PROJECT EVALUATION

Collected Papers

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CHAPTER 2: SURVEY OF LITERATURE

B. MEASUREMENT OF BENEFITS AND COSTS

1. Projections of demand for the affected product

Projections of demand for the affected product are an important element in estimating the economic feasibility of a project and determining its appropriate scale. The techniques of projection appropriate to any given case can be determined only by a careful study of the case itself, but certain general statements can be made.

(a) The potential market for the product must be ascertained (local, regional, national, and international).
(b) Factors influencing the intensity of demand for the pro- duct in this market must be isolated and projected.
(c) On the basis of (b), the over-all level of demand for the product must be projected.
(d) The prospects of expansion of existing alternative sources of supply must be examined and corresponding projections made.
(e) The prospects of new sources of supply appearing in the future must be evaluated and, if they are likely to appear, supply from these sources must be projected.

For any market, a key factor influencing demand is the level of income, and the projection of this magnitude is therefore of key importance. Unfortunately, there is no touchstone to estimating the rate of growth of income. In particular, the rate of growth of income is not directly tied to the rate of capital accumulation in the community, but is the resultant of many factors, of which capital accumulation is only one.[21]

This fact introduces considerable uncertainty into all income projections, and suggests that basing such projections mainly or exclusively on capital-output ratios is unwise. The most

appropriate procedure appears to be to assess the relative contribution of certain key factors (capital formation, labor force increase, improvement in labor force quality and technical advance) to past economic growth, to assess their probable future strength and to estimate the likely rate of income growth on this basis.

Having projected the rates of growth of income, population and so on, the problem of estimating demand for a particular product depends on the nature of the product. For most consumer goods, income and relative price appear to be the key determinants of demand; so that demand, expressed as a function of price, can be projected once the course of income is known. However, for products which are materials or intermediate goods, the best procedure is to estimate the demand for each type of end-use separately, and to project the demand for the material according to the projected growth of each of its corresponding enduses.[22] Care must be taken, however, to allow for possible future changes in the quantity of the material used per unit of each end-use product. Capital goods demand should be projected on the basis of the amounts expected to be required for replacement, plus the additional amounts needed to produce projected increases in the final product of the activity in which the capital goods are used.[23] Once again, it is important that prospective development of improved and competing types of equipment be taken into account.

2. Projections of product prices

Since the market price of the output of a project is the principal element in estimating the benefits to be obtained, it is important that a project analysis should include projections of the probable path of this price through time. Project analyses need not be concerned with possible movements in the general level of all prices (i.e. general price inflation or deflation), as a parallel movement of all prices and costs would not alter the real cost-benefit relationship. However, movements of relative prices can have a determining influence on the worth-whileness of a project.

The best general procedure for projecting the prices and costs relevant for a project's analysis is to project their movements relative to the general price level. Concerning the price of the output of a project, one must therefore attempt to judge whether the price will move more or less than the general price level and, if so, by ho\v much. Having projected in index form the relationship P_{io} (P_{it}/P_{io}) (P_{go}/P_{gt}) where P_i is the price (If the project's output, and P_i, is the general price level, for each year of the expected life of the project, this index is then applied to the initial year's product P_i ice, P_i in order to express future years' prices in monetary unit, of the initial year's purchasing power. Thus the projected price cries would be of the form

$$P_{io}\ (P_{it}/P_{io})\ (P_{go}/P_{gt}).$$

The factor $(P_{it}/P_{io})\ (P_{go}/P_{gt})$, will average out to unity over the whole economy wheel the appropriate weighted average is taken for

$$\sum_i \frac{Q_{io}P_{io}}{\left(\sum_i Q_{io}P_{io}\right)} * \frac{P_{it}}{P_{io}} * \frac{P_{go}}{P_{gt}}$$

$$\frac{\sum_i Q_{io}P_{it}}{\sum_i Q_{io}P_{io}} * \frac{P_{go}}{P_{gt}} = \frac{P_{gt}}{P_{g0}} * \frac{P_{go}}{P_{gt}} = 1$$

Thus for a typical commodity, the projection of a constant product price is likely to be justified. However, relative prices exhibit substantial variations over time, and it is important to attempt to identify situations in which a particular price is likely to rise or fall relative to the general index of prices. In general, for industrial products, the course of prices will be the resultant of changes in input costs on the one hand and improvements in technology (including economies of scale) on the other. Since the wage component of input prices is likely to rise over time, the question largely centers on whether future technological advances will be sufficient to offset this force. In many industries, some indication of the likely force of future technological advances can be obtained from the

processes that today are being studied for possible future application, and projections can be made on that basis. In some cases, the present market for the product may be found to be abnormal, in the sense of a current shortage of output causing an unusually high price or a current glut of supply causing an unusually low price. It is particularly important that such situations be identified, as in these cases it is highly unlikely that the assumption that the price will remain at its present level will be warranted. Although most discussions of cost-benefit analysis pay lip- service to the principle of taking expected price changes into account, they generally do not go beyond this. Probably the most extensive treatment of the problem-itself not very extensive but at least attempting to face the major issue-is to be found in the ECLA Manual, pp. 26-28.24

3. Projections of cost components

(a) Wages.

One of the gravest deficiencies in the existing literature on project evaluation i$ its failure to allow, explicitly and systematically, for the expectation that wage rates will rise regularly in the future, relative to product prices. In an economy experiencing successful economic development, it can be anticipated that real wages will rise at a rate of 2 percent per year or more. Thus, whereas the price of the average product will change in accordance with movements in the general price level, wages will increase at a significantly greater rate. The rise of wages at a greater rate than that of prices is possible because of the continued improvement of productive techniques. But in a given project, the technique of production is often determined by the design of the project itself. In this case, labor requirements will be determined by the layout of the plant, the types of machinery installed, etc. Future rises in wages will not in this case be accompanied by reductions in labor requirements; hence, project costs will increase to reflect the rise of real wages.

A proper evaluation procedure should surely take into ac- count expected rises in real wages. In cases where future labor- saving innovations are anticipated, which will be applicable to the project in question, these may be taken into account, including in the project analysis the expected cost of introducing the innovations as well as the recollection in labor requirements that is expected to follow.

(b) The exchange rate.

The exchange rate is an exceedingly important factor in project evaluation and an adequate projection of its expected future course through time is therefore necessary. As with other types of prices, what is of interest is movements of the exchange rate relative to the general price level. Three key questions should be borne in mind in developing exchange rate projections.

First, does the present exchange rate reflect the normal forces of demand and supply, or are certain abnormal forces present which produce an exchange rate that is unlikely to be maintained in the future? Abnormal forces might reflect unusually high or low prices for key export (or import) commodities, unusually large capital movements and/or receipts of foreign aid, etc.

Second, what are the likely trends in the basic demand for imports and the supply of exports? Here one must take into account not only the effects of secular income growth, but also the effects of the changing composition of production. Thus projected expansions of export production, or of import substitutes, would influence the probable future course of the exchange rate.

Third, what are the likely changes in government policy with regard to import restriction? Here one can expect that the liberalization of trade controls will produce a higher price of foreign currency, and their tightening a lower price, than would be the case with unchanged policies.

(c) Other costs.

The prices of inputs that are manufactured products can generally be projected by the same method as was suggested above for projecting the price of the output of a given project, that is, as a resultant of expected changes in input cost and expected improvement in the technique of production. This procedure is based on the generally valid assumption that the prices of manufactured goods are largely cost-determined.

Minerals and agricultural product, however, are not typically as elastic in supply as manufactured goods. Hence their projection requires an analysis of the likely movement in both supply and demand. Moreover, because of the characteristically low price-elasticity of demand for these products, it can readily occur that the price observed currently is far different from the price to be expected in the longer term future, after the level of production can be adjusted to accommodate the demand situation.

(d) 'Annualized' benefits and costs.

The many possibilities listed above of prices and costs changing over time, as well as the likelihood (discussed in section A) that the relevant discount rate will itself change over the life of a project, indicate the necessity of carrying out project evaluation b) projecting expected benefit and costs on a year-by-year basis, and then discounting them back to the present by the appropriate discount factors. The often recommended procedure of attempting to put all benefits and costs on an annualized basis[25] entails the possibility of dangerous oversimplification. As it leads one to presume that all the relevant components of benefits and cost will be (comparatively) constant over time, the 'annualization' approach tends to distract attention from the whole set of problems considered in this section.

4. Indirect benefits and costs

In addition to its direct benefits and costs, a project may induce a series of indirect effect, which in principle should be taken into account in its evaluation. These indirect effects are the result of changes that take place in the rest of the economy as a consequence of the project in question having been undertaken. Obviously, any project is likely to have some perceptible effect on the demand and supply of goods produced by other industries, the main effects of this type being in the industries which supply the materials used by the project, and the industries which supply goods which arc either complementary to or competitive with the project's output. If, as a consequence of a project, changes occur in the output of an industry for which, at the margin, social benefits equal social costs, no adjustment need be made. But if (changes occur in the output of industries for which benefits exceed or fall short of costs, at the margin, an adjustment is in order. The appropriate adjustment is the difference between marginal social benefit and marginal social cost, per unit of output in the industry in question, times the change in the output of that industry which is induced by the project under consideration.

The task of measuring indirect benefits can thus be reduced, first, to ascertaining those industries or activities in the economy for which marginal social benefit (MSB) is likely to differ from marginal social cost (MSC); second, estimating the magnitude of the difference, for each such industry, per unit change in its output and, third, estimating the likely change (ΔQ) in the output of such industries as a consequence of the project being, evaluated. Having done this, the estimation of indirect benefits can be calculated by the formula $\sum_i (MSB_i - MSC_i)\Delta Q_i$ where the subscript i varies over all industries for which $MSB_i \neq MSCi$.[26]