. Once the distribution is reformed, the project evaluator can simply treat the money prices offered as guides to welfare without worrying about income distribution. This retort, while not uncommon, is somewhat hollow, since there are constraints—political, economic and social—that prevent such reforms of income distribution, and given these limitations the exercise of project evaluation cannot be based on the notion that all appropriate income redistributions have already been carried out.²³

Little-Mirrlees pose, and answer, a similar question in similar vein:

In the previous Chapter we raised the question whether a government seriously wants to raise the rate of investment at the expense of current consumption, if it does not raise taxation when it can, and if it does not take other steps to see that public savings, including those of public enterprises are as high as reasonably possible. Of course governments want to stay in power. There is a limit to the extent to which they will try to squeeze more savings from the public even if it is believed on ethical grounds that a greater provision should be made for investment and growth, and thus for consumption in the future. This raises a very important point. The most important and normal way for a government to hold consumption in check and so increase savings is taxation; and taxation is notoriously unpopular.²⁴

Both answer the question in terms of *constraints* on government action which prevent it going as far as it would like by the use of normal instruments. But why, then, should these constraints be removed by the introduction of SCB? If a government's political supporters prevent it from raising taxation as much as it might like, this is surely because those who pay the taxes dislike, and are strong enough to resist, the cut in real income implied, not because they have taken a particular dislike to the form (taxation) which the cut takes. In the first instance, ignorance may prevent any public outcry against the use of SCB to achieve objectives which have been successfully thwarted as far as other instruments are concerned. But if the use of SCB is equally effective in achieving the objective, then it is likely to be subject to the same constraints as other instruments. Why should the *instrument* used influence the possibilities?

If the net effects are identical it seems unlikely, in the long run when the veil of ignorance has been eliminated, that constraints will be removed simply by the introduction of new tools. The unpopularity of taxation is not irrational but a consequence of its effects and will be shared by any other instrument, including SCB, which has the same effects. The possibilities of using SCB to achieve objectives such as income redistribution, where other tools are ruled out because they are unpopular, thus must rest on some peculiarities of SCB, as compared with other tools.

First, SCB has, to date, applied, and is likely to apply, to only a small minority of cases. Hence the overall effect on interests is likely to be marginal as compared with more direct methods. Its use depends on its marginality, or ineffectiveness. As soon as it becomes more than a marginal instrument, it will be subject to the same constraints as other instruments.

Secondly, SCB is optional and not mandatory. With most systems of taxation, once a system (and rates) have been established, its enforcement is subject to the country's legal system. There has never been the same sort of legal enforcement of SCB. Governments may go against the recommendations of SCB with legal impunity. This means that it is easier to establish it as a system, than to change the tax system, because it is always possible, when the time comes, to ignore the recommendations. The third London Airport provides an example.

Thirdly, SCB, as an instrument, does not always have identical effects with the alternative instruments. Partly, this is because it only applies to a small number of cases, so the impact is much smaller—i.e., the same

point as that above. For example, it may be politically attractive to put a high weight on redistribution of income in SCB, thus getting credit for pursuing the objective, while not actually meeting any costs to speak of, because of the small number of cases. But there are also cases where SCB involves a *different* distribution of costs and benefits from the alternative instruments. The premium put on savings is a good example. Raising savings by extra taxation involves placing the burden of reduced current consumption on current taxpayers, generally the employed and the richer members of society. Using SCB to achieve extra savings means that those whose consumption is cut are those who would be employed if no premium were put on savings, but are not if a premium is placed on savings and capital-intensive projects therefore selected. The burden is thus borne by the unemployed. The different class burden explains why a government may be subject to constraints in the use of one instrument—taxation—but not another—SCB.

SCB is thus used as an instrument, rather than other instruments, because governments do not represent the "social" interest, but their own class interests, and yet wish to appear to represent the "wider" social interests. SCB is used either because governments do not wish the impact to be effective (reasons one and two above), or because they want a different class distribution of the costs and benefits than would be achieved by the use of more direct instruments (reason three). The answer to the puzzle thus supports the general analysis of this paper. SCB does not show governments stepping outside their normal activities to represent the interests of all; rather, it is another instrument in the class struggle.

Notes

1. P. Dasgupta, S.A. Marglin, and A.K. Sen, *Guidelines for Project Evaluation* (UNIDO, United Nations, 1972), p. 27.
2. I.M.D. Little, *A Critique of Welfare Economics*, 2d ed. (Oxford University Press, 1957), p. 37.
3. In Dasgupta et al., *Guidelines*, and I.M.D. Little and J.A. Mirrlees, *Manual of Industrial Project Analysis in Developing Countries, Vol. II. Social Cost-Benefit Analysis* (OECD, 1969).
4. Little and Mirrlees, *Manual*, p. 31.
5. Sometimes described (e.g., by *ibid.*) as *social accounting prices*.
6. R.G. Layard, ed., *Cost Benefit Analysis* (Penguin, 1972), p. 9. My emphasis.
7. See K.J. Arrow, *Social Choice and Individual Values* (Wiley, 1951), and A.K. Sen, *Collective Choice and Social Welfare* (Oliver & Boyd, 1970).

8. Though this does seem a somewhat clumsy device, since once one had enough knowledge about social objectives to draw up the curves one would not need the curves to tell one what to do.

9. N. Kaldor, "Welfare Propositions of Economics and Interpersonal Comparisons of Utility," *Economic Journal* (1938), and J.R. Hicks, "The Valuation of Social Income," *Economica* (1940).

The principle of Pareto optimality, outlined by McKean in the previous reading, is difficult to apply in practice. Very few economic changes increase the welfare of one group without making anyone worse off. The Kaldor-Hicks criterion is a variant of Pareto optimality that makes an important concession to reality. It states that a project is an overall gain in social welfare if it generates a net increase in benefits—no matter how they are distributed—large enough for the winners from the project to potentially compensate the losers and still have an increase in satisfaction from the project. Stewart refers to this as an example of "bribery compensation criteria." [Ed.]

10. See A.C. Harberger, "Three Basic Postulates for Applied Economics: An Interpretative Essay," *Journal of Economic Literature* (1971).

11. Little's criteria (in *Critique*) recognize the central importance of distribution by combining the Scitovsky criteria with the additional requirement that the distributional implications must be acceptable. But again this leaves completely unanswered our central question: Who is to determine what is acceptable?

12. See T. Scitovsky, "A Note on Welfare Propositions in Economics," *Review of Economic Studies* (1941), and P.A. Samuelson, "Evaluation of Real National Income," *Oxford Economic Papers* (1950).

13. See A. Bergson, "A Reformulation of Certain Aspects of Welfare Economics," *Quarterly Journal of Economics* (1938).

14. A revealed preference exercise on other non-SCB decisions has also been suggested (B.A. Weisbrod, "Deriving an Implicit Set of Governmental Weights for Income Classes," in *Cost Benefit Analysis*, ed. R. G. Layard [Penguin, 1972]), though this is a bit odd if it is assumed that SCB allows the government to attain objectives, which it cannot attain in its absence. F. Seton (*Shadow Wages in the Chilean Economy* [OECD, 1972]) uses this method to establish the weights the government gives to income distributional objectives.

This is a reference to the principle for translating government objectives into quantitative parameters for project analysis used in

the UNIDO approach. As alternative project designs are presented to government decisionmakers and choices are made, the pattern of priorities is supposed to emerge. Gradually, decision-makers will reveal their values by the choices they make, and these values will eventually be specified clearly enough to be used as quantitative variables in social-welfare calculations. Stewart doubts that most governments have such consistent priorities that they can be precisely inferred by analyzing past choices. [Ed.]

15. See A.K. Sen, "Control Areas and Accounting Prices: An Approach to Economic Evaluation," *Economic Journal* (1972).

16. Plato spends considerable time delineating the very stringent conditions in which the Guardians must be chosen, educated, and live if they are to represent the general interest, and not sectional interests: so that "the whole State will grow up in noble order and the several classes will receive the proportion of happiness which nature assigns to them" (*The Republic*, trans. B. Jowett [1908], Book IV, 420). They "may not touch or handle silver or gold." They should have no property beyond what is absolutely necessary. Even laughter was to be banned.

17. Some recent analyses show how interests dominate government in a number of developing countries. G.L. Beckford (*Persistent Poverty, Underdevelopment in Plantation Economies of the Third World* [Oxford University Press, 1972]) shows how the interests of the plantation companies are pursued in plantation economies, by apparently "independent" governments. Leys (for Kenya, in "Politics in Kenya: The Development of Peasant Society," *British Journal of Political Science* [1971]), and Harris (for India, in *India China: Underdevelopment and Revolution* [Delhi, forthcoming]) analyze and explain government action in terms of the interests they represent. For developed countries, see R. Milliband, *The State in a Capitalist Society* (Weidenfeld and Nicolson, 1969).

18. This does raise the interesting question of whether one can desire something which is meaningless.

19. Dasgupta et al., *Guidelines*, p. 1.

20. *Ibid.*

21. *Ibid.*, p. 124.

22. This point is explored in Sen, "Control Areas."

23. Dasgupta et al., *Guidelines*, pp. 22-23.

24. Little, *Critique*, p. 42.

Project Selection for Poverty-Focused Rural Development: Simple Is Optimal

Robert Chambers

Development strategies and donor policies proclaim priority for projects that provide employment, reduce poverty, and promote greater equity. Robert Chambers begins this article with the unassailable observation that designing these kinds of projects and making them work is not easy. Chambers explores some sources of this difficulty and questions whether the kinds of cost-benefit methodologies introduced in this reader are likely to lead to better poverty-focused rural development projects.

The institutional needs of donor agencies—however strong and genuine the commitment to reach the poor—tend to clash with the imperatives of a rural-centered development approach. Chambers describes the “big project trap” that is one result of this conflict. Turning to project appraisal itself, Chambers affirms what other readings have made clear: Cost-benefit analysis is not an objective technique, but a structured approach to project appraisal that remains dependent on subjective judgments and vulnerable to political pressures. Allowing for equity objectives in the methodologies is no assurance that they will in fact be furthered.

Chambers then discusses the real possibility that sophisticated appraisal methodologies, in combination with other donor-agency requirements, might overburden project designers, delay project approval, and undermine efforts to reach the rural poor. A powerful observation follows: Institutional resources for planning and implementing development projects can be

acutely scarce, sometimes far scarcer in practice than the goods and services that cost-benefit analysis goes to great lengths to allocate efficiently.

The opportunity cost of trained manpower can be painfully high. This has two fundamental implications: First, cost-benefit studies may fail to consider the opportunity cost of the managerial resources that a project will require, when administrative capacity is weak and the need for management is widespread and urgent. Second, comprehensive cost-benefit analysis can itself make great demands on the time of project planners—donor-agency staff and their counterparts—and thus threatens to be extremely costly. The costs of analysis for each project become particularly important if a rural development strategy implies many small projects.

Chambers concludes that these observations warrant changes in both the strategy and the tactics of project design and analysis. His proposed strategy for expanding the knowledge and sharpening the judgment brought to bear on project design has two aspects: A policy of decentralization should shift decisionmaking authority from central agencies to the field, where familiarity with local conditions is presumably greater. At the same time, donor agencies should take steps to ensure that their personnel gain experience of the real conditions in rural areas.

The analytical tactics Chambers outlines correspond with his theme of optimal simplicity. Straightforward methodologies—such as decision matrices, poverty-group rankings, and cost-effectiveness analysis—are pictured as appropriate guides for practical decisions about poverty-focused projects. [Ed.]

This paper takes as its point of departure the rhetoric of donor agencies and of national plans, which requires a high priority for rural development and especially for rural development that will benefit the poorer people. The paper is concerned with project selection, both in theory and in practice. It takes project selection to include identification, design, appraisal, and choice. It does not tackle issues of radical redistribution, for example through land reform, vital though that sometimes is as a precondition for major help to poorer rural people; nor does it consider vital questions concerning the political organization of poor people. It is confined to projects which are selected by donors, governments, and other agencies, and which might be considered suitable for formal appraisal procedures.

A problem in thinking constructively about project selection for poverty-focused rural development is the temptation to start with appraisal methodology. The corpus of literature on social cost-benefit analysis is large, accessible, and, despite its critics, invested with an aura of sophistication and authority. If, however, our objective is to improve project selection so as to reduce rural poverty, then the right starting point is not the means but the end, not the library but the village, not the methodology of appraisal but the poorer rural people. Starting from them rather than from the cost-benefit paradigm, and trying to see what approaches will help them rather than consummate the training in project appraisal which many economists have received, leads away from complex procedures and towards the conclusion that for these purposes true sophistication lies in simplicity: in short, that simple is optimal.

RURAL POVERTY: PROBLEMS AND OPPORTUNITIES

The poorer rural people are hard to reach. They are typically unorganized, inarticulate, often sick, seasonally hungry, and quite frequently dependent on local patrons. They are less educated, less in contact with communications, less likely to use government services, and less likely to visit outside their home areas than their better-off rural neighbors. They are often especially concentrated in regions remote from urban centers. Further, they are relatively invisible, especially the women and children. Urban-based officials and foreign experts alike can easily, as "rural development tourists," make rural visits without either seeing or speaking to the poorer people. Residentially,

they are often separate. A week could be spent in South India visiting villages without ever entering one of the harijan colonies where many of the very poorest live. In parts of Africa, roadside elites are emerging as the richer people buy up the more desirable plots beside the roads and build good houses there, while the poorer people increasingly shift away out of sight. Visitors tend to see, to meet, and to interact with only the more influential and better-off rural people.

As though these were not obstacles enough, there is the notorious tendency—the "talents effect"²—for the rich to get richer and the poor to remain as they are or to get poorer. Projects and programs for rural development are again and again captured by rural elites for their own advantage. Credit goes to the creditworthy who are those who least need it. Subsidized inputs supplied through a cooperative are monopolized by the leaders of the cooperative who are the better-off people to start with. There seems to be a general law that the greater the amount of money that has to be spent in a rural development program and the shorter the period in which that money has to be spent, the more likely it is that the rural elite will benefit disproportionately.

The selection of poverty-focused projects has to take account of these realities. Developments which generate livelihoods, which create new demands for rural labor, which provide services to which all have effective access, or which enable poor people to support one another and to organize themselves in groups, will usually be preferred in a poverty-focused approach. Some large projects which distribute or redistribute productive assets to poor people (including some irrigation and settlement projects) may score well. But many of the most effective initiatives will look very different from traditional large high-capital projects. They may emphasize institutions. They may seek to combine experiment with replicability. They may involve, for example, forms of agricultural organization for small farmers, or for landless laborers, or for women; or procedures for recruiting smaller farmers for farmer training courses; or the development of alternative sources of income for landless agricultural laborers in the off-season; or improvements in the management of irrigation bureaucracies; or the provision of mobile services for nomadic people. For these and similar initiatives, local-level institutions and procedures have a central importance.

In future it seems that many of the most effectively poverty-oriented rural projects will in practice be:

1. small. Even where a program may be quite large, for example for building rural health posts, its component projects may be small.
2. administration-intensive rather than capital- or import-intensive. The amount of administrative input per dollar expended will be high.
3. difficult to monitor and inspect. Many of the most effective programs will be highly dispersed, and will often involve actions like the formation of groups or the construction of small items of infrastructure which are not easy to inspect.
4. slow to implement.³ Dispersed construction faces logistic problems; scattered staff are difficult to supervise; remote areas are difficult to reach; local participation (so widely advocated but so rarely analyzed) implies going at the people's pace; poor people often take time to realize what they can achieve and there are many obstacles to their becoming organized.
5. not suitable for complex techniques for project appraisal. Geographical dispersal, uncertainties about implementation, low project costs, and the large numbers of projects combine to make standard complex techniques for project appraisal both expensive and inappropriate.

If this is where many of the needs and opportunities lie, much of the aid and investment process appears still to point in other directions. A gap yawns between the rhetoric of poverty-orientation and the realities of resource allocation and effective access to resources. Project selection is only one part of that gap. Its importance, and the justification for considering it here, is that it is a part of the process where many crucial decisions are taken or preempted, and where much analysis and intervention are concentrated. To understand how it might be improved we must examine some of the obstacles to effective poverty-orientation on the part of governments and, more especially, of donors.

PROBLEMS IN PROJECT SELECTION

The problems discussed below are by no means a complete list; but they do comprise some of the more serious difficulties in effective selection for poverty-focused projects.

The Needs of Donors

In contrast with the rural poor, the rich donors are well-organized, articulate, educated, concentrated in

urban centers, and above all, powerful. Their needs are many and various. They include a need to satisfy themselves that their funds are being "well-spent," as well as a need actually to spend them. The poverty-orientation of many donors in recent years has made it harder to find suitable projects. There is a common lament that poverty-oriented projects are scarce. Donors compete with one another to aid a few favorite poverty-oriented countries, and in other countries to support the few poverty-oriented projects which can be found. But as the need to spend persists and even becomes more acute and as their expenditures come under critical scrutiny donors are still impelled to prefer projects which in practice are:

1. large;
2. capital- and import-intensive rather than administration-intensive;
3. easy to monitor and inspect;
4. quick to implement (using foreign skills where necessary); and
5. suitable for social cost-benefit analysis.

These preferences are reinforced by some of the writing about development. Analysts of development have tended to pay more attention to large than to small projects. Large projects are more familiar to economists from industrial countries; funds, at least in the past, may have been more readily available to study them than to study small projects; data from them may have been more accessible; and they have lent themselves to conventional methods of *ex ante* appraisal and *ex post* evaluation. Thus 28 out of the 29 projects analyzed in King's *Economic Development Projects and Their Appraisal* were for major infrastructure; and although his analysis was far from conventional, Hirschman's eleven cases in *Development Projects Observed* were all large-scale. Roads, power, multi-purpose valley development, industries like cement, paper, and steel, and large agricultural or irrigation projects have tended to be the most visible, the most prestigious, the most visited, and the most written about. More recent studies, such as Uma Lele's *The Design of Rural Development: Lessons from Africa*, although still examining some large projects, have shifted attention towards smaller, more scattered and decentralized initiatives to reach and help the rural poor. The question is to what extent can and will donors and recipient governments similarly shift their sights and priorities.

The Big Project Trap

The shift is difficult because interlocking forces bias donors and recipient governments alike towards large projects. The reasons are commonplace. For some donors, big is beautiful because big is bankable; pressures to spend aid funds are best overcome through large projects, often for infrastructure. Such projects tend to have a high import content, which pleases political leaders and civil servants alike. They are professionally challenging. They may provide opportunities for corruption at the higher levels of government. They provide contacts for local professionals and civil servants which may make it easier for them to join the brain drain to the richer world. Consultant firms throughout the world find large projects a source of profitable employment. Implementation can be assured where necessary through the use of foreign skills. Finally the methods of appraisal for such projects have been quite highly developed, routinized, and accepted and have a measure of general utility.

Because of the conjuncture of all these factors, big projects can be a trap. Moreover, the trap may close much earlier than is commonly realized. Irreversibility of commitment, whether by recipient or donor, whether by politician or civil servant, does not feature much if at all in the literature of project appraisal. But the "yes—no" decision about a project begins to close and often closes before any formal cost-benefit appraisal can be carried out. Cost-benefit approaches may then be useful in the design stage in improving choices between alternative designs, but they will have become irrelevant to the decision to invest which, in terms of political realities, has already been taken.

To the extent that big projects are needed to support or complement poverty-oriented programs, or to the extent that, as with some agricultural settlement and irrigation projects, they are directly poverty-oriented, it may not matter unduly in itself that they represent the needs of donors and of governments, and that they trap them at an early stage. But there is a recurrent danger that a big project will divert resources (including administrative resources) and attention away from other better projects or activities. An example is the Tarbela dam in Pakistan which is expected to cost \$1.2 billion. It has been estimated that the water it will make available to irrigators will be less than one-third of what might be saved for a fraction of the cost through improved management of existing irrigation in Pakistan.⁴ This appears to be a case where a highly visible and prestigious project has focused attention in the wrong

place, away from less spectacular but much more rewarding opportunities. More generally, big projects may provide diversions which make it easier to avoid grasping the nettle of rural poverty. In the 1960s some large projects were described as white elephants which became sacred cows. With the poverty-orientation of the 1970s, some are red herrings.

Project Appraisal in Practice

A further possible obstacle to effective poverty-oriented projects is the tendency towards complexity and obscurity in methods of appraisal. Whatever has happened to the economies of the poor countries, the literature of project appraisal has an impressive record of growth. The observer may be forgiven for wondering where it will all end, as some try to develop appraisal methods which will keep pace with changing criteria of appraisal (new criteria being added rather than old ones being subtracted) and practitioners struggle to follow their advice. One question here is whether the addition of employment and poverty criteria to social cost-benefit analysis will lead to a net improvement in resource allocation. To answer this question would require a major study. A positive case can be argued at both theoretical and practical levels. Certainly, in practice, the questions asked of a project during appraisal can influence the "yes—no" decision, and also design. The negative case, however, often goes by default because it does not fit into the cost-benefit paradigm. In presenting parts of the negative case, the purpose here is to raise issues of concern rather than to pretend to definitive answers.

Any evaluation of a method of project appraisal should be based not on its appearance, nor on the theory of how it should be applied, but on what happens in practice. It is not the study of manuals and procedures that is relevant but the study of behavior. Analyses from the standpoints of public administration and political science, like those of Caiden and Wildavsky and Self are valuable not least because they admit forms of evidence about behavior which some mathematicians and some economists might be inclined to disregard or discount. In the writer's experience it is common to find that practitioners of social cost-benefit analysis admit in private that what appears as a clinical and objective procedure is in practice a compound of judgment about future events which are very difficult to predict, and judgment about discount rates and shadow prices within limits which allow for wide variation. The uncertainties and difficulties are especially acute with

agricultural projects. In one case reported to the writer the same agricultural project appraised by three different teams was accorded rates of return of 19 percent, 13 percent, and minus 2 percent, respectively, much of the variation being explicable in terms of differing estimates of rates of implementation and/or the adoption of innovations, both of which are inherently difficult to anticipate.

It may be asked to what extent the combination of uncertain judgment and methodological complexity exposes social cost-benefit analysis to political pressures. Ironically, appraisal techniques developed to make decisionmaking more rational may be used to legitimize decisions arrived at in other ways. Partly this is possible because of the obscurity of the calculations when final data are presented to a decisionmaker. Partly it may occur because decisionmakers know that the results are easily manipulable. Far from defending appraisers from political pressures, the procedures may then expose them all the more. In practice, rates of return are sometimes determined first and the calculations done later to produce them; and there are more subtle personal and political interactions between calculations and desired results.⁵ The danger is that the addition of employment and poverty criteria to social cost-benefit analysis will have little effect because the procedure itself is so sensitive to judgment and so vulnerable to personal factors and to political pressure.

Complexity, Dependence, and Delay

Complex procedures may also contribute to and sustain dependence and delay. The combination of pressure to find projects, shortage of good projects, and the demand of donors for complex appraisals creates congestion. The response of many international agencies is to intervene in project preparation. But as Rondinelli has argued in an examination of the World Bank, USAID, and UNDP,

The direct intervention of international agencies in project preparation is in part a response to the severe deficiencies in planning and project analysis skills in developing nations, but the "deficiencies" are in a sense, artificially created by the complexity of international procedures. Project preparation guidelines are designed to ensure that proposals are compatible with lending institution policies, procedures and requirements; and as such have become instruments of control rather than of aid. And as those procedures become more numerous and complex, further demands are placed on the limited planning and administrative capacity of developing nations, making them more dependent on foreign expertise . . . the imposition of international requirements . . . may in fact, have aggravated the problem of preparing relevant and appropriate investment proposals.⁶

The argument of this paper is not that there are no benefits from such procedures. The question is to what extent the costs of following the procedures are justified by the benefits. For the costs can be high, especially in the poorest countries which are precisely those in which the procedures are most difficult to carry out. Donors are liable to respond to these difficulties in ways which either sustain dependence (by posting in their own staff to do the job) or which reduce benefits to the poorer countries and to the poorer people within countries, by concentrating on other countries and on groups other than the poorest. To quote Rondinelli again:

The limited staff time within aid agency headquarters leads to a preference for large projects in developing countries with better project preparation capabilities or with access to technical consultants, than for smaller projects in poorer countries with limited preparation capabilities.⁷

There may thus be a syndrome in which what passes for sophistication in project selection actually hinders aid to the poorest. Donors bring to bear "an imperious rationality"⁸ on recipients. The laborious procedures required delay projects. Delays to projects increase pressures for donors to spend. Pressures to spend exert biases towards the less poor developing countries, towards larger projects, towards urban areas,⁹ towards the more accessible rural areas, and, within rural areas, towards those who are better off. In short, complex procedures can divert development efforts away from the poorer rural people.

The Neglect of Administrative Capacity

Again and again administrative capacity—the capacity to get things done—emerges as a preoccupation. It is, indeed, often the most critically scarce resource.¹⁰ Problems of implementation, above all in the rural sector, are an almost universal lament. Lele concluded from her study of rural projects in Africa that the most important factor in limited effectiveness was the "extreme scarcity of trained local manpower."¹¹ The shortage of good rural projects is often a crippling impediment. The capacity to spend is often severely limited. In Botswana, in the three years from 1973-74 to 1975-76, the Ministry of Agriculture was able to spend only 30 percent of its development budget. The capacity to implement is often a far, far scarcer resource limiting achievement than any other factor; but the implications of this fact have apparently not been incorporated in procedures for project appraisal.

Three aspects of the scarcity of administrative capacity deserve attention. First, managerial and technical skills attracted to a project may have a high cost in terms of benefits foregone elsewhere in the economy. The ODA Manual has a significant line: "The supreme importance of good management for the success of a project must always be kept in mind."¹² The recurrent danger is that donors will insist on recruiting high-level nationals to manage projects, removing them from key posts of greater importance. This cost does not feature in the Manual by Little and Mirrlees who list land, labor, capital, foreign exchange, and savings among their scarce resources, but not administrative capacity.¹³ The nearest they come to considering it is in the shadow pricing of skilled labor.¹⁴ They write, "If there is a shortage of skilled people (and for many categories of skills this is true and likely to remain true for some time in the case of many developing countries) then . . . one cannot do better than ask what employers are willing to pay for the relevant skills." The accounting price would then be the price which would eliminate any excess demand for such skills. And they conclude that "it does not seem to us that very much time should normally be spent on contemplating the problems raised in this section." But especially in countries where managerial or technical talent is scarce, the costs to the economy of the removal from their posts of key nationals to work on a new project may be very high indeed, and grossly under-estimated by costing at the price which would eliminate any excess demand for their skills. Thus the true cost of a project may be seriously underestimated by neglecting administrative capacity as a scarce resource. More specifically for our purposes, the unasked question is whether the managerial and technical staff recruited to a project will be brought from posts and activities in which they would have made a greater contribution to alleviating rural poverty.

Second, administrative capacity in existing organizations is inelastic. A government organization used for one program may not be able simultaneously to carry out another. Demands for information can have high costs in other field staff activities foregone. The introduction of a program for agricultural credit to be implemented by an extension agency may appear desirable, but may be anti-developmental because of other extension activities which it crushes or preempts. In Mwanza District in Tanzania, the arrival of tractors diverted agricultural extension staff from a promising program for improving cotton production among the

generality of farmers to a narrow program of mechanization. Not only was the mechanization a failure, but the high potential benefits of the extension program were lost.¹⁵ This point has a strong bearing on the poverty orientation. Since much poverty-oriented rural development is administration-intensive, special care has to be taken in the allocation of field staff time between alternative activities. Unless this is done, programs may be introduced which appear beneficial but the net effect of which is to reduce the impact of government action on rural poverty.

Third, the time of economists and planners is itself a scarce resource. Cost-benefit analysis has costs and benefits itself. But a survey of some of the texts on project appraisal¹⁶ reveals that they concentrate almost exclusively on procedures of analysis and their presumed benefits while ignoring or not considering in any detail the costs of carrying them out.¹⁷ Whether some economists have a mental block, or a becoming if uncharacteristic modesty when it comes to costing their scarce selves may be a whimsical speculation. But only when their time is treated as a scarce resource can good decisions be made about optimal levels of complexity in project selection. An exception is provided by Caruthers and Clayton who do evaluate project appraisal from the point of view of the demands it makes on skilled effort. They write that

. . . the laborious process of shadow pricing, according to the manuals, absorbs an undue amount of skilled effort while *ex post* evaluation reveals that the factors which determine project success or failure are not primarily related to these aspects of planning.¹⁸

The point is important since poverty-oriented rural development is likely to require the processing of more small projects. Appraisal procedures should not only be relevant; they should also be sparing in their demands on the time of skilled manpower. If they are not sparing, the danger is that appraisal bottlenecks will reduce the net contribution of projects in alleviating rural poverty and will divert economists and planners from more crucial tasks.

SOLUTIONS: SIMPLE IS OPTIMAL

General prescriptions follow from this discussion. Biases based on the needs of donors and sustained by some past writing on development should be consciously offset. Big projects should be approached with circumspection. Data requirements for appraisal should be restrained. The considerations on which decisions

are to be based should be clear to decisionmakers. The costs of complex procedures should be recognized. Administrative capacity, including the time of economists and planners, should be treated as a scarce resource. Taken together, these prescriptions imply that for the many rather small projects which are essential in any poverty-orientation, methods of selection are needed which are simple, open to inspection, and readily intelligible, and which either make sparing demands on scarce skills or concentrate their demands on skills which are underused. Furthermore, steps should be taken to improve the judgments inevitably involved in selection.

Three approaches are suggested to satisfy these requirements. They have in common a thrust towards simplicity—in decentralized administration, in appraisal procedures, and in the life styles and experience of officials.

Decentralization

Poverty-focused rural development requires changes of direction and emphasis. It is true that major infrastructure in the form of roads and other communications, storage facilities, and the like are often a necessary precondition for or complement to smaller projects. But for the reasons presented above, large projects have been given high priority, and much more attention has now to be given to smaller, lower-level initiatives. The sheer volume of identification and appraisal work that these could entail could easily overwhelm central government and aid agency officials. There is already a sad history of district-level planning in some countries and regions (such as Kenya, Tanzania, and Zambia for their second Five-Year Plans, and Tamil Nadu in 1973-74) in which many projects have been worked out in the districts and submitted in long heterogeneous shopping lists to the center, only to be ignored because of the poor quality of the submissions and the impossibility of handling so much detail. The results have been disillusion among field staff, political embarrassment at all levels, and high stacks of mouldering documents gathering dust on the shelves of offices. For the future, the only way forward on any scale appears to be through effective decentralization.

For such decentralization to work, financial discretion has to be given to staff at the local level. One pattern which may deserve serious trials where it does not yet occur is a block grant system in which each financial year a sum of money is made available to

local-level officials to spend at their discretion on projects which accord with centrally determined guidelines. These guidelines can stipulate that the main beneficiaries of projects should be poorer rural people. Experience with block grants has already been gained in East Africa.¹⁹ There are, of course, dangers of misallocations and of corruption. Cautious accountants and auditors often distrust local-level officials; but the distrust becomes self-validating when those officials are given little discretion and thus little opportunity to demonstrate their capabilities. In many countries, field staff constitute a major, very expensive, and underused resource. Only by giving them more discretion and resources can they realize their potential. Donors who do not have a local cost constraint are particularly well-placed for this sort of assistance.

With decentralization combined with central guidelines, the administration-intensive processes of identification and preparation can be undertaken by the often underused local-level staff. Central government staff, including planners and economists, can have monitoring and training roles which are much less exacting than carrying out identification and appraisal themselves. And many more small initiatives can be undertaken to the benefit of the rural poor.

Simple Procedures

An essential part of any poverty-focused rural development is the devising and use of simple procedures. There is an almost universal tendency for procedural overkill. Procedures are almost always additive: New ones are introduced, but old ones are not abolished. Procedures drawn up by committees, or through consultation with various people or departments, tend to be longer and more complicated than those drawn up by one person—and participative management may reinforce this tendency. It is often safer to add a requirement for an additional item of information than to leave it out. Promotions go to bright people who can devise and answer questions, and not to those who tell their superiors that they did not consider the benefits of being able to answer their questions justified the costs of collecting the information necessary.

A first step is then to have the insight to see what it is not worth knowing, and the courage not to find it out. Courage is needed because optimal simplicity looks naive.

Simple procedures are also necessary if decisions are to be kept in the open, making it clear to the decision-maker what criteria are being used, and how the method

works. As Carruthers has commented in review of Squire's and van der Tak's *Economic Analysis of Projects*, "A practice has not much to recommend it if the working of the method and the decision criteria are not evident to the decision-makers." As we have noted, the obscurity of some social cost-benefit analysis exposes it to abuse. It is easy, and known to be easy, to adjust assumptions (discount rates, shadow prices, rates of implementation or adoption, etc.) to produce a wide range of results. Rationality may be defended through selection procedures in which the assumptions are always clear and which so far as possible can be understood by a non-economist layman decisionmaker.

Five simple approaches are suggested. Probably none is new. Most or all of them may be used in governments and aid agencies already, especially for small projects. But curiously, while social cost-benefit manuals are published and widely distributed, these simpler aids to selection are rarely written about. They should be the subject of much more serious comparative study.

Decision matrices. As argued by Carruthers and Clayton, decision matrices can be used to present alternatives clearly, keeping factors separate instead of conflating them into a single numeraire. They enable the decisionmaker to assign his own implicit weights and to understand more clearly the implications of his decisions. They can be used to present the implications for the poorer people of alternative projects or alternative approaches to the same project.

Poverty group rankings (see Appendix for an example). Poverty group rankings are a device for concentrating thought and attention on which groups in the society will benefit from a project. They require those preparing a project to ask the crucial "who benefits?" question, and to rank groups according to their degree of benefit. The question should make low administrative demands on those who have to answer them. The result should be to force officials, whether in ministries or in decentralized administrations, to think at an early stage about beneficiaries; and the procedure can be designed so that those originating a proposal for a project have to defend the rankings which they have given it. Such a system should benefit the poorer rural people by affecting the thinking, behavior, and choices of those who identify, design, and select projects.

Checklists. Checklists of factors to consider are widely used but little written about.²⁰ They may be used specifically to alert appraisers to considerations such as poverty, employment, and administrative capacity.

Some officials have their own checklists. Checklists do, however, run the risk of becoming too long. As with other procedures it is optimal to stay simple.

Listing costs and benefits. Where some sort of cost-benefit appraisal is needed for a small project, a simple approach is to list anticipated costs and benefits putting figures on them as appropriate. This approach is illustrated in the OXFAM Field Directors' Handbook (Section 5), and also put forward by the Government Affairs Institute in their book, *Managing Planned Agricultural Development*, which recommends identifying "all relevant aspects of proposed projects, quantifying those costs and benefits for which data are available, and to which monetary values can be assigned without violating common sense."²¹ While the word "all" is dangerous, since with ingenuity one can add almost endlessly to minor externalities, the approach in practice is likely to be intelligible and to provide a potential basis for reasonable decisions.

Unit costs and cost-effectiveness. Unit cost and cost-effectiveness criteria are widely applicable and useful. They are used by OXFAM, with rules of thumb for different types of project, and an "index of unit costs" which is the cost of a project divided by the number of people benefiting. They are especially useful with projects for health, education, water supply, and the provision of other services.

These five procedures are open to criticism by perfectionists. The traditions and methods of mathematics value precision. But in practical decisionmaking there are optimal levels of imprecision and ignorance. The key to optimizing procedures is to realize that the cost-effectiveness of the procedures themselves relates to low costs in staff time and in demands for information as against high benefits in improving the quality of the decisions. The danger is that "intelligent" criticism of simple procedures will consider only the benefit side and neglect the costs, leading to "improvements" which make the procedures more laborious, less practical, more costly to carry out, and counter-productive. Complexity and sophistication are not synonymous; on the contrary, complexity can be crude and naive. The true sophistication is to see how far it is optimal to be simple.

Life Styles, Learning, and Judgment

A danger remains that demands for information by bilateral and multilateral donors will develop a galloping elephantiasis which will paralyze administrations, reduce aid to the poorest, and perpetuate and increase

dependence on foreign expertise. The danger is that more and more highly trained and experienced people will be sucked or enticed into the prestigious, well-paid, urban-biased business of project identification, appraisal, monitoring, and evaluation. Thus at a time when rural development has become a priority, especially the much more difficult objective of rural development which benefits the poorer rural people, there may perversely be less and less contact between those responsible for rural projects and policies on the one hand and poor rural people on the other. These trends can be moderated by the decentralization and the simple procedures advocated above. But there is one more measure to be taken: a conscious and determined drive to counteract the effects of the urban and elite life styles, experiences and perceptions of many of those concerned with rural policies and programs. The seriousness of the need varies by country and region. But the reform proposed is a requirement by every donor agency, and selectively by governments, that their officials should be systematically exposed to and encouraged to learn about rural life and especially rural poverty. This could mean, for donors, that each official would be required to spend two weeks of every year actually living in a village, ²² not making the easier, more congenial visits of a rural development tourist, thereby learning how rural people, and especially the poor rural people, live, and so trying better to understand their needs.

The benefits would be many. Some officials would resign. Others would work harder and better. The asymmetry of the aid relationship would be mitigated, since "donors" would have to go cap-in-hand to "recipients" and ask them to allow their "donor" staff to be recipients of experience in villages.

The main benefit would be improved judgment. However carefully procedures are devised, training undertaken, and feasibility appraised, the element of judgment always has a major part to play in project selection. With poverty-focused rural development, judgment must be based upon an understanding of rural realities. Direct exposure to village life, if sensitively managed, should enable officials better to assess rural needs, better to appreciate the capabilities of rural people and their potential for participation, and better to understand and counteract the tendency for projects to be captured by rural elites. Officials should become better judges of implementability and of rates of change. They might repeatedly learn and relearn the lesson that simple is optimal. The outcome should,

indeed, be that more projects would be selected and implemented which would truly benefit the poorer rural people in ways which they would welcome.

APPENDIX: A POVERTY GROUP RANKING METHOD FOR RURAL PROJECTS

The proposal which follows was thought out in relation to procedures in Botswana. The examples given are hypothetical or real cases. Most rural projects in Botswana are not subjected to a full social cost-benefit analysis but are written up first in a thumbnail sketch and later in a project memorandum. The procedure is outlined in the Botswana Government's *Planning Officers' Manual* (Chapter 3). This procedure does not appear to require that those who are expected to benefit from a project should be identified.

There is a strong income gradient in Botswana from extra-rural (low) through cattle posts, small villages and large villages to urban centers (high), and a persistent tendency for urban and large village bias in benefits from projects in spite of government policy directed towards reducing rural poverty. This proposal therefore includes a ranking of zones in which the expected beneficiaries reside.

The relevant part of the thumbnail sketch and project memorandum would be:

Which groups will benefit?	
Group	Ranking
Very poor	
Poor	
Small men	
Well-off	
Very wealthy	

Where do the beneficiaries live?	
Group	Ranking
Extra-rural	
Cattle posts	
Small villages	
Large villages	
Urban centers	

Notes:

A preliminary indication of the group is:

- Very poor: People without stock and who do not cultivate regularly, including borehole squatters, hunters, and gatherers, destitutes, cattle herders, and traditional dependents.
- Poor: People with small stock only and/or 4 or less head of cattle and/or who cultivate by borrowing animals for draught.

Small men: People with 5-20 head of cattle or income-equivalent small enterprises.
 Well-off: People with 21-200 head of cattle or income-equivalent medium enterprises.
 Wealthy: People with over 200 head of cattle or income-equivalent larger enterprises.

The ranking (1(high), 2, 3, 4, 5 (low) for group and for zone should be entered in the boxes as appropriate.

The proposal is simple. Each thumbnail sketch and project memorandum would be ranked by the originating ministry to indicate which groups of people and in which zones were expected to benefit from the project. The ranking would be ordinal, in this case 1 (high benefits) through 5 (low benefits). If the benefits were from income, the ranking would be based on the total additional permanent net income expected to accrue to members of the group or residents of the zone. If the benefits were from services, the rankings would be based on the numbers of people in each group or zone expected to benefit from the services.

The omission of columns for *per capita* benefits in each group and for numbers of beneficiaries is deliberate. It will quite often be very clear from local knowledge what the correct ranking is, but more difficult to set figures on it. It would be a matter for judgment whether the costs of estimating incomes or numbers of beneficiaries would be justified by the benefits of doing so.

Examples

Project: *Health Posts for Remote Areas*

Which groups will benefit?	
Group	Ranking
Very poor	1
Poor	2
Small men	—
Well-off	—
Wealthy	—

Where do the beneficiaries live?	
Zone	Ranking
Extra-rural	1
Cattle posts	2
Small villages	—
Large villages	—
Urban centers	—

Project: *Free Fencing Materials for Communal Grazing Areas*

Which groups will benefit?	
Group	Ranking
Very poor	—
Poor	3
Small men	1=
Well-off	1=
Wealthy	—

Where do the beneficiaries live?	
Zone	Ranking
Extra-rural	—
Cattle posts	3
Small villages	1
Large villages	2
Urban centers	—

Note: The beneficiaries are those with herds which will depasture in the communal areas. The 45 percent of rural households with no cattle will not benefit directly.

Project: *Veterinary Quarantine Fence*

Which groups will benefit?	
Group	Ranking
Very poor	4=
Poor	4=
Small men	3
Well-off	2
Wealthy	1

Where do the beneficiaries live?	
Zone	Ranking
Extra-rural	4=
Cattle posts	4=
Small villages	3
Large villages	1=
Urban centers	1=

Notes: The Veterinary Quarantine Fence will improve disease control. The main beneficiaries will be large cattle owners in large villages and urban centers. Permanent employment in maintenance gangs will be created for foremen and laborers, mainly from extra rural and cattle posts zones, but benefits to them will be small compared with those to the large cattle owners.

Notes

1. Joseph Ssenyonga, personal communication.
2. Andrew Pearse, "Technology and Peasant Production: Reflections on a Global Study," *Development and Change* (July 1977).
3. This generalization is justified by the concentration in this paper on "top-down" projects, i.e., projects which involve government planning of implementation. Poverty-oriented rural projects may be very rapidly implemented where they originate in popular enthusiasm.
4. This reliable information was given on condition that in quoting it the source would not be quoted.
5. Myths are perpetuated because the evidence for statements of this sort is usually informal personal communication rather than the printed word. For obvious reasons, sources for the illustrations given here cannot be cited. But examples reported to the writer by experienced practitioners of cost-benefit analysis include the following: A multilateral agency wished to finance a livestock project. The appraisal team estimated a rate of return of 11 percent, only to be sent a cable from the organization's headquarters telling them to make it 15. Or again, an appraisal team, after months of work on an electricity project, visited a senior official and told him that the rate of return would be 9 percent only to be told "Come back tomorrow when it is 14." Or again, a senior official responsible for preparing and submitting projects to donors always decided the rate of return first and then instructed his staff to produce it. It is not easy to assess how common such practices are; but it is extraordinary that the informal quality of decisionmaking is not more seriously treated in the manuals on project appraisal. An honorable exception is the OXFAM Handbook for its Field Directors which states, for example, "The danger of using shadow prices is that they may be over- or under-estimated in order to justify projects to which the appraiser feels personally committed" (OXFAM, *Field Directors' Handbook* [OXFAM, 274 Banbury Road, Oxford, 1976], p. 5).
6. Dennis A. Rondinelli, "International Requirements for Project Preparation: Aids or Obstacles to Development Planning," *Journal of the American Institute of Planners* 42:3 (July 1976):3. (Version cited here is a pre-publication mimeograph, not dated.)
7. *Ibid.*, p. 20.
8. Dennis A. Rondinelli, "International Assistance Policy and Development Project Administration: The Impact of Imperious Rationality," *International Organization* 30:4 (Autumn 1976).
9. Michael Lipton, *Why Poor People Stay Poor: A Study of Urban Bias in World Development* (London: Temple Smith, 1977).
10. Robert Chambers, "Executive Capacity as a Scarce Resource," *International Development Review* 11:2 (June 1969); and *idem*, *Managing Rural Development: Ideas and Experience from East Africa* (Uppsala: Scandinavian Institute of African Studies, 1974), p. 152.
11. Uma Lele, *The Design of Rural Development: Lessons from Africa* (Baltimore and London: The Johns Hopkins University Press, 1975), p. 176.
12. ODA, *A Guide to Project Appraisal in Developing Countries* (Overseas Development Administration) (London: HMSO, 1972), p. 23.
13. I.M.D. Little and J.A. Mirrlees, *Project Appraisal and Planning for Developing Countries* (London: Heinemann Educational Books, 1974), chapter 3.
14. *Ibid.*, pp. 229-31.
15. Chambers, "Executive Capacity."
16. Roland N. McKean, *Efficiency in Government Through Systems Analysis* (New York: John Wiley and Sons, 1965); John A. King, Jr., *Economic Development Projects and Their Appraisal: Cases and Principles from the Experience of the World Bank* (Baltimore: The Johns Hopkins Press, 1967); Arnold C. Harberger, *Project Evaluation: Collected Papers* (London: Macmillan, 1972); ODA, *A Guide to Project Appraisal*; OECD, *Methods of Project Appraisal in Developing Countries* (Paris: 1973); Little and Mirrlees, *Project Appraisal*; Lyn Squire and Herman G. van der Tak, *Economic Analysis of Projects* (World Bank Research Publication; Baltimore and London: Johns Hopkins University Press, 1975); George Irvin, *Modern Cost-Benefit Methods: Financial, Economic and Social Appraisal*, draft edition (Institute of Social Studies, The Hague, 1976); Hellmuth Bergmann and Jean-Marc Boussard, *Guide to the Economic Evaluation of Irrigation Projects* (Paris: OECD, 1976); and M. F.G. Scott, J.D. MacArthur, and D.M.G. Newberry, *Project Appraisal in Practice: The Little-Mirrlees Method Applied in Kenya* (London: Heinemann Educational Books, 1976).
17. Squire and van der Tak do, however, briefly consider the costs and benefits of their proposals. They believe that the benefits justify the costs, but note nevertheless that "the initial cost of transition to the new methodology is substantial, since users must become familiar with the new techniques, and initial estimates of country parameters for shadow-pricing must be built up" (*Economic Analysis of Projects*, p. 5).
18. I.D. Caruthers and E.S. Clayton, "Ex post Evaluation of Agricultural Projects: Its Implication for Planning," *Journal of Agricultural Economics* (UK) 28:3 (1977):9-10.
19. Paul Collins, "The Working of Tanzania's Rural Development Fund: A Problem in Decentralization," in *Planning in Tanzania: Background to Decentralization*, ed. A.H. Rweyemamu and B.U. Mwansasu (Nairobi, Kampala, Dar es Salaam: East African Literature Bureau, 1974); and Chambers, *Managing Rural Development*, pp. 94-100.
20. But see ODA, *A Guide to Project Appraisal*, and Government Affairs Institute, *Managing Planned Agricultural Development* (a reference book prepared for the Agency for International Development) (Agricultural Sector Implementation Project, 1776 Massachusetts Avenue N.W., Washington D.C., August 1976), pp. 15-29.
21. Government Affairs Institute, *Managing Planned Agricultural Development*, p. 29.
22. When this proposal was put to a senior UN official, he was against it because of the health risks his officials would face from living in villages. Comment should be unnecessary.

Economic Analysis in AID

Previous readings explored the conceptual basis and purpose of cost-benefit analysis and outlined the techniques used or questioned the methods or assumptions embodied in the various approaches. In this reading, the focus is on the formal requirements, the practice, and the problems of economic analysis in one organization, the Agency for International Development (AID).

First, an excerpt from AID Handbook 3 outlines the requirements for incorporating economic analysis into project papers. An appendix to the handbook spells out in more detail the broad intent of these requirements.

The second statement is drawn from "Inside Cost-Benefit Analysis in AID: A Critique," by two economists familiar with AID practice. Kenneth Jameson and Laurel Worthington. The first and third sections of their article are reprinted in full: first, a review and comments on the picture of cost-benefit analysis given by the Handbook, and then an examination of the peculiar situation of a development assistance organization and the potential role for cost-benefit analysis in the context of AID operations. The second section, a survey of how economic analysis was actually carried out in a sample of 110 AID projects approved between 1970 and 1976, is summarized.

Three main points stand out in these selections:

First, AID's objectives, as an organization, are only partly congruent with the circumstances within which cost-benefit analysis is supposed to be applied. Nearly all approaches to cost-benefit analysis assume a clearly limited economic system within which decision-makers—vested with the authority to articulate society's objectives—make choices on alternative development projects. Cost-benefit analysis is a system for giving

decisionmakers information needed to choose the best allocation of strictly limited resources among a collection of competing uses. These are not the circumstances commonly faced by AID project designers. The constraints under which they operate are usually less clear, but no gentler, than the stark economic reality of resource scarcity. It is quite possible that cost-benefit analysis is not designed to answer the questions that are most urgent from the perspective of a project designer in a development assistance agency.

Second, AID neither endorses nor excludes any particular approach to economic analysis; the guidelines of the Handbook are suggestive rather than prescriptive. Projects are to be "economically justified," but it is left to project designers and analysts to determine what this means, how economic soundness is to be determined, and how it is to be demonstrated. An exception to the overall pattern of AID guidelines is the suggested rate of return that projects should display. A 15 percent return is presented as a broad standard, yet where this number comes from is not revealed. A cut-off rate for IRR calculations is meant to reflect the opportunity cost of capital. The AID standard seems to presume that if any given project cannot generate a 15 percent return, there are alternative projects that can, and the resources would be better devoted to these other uses. This is a fragile assumption for an agency involved with many different types of projects all around the world, and when so many criteria other than economic ones must be considered in pronouncing a project wise or wasteful. Note, however, that this standard of 15 percent is presented as a target, not as a rigid minimum, and project designers are encouraged to take non-quantified factors into account if appropriate.

A third point derives from the authors' survey of economic analysis in AID projects. Their limited sample raised the possibility that AID personnel seldom inquire into the economic sense of projects in the structured ways that have been discussed in this reader. Only about half of the 1970-76 projects surveyed used any conventional technique of economic analysis, and fewer still sought original data on which to build the analysis. Jameson and Worthington discuss these points and suggest some dimensions of what they see as the real value of cost-benefit analysis in AID. [Ed.]

PREFACE

SELECTIONS FROM AID HANDBOOK 3

1. All AID projects must be economically justified. The economic benefits of some projects can be fully quantified; for other projects the benefit analysis must be handled through a mixture of quantitative and non-quantitative analyses or be entirely handled through nonquantitative techniques. (Appendix 6G to this chapter provides guidance for both quantitative and non-quantitative economic analyses.) AID is not wed to any particular system or procedure as long as the economic analysis is performed with professional integrity and competence and as long as the system used is explained in the presentation.

2. Economic analysis is not necessarily a discrete undertaking, since factors influencing the economics of a project may include political, social, and administrative matters. In this section of the PP, however, the thrust of the effort should be to present the results of an analysis of the *economic effects of the project*. Such effects would almost always include a measure of *project benefits to the economy against prior costs* (regardless of by whom financed), project effects on *income* (or similar measures of well being), and *employment*. (Conclusions on the income effects on beneficiaries should be discussed in this section.)

3. AID projects ought to have an economic rate of return of 15 percent or higher. In those cases where analysis indicates this cannot be expected, special attention needs to be given to the significance and criticality of the nonquantified benefits. The 15 percent standard should be looked upon as a warning signal and

not as an absolute minimum below which AID cannot go. This standard is, of course, particularly appropriate for those projects for which a quantified economic rate of return analysis can be calculated which rather fully expresses the project's economic benefits. In any case, quantified economic analysis should be carried to the furthest practical point and then qualitative information should be discussed to round out the presentation.

4. For those projects where a cost-benefit analysis is not possible or practical, a "least-cost" or "cost-effectiveness" analysis would be the appropriate technique. In such cases the economic analysis should demonstrate that the project is the best cost alternative for the particular setting.

5. Based on the above, set forth the conclusions of the economic soundness of the project.

APPENDIX 6G

ECONOMIC ANALYSIS OF PROJECTS: COST-BENEFIT AND COST-EFFECTIVENESS ANALYSES

1. Economic analyses of projects should be useful at two distinct levels. In the first place they should be useful in helping technical personnel select the most efficient and effective project design from among alternative options. In the second place, they should help decisionmakers and budgeteers choose among different projects in a given sector as well as among projects in different sectors. In other words, a principal value of good analysis is that it helps the project designer clarify and systematize alternative ideas and designs for his own benefit, well before he presents the final results of his analysis to reviewers and decisionmakers. In fact, the discipline imposed by the analytical process may in many cases be more important than the "numbers" or "facts" finally produced. The real purpose of economic feasibility analysis is to aid in the *choice of alternative projects and alternative project designs*. Thus, it is essential that analysis be done early in the project identification and design process. Otherwise there is a danger that analysis will be employed—as is unfortunately all too often the case—to *justify* already determined projects and project designs.

2. AID does not have a rigid methodology for economic feasibility analysis. This is as it should be since the exact methodology used should vary from project to project depending upon the nature of the activity, upon the analytical training and experience of project designers and host country counterparts, and upon the

availability of data. A simpler method with which the project designer is thoroughly familiar and in which he/she has confidence is always better than a more complex methodology that the designer follows only in a mechanical fashion. Choice of a simpler method will also facilitate the use of analysis to appraise several alternative approaches, especially at an early stage in the process. A project designer should familiarize himself with several standard approaches in his sector of interest and should apply the methodology that seems most credible and relevant for the project at hand. This, of course, does not mean that the project designer should not be innovative in, for example, combining different approaches if the situation warrants.

Discounting and Social-Private Divergences

Two fundamental concepts are crucial for any economic analysis method. These concepts are (1) discounted present value (or discounted cash flow) and (2) the possible divergence between social returns (sometimes called "economic" returns) and private returns (sometimes called "financial" returns). These concepts and their associated economic principles apply to activity areas traditionally considered "non-economic," like education and health, as well as to production activities with marketed outputs. Even when it is not appropriate to quantify on a cardinal scale the "outputs" of, say, education or health activities in economic terms, it is still appropriate to consider whether different "time profiles" of costs, whose total values may differ from one another significantly in present value terms, can achieve equal output effectiveness levels. (For example, if the opportunity cost of investment capital is 10 percent per year, the "present value" of one dollar spent next year is only 90 cents. Therefore the principle of discounting indicates that a dollar spent in the future to achieve a given improvement in health, education, or other "social" projects may in an economic sense be more "cost-effective" than a dollar spent today.) As regards the divergence between "social" and "private" aspects of "non-directly productive" projects like education and health, it is clear that various subsidy schemes often make the private costs of education or health substantially lower than their social costs. The analysis for any project in any sector should estimate discounted costs (and, where appropriate, discounted returns) and should analyze costs and returns for possible divergence between social and private magnitudes.

Cost-Benefit versus Cost-Effectiveness

1. For purposes of this discussion, there are two main types of economic analysis which design personnel should consider in developing projects: (a) "cost-benefit" (or "rate-of-return") analysis and (b) "cost-effectiveness" analysis. In broad general terms, cost-benefit analysis will usually be the more appropriate technique when a project's outputs are primarily marketable items or when they at least can realistically be valued in monetary terms. (For example, in the transportation sector, a leading project benefit is often "time saved" for both people and commodities in transit. While such time savings generally cannot be "marketed," it is usually possible to assign them a realistic monetary value.) On the other hand, cost-effectiveness analysis will usually be more appropriate when a project's outputs cannot be assigned realistic monetary value. Another way of distinguishing the two classes of situations is to say that cost-benefit analysis is usually more appropriate for "economic" (or "directly productive") projects, while cost-effectiveness analysis is usually more appropriate for "social" (or "non-directly productive") projects.

2. Cost-benefit analysis should normally be performed for *any* revenue producing project or for any project whose outputs translate realistically into monetary equivalents. The benefit-cost ratio, net present value, or internal rate of return for the project may then be compared to those for other projects in the same or other sectors to gain some notion of the project's relative economic efficiency. On the other hand, cost-effectiveness normally will be done for those "social" or "nonrevenue producing" projects (i.e., those without significant income streams) whose output can nonetheless meaningfully be quantified. For example, health projects to reduce child mortality or specific disease rates, education projects to increase literacy rates, or family planning projects with specific fertility reduction goals all have (conceptually) quantifiable outputs and therefore are excellent candidates for cost-effectiveness analysis. Cost-effectiveness analysis in general is less important (though often still useful) for projects whose primary outputs are, for example, technical assistance or "institution building." In cases like the latter, the costs for any known alternative means of achieving the same output levels should be stated where possible, even if a more sophisticated analysis is not feasible.

General Features of Any Economic Analysis

1. Any analysis should justify the discount rate (or, when sensitivity analysis is done, rates) used. Beyond these minimum requirements, project designers must decide themselves and justify their decisions on issues such as whether market prices are so distorted as to warrant using shadow prices to measure the "true" values of inputs and outputs. Quantifiable benefits and costs of a project should be identified and expressed in physical or monetary units. Indirect and external benefits and costs should be included when significant. The monetary expressions should be at market prices, but wherever market prices are not realistic from a public viewpoint because of subsidies or administrative price controls, a supplementary set of benefits and costs in "shadow prices" may be appropriate. The values of costs and benefits should be divided by years during the expected life of the project and appropriately discounted over time to yield present values. The discount rate selected should normally be the marginal opportunity cost of capital in the economy (or the rate required to attract the needed capital). In any event, the basis for selecting the discount rate should be described.

2. If shadow prices are used in project analysis, the first step is to determine a system of shadow prices that would (if applied to the entire market) clear the market, leaving neither a surplus nor shortage of capital or

labor. This is not an easy matter, as attested by the rigorous debates on methodology and by various manuals on the subject. However, when a wide discrepancy exists between actual market prices and shadow prices, a precise solution is not necessary if the estimate is in the right direction and is roughly the right magnitude. In some countries "real" foreign exchange rate values have been estimated by local or outside economists and can be adopted; in others, if markets, for example, are very "thin," estimates can be made on the basis of unofficial or black market rates. Shadow wage rates for unskilled labor should be based on the local competitive wage rates for the periods of the year the project will be carried out. Since interest due on loans made to government agencies or large contractors may be unrealistically low, due to concessional rates from international financial sources or domestic policies, the appropriate discount rate may need to be estimated as a shadow price. This shadow discount rate should be equivalent to benefits foregone on alternative investment opportunities and in many developing countries will be 10 percent or more. Again there may be existing estimates that are applicable. (However it must be cautioned that private "curb" rates of interest in many countries without extensive formal capital markets may contain large risk premia. Therefore their private interest rates may significantly overstate the true social opportunity cost of capital.)

Inside Cost-Benefit Analysis in AID: Its Uses and Abuses in Project Formulation

Kenneth P. Jameson
and Laurel Worthington

Foreign assistance funds can be delivered to recipients at a variety of levels: general budgetary or foreign exchange support, sectoral support, or project support programs with funds allocated to specific undertakings within sectors. In recent years AID's "development assistance" has focused primarily at the project level. There are a variety of arguments for such targeting, e.g., efficiency in the use of funds and effectiveness of technical assistance; but certainly one prime factor in this focus has been the willingness of the Congress to undertake review on a project-by-project basis and to evaluate each project in light of the requirements of the "New Directions."

Such a focus requires a process of project formulation, analysis, and review which has been developed most completely in the Agency's Handbook 3, entitled "Project Assistance." Included in the materials of Handbook 3 are the general guidelines for analyses of the economic factors in the project. In particular, chapter 6 deals with the final analyses of project viability which are required, including "financial" and "economic" analyses. Appendices 6E ("Financial Rate of Return and Financial Viability") and 6G ("Economic Analysis of Projects: Cost Benefit and Cost Effectiveness Analyses") add specificity to these components of the final analysis.

NOTE: The views expressed herein are those of the authors only and should not be attributed to the Agency for International Development.

Reprinted from "Inside Cost-Benefit Analysis in AID," by Kenneth P. Jameson and Laurel Worthington, 1976, by permission of Development Studies Program—AID.

This paper will examine economic analysis in the AID context as represented by the handbook materials. Two questions will be of greatest importance. First, how is the economic analysis carried out in actuality: how often, in what types of projects, and using which techniques. The second focus will be on the "validity" of the types of analyses carried out and will attempt to suggest where economic analysis within the agency should be going.

Before looking specifically at these questions, it will be helpful to review the requirements for analysis as specified in the handbook.

THE CONTEXT OF ECONOMIC ANALYSIS IN AID

Before examining the specific guidelines for economic analysis, it is useful to emphasize that "economic analysis" is quite broad and can cover a wide variety of undertakings from macroeconomic modeling of entire economies to examinations of a particular problem within a particular firm. The importance of this fact is that in many cases, economic analysis at one of these levels may at best be misleading and at worst completely wrong if the economic conditions at another level are not taken into account. To be more precise, if economic analysis is to be carried out on a project to foster production of an agricultural export, and if this project were to overlook a downward trend in the international market for that commodity, the project analysis could be very incorrect. Thus the linkages must be

borne in mind and indeed it must be realized that a complete economic analysis at project level may, of necessity, bring in economic analyses at other levels, and any inconsistencies between a project analysis and a sector assessment must be resolved, and between them and the economic analysis in the Development Assistance Program. A similar point notes that economic analysis by itself can often be misleading unless it takes into account results from "non-economic" studies of institutions and cultures. More will be said on that later.

Let us turn now to consideration of project analysis. In that context, economic analysis sets out to answer the question: "Do the social returns of the project outweigh its social costs?"

In answering the question, substantial developments in analytical technique have taken place. The work of Little and Mirrlees is perhaps the most notable example.¹ It is at this level that a good deal of the AID analysis is focused, along with a large portion of the resources of the agency. In what follows the claim will be made that it is at this level that the economic analysis carried out by the agency is most flawed and should most directly be changed or abandoned altogether.

At this point, however, let us concern ourselves with the requirements for project analysis which are contained in the AID handbook. The need for "economic analysis" emanates from Handbook 3, chapter 6, where it is clearly stated that "the substantive areas listed below *are to be covered in project papers*" (Part 3-D Economic Analysis). Thus as a general rule every project is supposed to have an economic analysis, though this may be a large or small section depending on the particular project. Moving to the text which describes the economic analysis, we find rather clear instructions of what it is to contain.

The first canon is that "all AID projects must be economically justified" (pp. 6-9). There is an admission that no one type of analysis can be used in all cases to assess the economic justification of a program, but some justification must be offered and the method of obtaining it must be indicated. The question of what shall be defined as justifiable is left hanging in this section of the handbook.

The second canon to be followed is that the thrust of analysis should be on the *economic effects of the project*. There will be political and other considerations in a project, but they should be distilled from the analysis allowing it to concentrate on project benefits and costs, where some of the key benefits should be seen in

employment and in income (or some other measure of welfare). There is a major difficulty with the suggestion of separating the social and political effects. For it is entirely conceivable for a project to exhibit substantial benefits in simple economic terms, which, because of social environmental or political factors, are completely negated. How can these factors be entered or should these factors be omitted? There seems to be little guidance on this though the implication is that they be omitted, presumably to be filled in through some separate analysis.

The third guideline of economic analysis is that AID projects should have an economic rate of return of 15 percent or higher. If the rate does not reach 15 percent, then nonquantified benefits should be considered. Presumably this is an invitation to "fudge." In any case, it is encouraged that the "quantified economic analysis should be carried to the furthest practical point, and then qualitative information should be discussed to round out the presentation" (pp. 6-10). Once again this begs a whole series of questions, for a true cost-benefit advocate would claim that anything could be quantified, from the cost of another death to the cost of social disruption. Thus, there would seem to be an incentive to push the economic analysis to point where the 15 percent return was obtained, regardless of what the analytical technique might suggest to us. Finally, where cost-benefit analysis is not possible or practical, cost-effectiveness analysis can be used to demonstrate that the project is the best cost alternative for a particular setting. This implies finding two projects such that the benefits to be gained from one are the same as those from the alternative approach. Under these circumstances the least cost option is chosen. This approach may simplify matters in some cases, but in general the complexities will remain.

Somewhat greater detail on some of the issues is added in Appendix 6G. In particular, cost-benefit analysis is suggested to allow the choice between alternative projects and project designs; but the technique is only one among many which could be used to assess "project feasibility"—where again feasibility is never defined. It is also pointed out that both costs and benefits should be discounted, using the opportunity cost of capital, and that costs and returns should be analyzed for possible divergence between social and private magnitudes. Finally, when benefits are quantified they should be valued at market prices unless they are distorted, in which case a "supplementary" set of benefits and costs using "shadow prices" may be appropriate.

While this additional information appears to put the practice of cost-benefit analysis into a familiar economic context, it does raise some additional issues which should be addressed. First of all, it is suggested that the marginal opportunity cost of capital in the recipient country be the discount rate. This implies that they should be allocated within the recipient country in the most efficient manner possible. Conceptually this is fine, but it does conflict with the earlier canon that a project must have at least a 15 percent rate of return to be acceptable; for if 15 percent is the magic number it should also be used to discount. In addition this process requires a complete listing of projects in the economy with selection according to the most viable; yet the analysis is carried out at the project level with little requirement or likelihood that such a complete listing will enter into the considerations.

Another difficulty raised is the definition of "social." In several places in the appendix, social is used as a synonym for "nondirectly productive." It is important to realize that conceptually there is no difference between income-producing projects and non-income producers, and certainly that such a distinction is not at the basis of "social cost-benefit analysis." Social implies that private and social cost-benefits differ, and it is only in such a case that cost-benefit analysis differs from financial analysis. For if the analyst were able to follow the guideline's suggestion that market prices be used, then there would be no need for cost-benefit. It is when goods are not marketed or when there are deviations of market prices and from social scarcities due to market imperfections that cost-benefit is useful.

With these caveats, let us turn briefly to financial analysis. By financial analysis it is generally meant: a) for government projects, an estimate of the costs and revenues of the project which can be used to assess whether the resources available will cover the necessary outlays of the project or b) for private projects generating revenues for their participants an estimate of whether the net return to private participants will be positive. The requirement for such an analysis is contained once again in Handbook 3, chapter 6, as Section B of Part 3, "Project Analyses": "Every project should contain a study of the financial rate of return/viability; a recurrent budget analysis of implementing agencies; a financial plan/budget tables; and finally, a summary option" (pp. 6-7, 6-8).

The situation with financial analysis is much more straightforward than in the case of the economic analy-

sis. In some sense, it should be considered as ensuring that the minimal requirements for project viability are met. For if it is found that the project offers its potential participants a rate of return which is negative or less than can be obtained elsewhere, or if it is found that the demands on the country's governmental resources for keeping the project in operation are unlikely to be met, then any other type of analysis is essentially moot. Despite the technical soundness of a project or its environmental or social soundness, it is unlikely that it will have any chance of success.

Some indication of the relation of economic and financial analyses would perhaps be useful. In the first place, the financial analysis can be considered a starting point for the economic analysis. It isolates the recurrent costs and revenues and discounts them to comparable present values. This is one component of the information which must go into an economic analysis of a project. A financial analysis provides more than raw material for the economic analysis, it provides a bit of a "reality check" as well. For there is a tendency in an economic analysis to overlook certain fundamental questions and to concentrate simply on the analytics of a given problem. For example, it is not unlikely that a cost-benefit analysis could completely overlook the question or whether the government resources for a given project will indeed be forthcoming. It will be the contention of this paper at a later point that any analysis which did make such an omission would be highly flawed and a misuse of the constructs of cost-benefit analysis; but under certain uses of the technique, such an eventuality could not be dismissed.

The second linkage is one which was implied above. Economic and financial analysis do not differ unless prices do not represent social scarcity. In such cases, it is likely that the starting point will be a financial analysis and that it will be modified to take into account the "shadow prices" which are used to represent social scarcities.

This paper will not directly consider financial analysis for the reason that it raises few analytical questions and is relatively straightforward, drawing as much on accounting considerations as economic ones. Nonetheless, it is to be emphasized that there is indeed a linkage between financial and economic analysis, and that this linkage goes beyond the common data inputs.

With this background, let us turn now to an empirical question: How is economic analysis carried out within AID in actuality. We will draw upon the information which is provided by the project papers for approved

projects. In this fashion, we will be able to see how the requirements for economic analysis are met in practice.

The second part of the study is based on a sample of 110 Project Papers (33 papers in the sample were Capital Assistance Papers, the pre-1975 format for documenting projects involving loans). All of the projects had been approved between 1970 and 1976.

Jameson and Worthington developed a system for classifying the economic analysis presented in the papers. The nine categories are:

1. No economic analysis included (or even mentioned).
2. Analysis omitted, with lack of data or other reason cited.
3. Overview of economy, showing need for project outputs.
4. Qualitative or quantitative listing of benefits.
5. Cost-effectiveness analysis.
6. Internal rate of return calculated.
7. Benefit-cost ratio calculated.
8. Internal rate of return and benefit-cost ratio.
9. Non-conventional form of economic analysis.

The projects fell into these categories thus:

Type of Analysis	Number of Projects (110 total)
None	10
None (lack of data)	7
Overview	16
List benefits	23
Cost-effectiveness	6
Internal rate of return	16
Benefit-cost ratio	17
Internal rate of return and benefit-cost ratio	12
Non-conventional analysis	3

The 110 projects were separated by purpose codes:

Type of Analysis	Agricultural Projects (56)	Rural Development (33)	Nutrition Projects (7)
None	7	3	0
None (lack of data)	3	1	0
Overview	8	5	1
List benefits	10	8	2
Cost-effectiveness	2	1	1
Internal rate of return	12	4	0
Benefit-cost ratio	10	6	1
Internal rate of return and benefit-cost ratio	4	4	1
Non-conventional analysis	0	1	1

Type of Analysis	Health Projects (7)	Education Projects (7)
None	0	0
None (lack of data)	2	1
Overview	0	2
List benefits	2	1
Cost-effectiveness	0	2
Internal rate of return	0	0
Benefit-cost ratio	0	0
Internal rate of return and benefit-cost ratio	3	0
Non-conventional analysis	0	1

The survey also determined the sources of the data cited in the project papers.

Data Source	Number of Papers (110 total)
No data included	22
Country census	3
Survey conducted for project analysis	3
Previous AID paper	7
Unspecified	12
Other secondary source	40
Other	1 (This paper simply referred the reader to a similar project elsewhere.)

Jameson and Worthington's sample suggests two main conclusions: First, the guidelines of Handbook 3 are not uniformly followed; only about half of the approved projects studied met the formal requirements for economic analysis. Second, most of the papers based the economic analysis on secondary data. [Ed.]

A CRITIQUE OF ECONOMIC ANALYSIS IN AID

The previous sections have indicated the requirements for economic analysis and the actual practice deviate substantially. In this section we would like to suggest that on both counts there is room for substantial doubt about the usefulness of this type of analysis. Indeed both requirements and practice are so far from what theory would require that we must look elsewhere for the explanation of economic analysis in AID. Finally, we will suggest that benefit-cost analysis has substantial utility in project design processes, but that its value is not captured either in the Handbook requirements nor in the actual practice. Rather, it must be looked at as a tool which can force comprehensive

consideration of all factors which can affect project success and a framework for organizing information. As such it may have no greater importance than the logical framework though its theoretical basis is more powerful.

As we turn to an examination of the use of cost-benefit analysis, we should recall the critiques that were made earlier; the arbitrariness of the 15 percent rule; its inconsistency in being used only for internal rate of return calculations; the weak treatment of "qualitative" factors and of the meaning of "social" benefits; and finally, the fact that fewer than 50 percent of the projects follow what seem to be the guidelines.

The first point to highlight is that in AID practice the conditions of cost-benefit analysis are not generally met. Scarce resources are not being allocated among competing uses; there is no master shopping list of projects awaiting funding. Thus, the context for cost-benefit analysis simply does not exist.

Judith Tendler, in her book *Inside Foreign Aid*, has given an excellent description of this situation. She writes: "Yet when alternatives are few or nonexistent in institutional reality, then economic criteria can have no more force than the moral injunction to be good: one 'ought' to avoid economic misallocation, even though one does not have to. Needless to say, the moral imperative to be economic can have little punch in a world where the most compelling absolute is that money shall be spent" (p. 95).

Although resources are indeed in scarce supply, both in the United States and in the country in question, such questions of scarcity rarely come into play. This is not to say that they should not come into play, but simply that in general such is not the case. From the standpoint of the lending agency, funds are always seen as scarce, but scarce in the sense of failing to allow all the activities deemed necessary, not in the sense of having to be allocated so as to generate the greatest return for the available funds. Were the latter the context, we would not find benefit-cost analyses being carried out and measured against some standard of 15 percent, rather we would find that all possible projects would be analyzed and benefit-cost ratios computed, and then the funds would be allocated to those projects which provided the highest social return, where social would obviously have to be based on some world standard of social scarcities. As Tendler points out, the opposite is often the case. Generally, there is a battle at the level of Congress to obtain a certain level of funding. Then the

problem for the agency is to ensure that that money is disbursed in the fiscal year to which it corresponds. Instead of being faced with a situation in which there is too little money being chased by too many projects, there comes to be a frantic search for projects which will allow the obligation of the available funds, and one measure of one's success as a project designer is to move large amounts of money. Thus, in this case the canons of cost-benefit analysis are hardly applicable.

Surely in the host country there is a situation of scarce resources and the discipline of cost-benefit analysis can be of aid in making rational economic decision. Here again, it is very rare to find an economic shopping list. There may be a list based on political grounds, but then no economic analysis is necessary to provide a justification. From the standpoint of rational allocation within a national economy, the actual usage of cost-benefit analysis is generally of little help. Thus, we must look elsewhere for its utility.

Tendler gives some indication of her thinking on this question. She sees two main bureaucratic reasons for the use of economic analysis. The first is to facilitate the movement of money. If there are critics who are sternly examining the usage of funds, one means of disarming them and winning credence for the effectiveness of the chosen expenditures is to filter them through a commonly accepted format. Thus, if benefit-cost analysis indicates a return of 15 percent or greater, it is more possible to go to Congress and indicate to them that the funds are being well spent. And, it is likely that there is indeed a relation between favorable showing on these indicators and actual effectiveness of projects, so there may be value to the exercise. However, it should be realized that these are not the benefits claimed for benefit-cost analysis.

The second and somewhat contradictory reason is that such rigorous analyses can almost always provide a justification for bureaucratic inability to move funds in a rapid manner. As she says, "Rigor, then, seems to have become just as much an extension of bureaucratic delay and complexity as a source of improvement in the quality of decision-making" (p. 96). Thus, once again, there is a reason for the analysis which satisfies not economic requirements but bureaucratic needs.

It should be noted that there is one other use which can be made of economic analysis, and it may once again be of a positive variety. The requirements contained in Handbook 3 do place certain limits on the types of projects which can be undertaken and on the

degrees to which they can fail to satisfy minimal economic criteria. Thus, it does provide one additional playing field in which the bureaucratic game of project approval can be played out. It is entirely conceivable that this weapon can result in the weeding out of projects whose justification is highly dubious and which are simply products of the need to move money. While economic analysis in many cases may be far from decisive, there have certainly been cases in which a project is rejected at final review stages on the basis of the economic impact as represented in the benefit-cost analysis. Unfortunately our sample contains no such examples.

Before we move to the possible contributions of benefit-cost, let us put this analysis in the context of the "New Directions" of AID, i.e., projects that will work with the poor majority, most often in rural areas, often on a small scale. This very description of projects indicates that a "good" cost-benefit analysis could generally not show such projects to be justifiable, for it is exactly the attributes mentioned above which make projects tend to have a low return. Combine this with the general reliance of benefit-cost analysis, as stipulated in Handbook 3, on market determined prices, where the incomes of the rich have more weight than that of the poor, and we find a double bias. We might say that such is not the case, for a true "social" benefit-cost analysis would take into account the social significance of rural poverty and unemployment. Conceptually this is true, but in the first place such adjustments are very rarely made in studies; and in the second place, it is likely that when it is done, the calculations will be based mainly on guesswork as to the weights which should be used to account for rural poverty. If we have to guess that the poor should receive a higher priority than pure economic criteria would suggest, why don't we simply take that as a starting point of the analysis and not clothe it in the garb of economic analysis? To summarize, it is perhaps fortunate that rigorous benefit-cost analysis is not applied uniformly to projects, for the New Directions in all likelihood would be left in the starting blocks.

Let us turn now to how benefit-cost analysis, or more specifically economic analysis, might be of use in improving project design and in ensuring that the types of projects which are finally okayed are carefully conceptualized, well-thought out, well-documented, and as likely to succeed as might be possible to ascertain *ex ante*.

A full cost-benefit analysis is the end result of a

rather lengthy and quite complicated operation, the starting point in the collection of data which will allow understanding of the project and its likely impact. Cost-benefit analysis then is a summing up of a series of analyses and their reduction to a measure which allows comparison over projects. It is important to realize that when we talk of "economic analysis" as opposed to financial analysis, we are talking of a procedure or study which has to incorporate the results of many other studies as well. Indeed without being overly imperialistic, we could say that the social soundness analysis, the environmental analysis, and the technical analysis are all raw materials for input into a full cost-benefit study. For it is ridiculous to think of a social cost-benefit study which would indicate a high positive return while at the same time resulting in substantial environmental disruption. Confronted with such a contradiction, we could only say that the analyst simply had not taken into account the long-term impacts, despite the fact that the analysis is supposed to be based on social costs and benefits and that its values are discounted present values. In the case of "social analysis," a project which resulted in substantial costs to the social structure of a society with resultant loss of welfare could exhibit favorable benefit-cost calculations only by virtue of a faulty analysis. Thus, in a very real sense the analyst must avoid categorizing and boxing problems into discrete categories of analysis, but must realize that they are all interrelated. Cost-benefit analysis may have its greater use in bringing together in summary the results of these different types of analysis. Thus, the dictum that social and political factors should be omitted is quite detrimental to cost-benefit analysis.

To emphasize this point, it might be useful to indicate the linkages of cost-benefit and other forms of analysis. We can think of projects and their realization in terms of a series of steps. First of all, there is a perceived problem which leads to an effort to deal with it. The next step is to undertake certain activities, e.g., the provision of seeds or of technical aid, where these activities, e.g., the provision of seeds or of technical aid, are related to the problem. These activities will link into the problem by affecting the social and economic processes and this will presumably result in some benefit or success in dealing with the problem. Cost-benefit analysis simply reduces this chain of relations to one measure which relates the costs of undertaking the particular activities with the benefits to be gained from the particular activity undertaken. This chain of relations can be schematized as follows:

Problems → Activity → (Social Process) → Success
(Benefit)

Now let us break down this relationship a bit. The first thing to note is that any analysis must have a measure of success, and indeed this is often the hardest part. In other words, to do a cost-benefit analysis, one must be able to indicate (measure) the benefits of the activity, and therefore to link the activity through its impact on the social process to the success of the program. This implies that a true analysis of the benefits of program will incorporate a whole series of analyses of the components of the chain. For example, in an education program, we will want to measure the impact of the particular educational program on the "human capital" of the students and then on the productivity of the economy as a whole. This increase in human capital is the benefit, and we need to estimate the change it will undergo as a result of the operation of the program. The usual program focused on by economists is the translation of an increase in human capital into a societal benefit, but there are other equally important linkages, e.g., that between project activity and resultant human capital. In other words, if we are building classrooms or training teachers, we must draw a direct linkage between these activities and the human capital which is formed by understanding how they fit into the social process we call education. This is obviously a job of analysis for a trained educationist, and in the absence of an analysis of the linkage between the project activity and the benefit, we can really say very little about the viability of the project. This becomes especially acute in New Direction programs, for "education" may play a very different role in different societies and our usual assumptions may simply be incorrect. A good cost-benefit analysis must take this into account. The failure to do so through a "social soundness analysis" would not simply violate the letter of the requirements for social soundness analysis, but would invalidate any claim about likely project success.

The upshot of the above is that cost-benefit analysis can have a very important and beneficial role in efforts at project design. Its main benefit will not be that which economists generally espouse, more efficient use of resources. Rather, its benefit will be in forcing the project designer to specify quite clearly the linkages between the activity which is proposed and the expected benefit of that activity, and to justify that expectation. Thus, we can expect the project design process to be improved by the use of cost-benefit analysis

because of its effect on understanding the underlying assumptions and the underlying systemic interactions. Such linkages will avoid one of the major failures of project design and indeed of project evaluation, i.e., mistaking project activities for project success. The same value can be gained from a cost-effectiveness analysis which used such analyses to standardize projects so that their benefits were comparable.

To summarize this section, we claim that cost-benefit analysis or cost-effectiveness analysis can have substantial beneficial impact on the project design process, but not of the sort usually considered. Rather, its benefit is in forcing the explicit consideration of the linkages and the logic of a project and in making its justification stand on the basis of the best knowledge of the link between the type of project activities undertaken and the goal to be attained. It also should force an integrated analysis of projects.

SUMMARY AND CONCLUSIONS

It is apparent that the actual usage of cost-benefit analysis within AID deviates substantially from that which its founders envisioned and from the theoretical requirements for correct analysis. Yet, cost-benefit has a utility in the bureaucratic framework of AID, and the case has been made that it is likely to improve project design by the analytical structures it places on the program designers as well as by opening a route by which projects may be attacked and rejected.

AID seems to be undergoing major changes in direction. One scenario suggests it will operate with roughly the same personnel but with larger amounts of money for assistance. How will cost-benefit fit into such a context? It is likely that it will be downplayed substantially, for there is little possibility that detailed analysis of every project could be carried out if the number of projects rose with no increase in personnel. What will have to move in to take its place as an analytical device and disciplinary measure will be some form of sectoral analysis or some variety of macro analysis. These will become the guides for targeting development funds. At the same time, this will imply a heavier reliance on host country governments and on host country personnel of a technical sort.

This may actually be beneficial to project success. For it will skew money to countries which have undertaken a process of project development in rural areas, and it should become very obvious which countries can

develop meaningful projects because they have the political will to begin to work with the poor majority. This may be a positive change from the situation of AID

project designers pushing New Directions projects on unwilling governments whose lack of will necessarily results in the "failure" of even the best project.