*The Pakistan Development Review*
30 : 4 Part II (Winter 1991) pp. 983 – 993

# Efficiency Analysis of Projects in the Pakistan Economy

SHAMIM A. SAHIBZADA and MIR ANNICE MAHMOOD

## INTRODUCTION

The analysis of projects can be undertaken in three stages; the first stage looks at the financial aspects; the second stage examines the projects from an economic aspect and the third stage appraises the project from a social perspective. For the uninitiated reader it is important to distinguish between these three types of analyses. Financial analysis is the initial stage of examining a project with respect to its viability. The analysis is undertaken from the point of view of the sponsoring agency or individual and the prices used for valuing inputs and outputs are those prevailing in the market, in other words, current prices. These prices naturally include taxes and subsidies which may and do act as a distorting feature. Also, in financial analysis the objective is more or less straightforward and simple – that is maximize profits. For a government planning officer or for one who is concerned with looking at the macro economy in particular, the picture that emerges is more complex. This is so because the government planning officer has to satisfy himself that the aims and objectives of development projects mesh in with the economic and social aspirations of the country as a whole and are not the objectives of a single particular group of persons. For this, the pricing and valuing system has to be different from the one that examines projects from a financial point of view.

Economic or efficiency analysis, therefore, looks at the benefits and costs of a project from the broader viewpoint of its impact on the economy. The major differences between economic and financial analysis lies in the fact that prices used to value inputs and outputs are net of taxes and subsidies; these latter reflect simply transfer payments and not real cost. Also, in an economic analysis, funds received from outside agencies are not treated as benefits and interest and principal repayments are not treated as cost. Economic analysis also takes into account external effects which are excluded from financial analysis. The incorpo-

Shamim A. Sahibzada and Mir Annice Mahmood are respectively Chief and Senior Faculty Member, Project Evaluation Division, Pakistan Institute of Development Economics, Islamabad.

ration of externalities in the analysis helps in depicting the impact of projects in a true perspective. This process, therefore, gives a more realistic picture of the real worth of resources that are used to produce output.

Social analysis is an extension of economic analysis in that it includes income distributive effects. However, due to lack of social parameters, this paper will not be examining the impact of projects on the intera- and inter-temporal distribution of income.

The objective of this paper, which is a preliminary attempt, is to look at the efficiency of selected large-scale public sector industrial projects. Five projects from the cement and fertilizer industries have been chosen for the analysis. Efficiency analysis of projects is desirable since this generates useful information that can form the basis for a more optimal allocation of scarce resources.

## METHODOLOGY

The methodology used in this paper for undertaking the economic evaluation/appraisal of projects using efficiency prices for valuing inputs and outputs is the one that has been developed by Squire and Tak (1975). It is a two-stage process. The first stage evaluates projects by using efficiency prices and the second stage uses social prices in appraising projects. As the second stage depends on detailed data availability for computing social prices, this paper restricts the analysis to the first stage; that of using efficiency pricing. This is also called the World Bank Methodology which uses the conversion factor approach to evaluate the economic profitability of development projects. The unit of account used in this methodology is border prices.

This paper analyses some large-scale projects in the industrial sector of the Pakistan economy as mentioned earlier. The projects have been very randomly selected and are five in number. Both financial and economic profitability measures are examined. Financial profitability measures are based on market prices. Economic profitability, on the other hand, is derived by using efficiency or economic prices. The latter are estimated through adjusting market prices for distortions using relevant conversion factors. In order to adjust for distortions there is need to determine the proper premium to attach to foreign exchange. The need to determine the foreign exchange premium arises because in many countries, as a result of national trade policies, people pay a premium on tradable goods over what they pay for non-tradables. This premium is not adequately reflected when the prices of traded goods are converted to the domestic currency equivalent at the official exchange rate. By applying the premium to tradable goods, it

becomes possible to compare the values of tradable and non-tradables by the criterion of opportunity cost or willingness to pay.

## USE OF SHADOW PRICES IN PAKISTAN

In Pakistan all projects that require the approval of the Provincial Development Working Party (PDWP), Central Development Working Party (CDWP) and the Executive Committee of the National Economic Council (ECNEC) need to be appraised by the Project Appraisal Sections of the Planning and Development Divisions at the Federal as well as Provincial levels. The appraisal of projects is based on the conversion factor approach which has been mentioned earlier. It is carried out in the following manner. The first step involves the derivation of the cash flow which is based on an annual statement of costs and benefits of the project. The next step involves the subtraction of transfer payments, e.g. duties, subsidies from the cash flow. Inputs and outputs are divided into traded and non-traded items. The value of traded goods (c.i.f. if imported and f.o.b. if exported) are converted into domestic currency using the official exchange rate. Non-traded goods have first to be shadow priced and then adjusted by a Standard Conversion Factor (SCF), which is defined as the ratio of the official exchange rate to the shadow exchange rate. In actual practice, due to the absence of shadow prices for non-tradables, market prices are used and then the SCF is used to reduce it in order to bring it at par with the tradables. A ten percent premium is placed on the foreign exchange component of all projects. This is done to reflect the scarcity of foreign exchange in the country. Other costs, such as that of the utilities, e.g. gas, electricity and fuels are given values double that of their market prices as shadow or efficiency prices for them have not been estimated. The absence of appropriate shadow prices, as mentioned earlier, has restricted us to limit our analysis to only the efficiency stage and that is what the general practice in the country is, including that of the Appraisal Sections of the Planning and Development Divisions of the Federal as well as the Provincial Governments. Even the efficiency analysis is not comprehensive in scope because the lack of appropriate national parameters forces the analysts to rely heavily on one parameter, the Standard Conversion Factor (SCF).

Attempts have been made by Guisinger (1979); Khan (1979); Khan (1974); Squire *et al.* (1979) and Weiss (1979) to estimate various shadow prices but these have failed to draw any official response. Official sources have neither accepted nor rejected these estimated parameters.

In order to capture the foreign exchange earning/saving impact of projects,

a measure called the modified Bruno Ratio has also been used. Bruno Ratio is also known as the domestic cost of saving a unit of foreign exchange.

## INDUSTRY PROFILE

According to the Pakistan Economic Survey 1989-90 large-scale industries contribute almost 13 percent to GDP. These industries include cotton textiles, vegetable ghee/cooking oil, fertilizers, cement and sugar. In this paper we are primarily concerned with two major industries, Fertilizer and Cement, as they are considered to be among the leading industries in the economy. A brief sketch is presented for these two industries.

### Fertilizer

Currently the total installed capacity of fertilizer is 1,192 thousand N. tonnes; 1090 N. tonnes is the capacity for nitrogenous fertilizer and 102 N. tonnes that of phosphate fertilizer. A breakdown of capacity installed by public and private sector shows that 650 thousand N. tonnes is in the former sector whereas 542 thousand N. tonnes is with the latter sector. In other words, 55 percent of the installed capacity for fertilizer is in the public sector and 45 percent in the private sector. The total number of units producing fertilizer is ten; seven in the public sector and the remaining three in the private sector. The production figures for fertilizer are given in the following table for the previous three years. The figures for 1989-90 are provisional. (Table 1.)

Table 1

*Fertilizer Production (000 N. Tonnes)*

| | Nitrogenous | Phosphates |
|---|---|---|
| 1987-88 | 1283 | 96 |
| 1988-89 | 1110 | 103 |
| % Change (July-March) | –13.5 | 7.3 |
| 1988-89 | 834 | 76 |
| 1989-90 | 869 | 78 |
| % Change | 4.2 | 2 .6 |

*Source:* Pakistan Economic Survey 1989-90.

### Cement

At present there are 23 plants that produce cement in the country with a

total capacity of 8063 thousand tonnes. Fifteen factories are in the public sector with a capacity of 5991 thousand tonnes and the remaining 8 units are in the private sector. The installed capacity of the private sector units is 2072 thousand tonnes. Table 2 below gives figures for the production of cement from 1987 to 1990. Again figures for 1989-90 are provisional.

Table 2

*Cement Output (000 Tonnes)*

| | |
|---|---|
| 1987-88 | 7072 |
| 1988-89 | 7125 |
| % Change (July-March) | 0.7 |
| 1988-89 | 5247 |
| 1989-90 | 5516 |
| % Change | 5.1 |

*Source:* Pakistan Economic Survey 1989-90.

## RESULTS

For this paper five projects in the industrial sector were randomly selected. The data used for analysing the efficiency of these projects have been obtained from the various projects documents as processed by the Government of Pakistan.

Tables 3 and 4 present in summary form the results of the two types of analysis carried out, namely financial and economic profitability.[1] As mentioned earlier, five projects have been selected rather randomly, the only criterion being that the industries were considered to be important in leading the country on the path of industrial development. Also, both these industries have been encouraged to be established because of the large import substitution effects that they can have. However, for reasons of confidentiality these projects are referred to by numbers, thus there are 3 fertilizer projects: namely Fertilizer-I, Fertilizer-II and Fertilizer-III and two cement projects: Cement-I and Cement-II. Financial profitability of the projects is given in Table 3. Here, the analysis has been undertaken using market prices. The net present value is given in millions of rupees and at two discount rates: a zero discount rate and a 20 percent discount rate. It should be noted that in Pakistan, in the large-scale manufacturing sector and especially so in the public sector, the cut-off rate is 20 percent. This implies that projects which have rates of return in excess of 20 percent are selected for im-

[1]For those interested, background tables dealing with data analysis are available with the authors.

Table 3

*Financial Profitability*

| Type of Project | Net Present Value (in Millions of Rupees) | | Internal Rate of Return (Percentage) | Break Even Point (Percentage) |
|---|---|---|---|---|
| | At 0 Percent Discount Rate | At 20 Percent Discount Rate | | |
| Fertilizer–I | 2,313 | 157 | 25 | 48.6 |
| Fertilizer–II | 292 | –75 | 8 | 93 |
| Fertilizer–III | 3,939 | (–)998 | 8 | – |
| Cement–I | 2,511 | 52 | 22 | – |
| Cement–II | 5,190 | (–)153 | 18 | 74 |

Table 4

*Economic Profitability*

| Type of Project | Net Present Value (in Millions of Rupees) | | Internal Rate of Return (Percentage) | Bruno Ratio of (Rupees Saved per dollar) (Percentage) |
|---|---|---|---|---|
| | At 0 Percent Discount Rate | At 20 Percent Discount Rate | | |
| Fertilizer–I | 2,307 | 245 | 31 | 5 (OER = Rs 18/$1) |
| Fertilizer–II | 247 | 34 | 25 | 16 (OER = Rs 18/$1) |
| Fertilizer–III | 3,186 | (–)902 | 9 | 45 (OER = Rs 18/$1) |
| Cement–I | 517 | (–)260 | 6 | 84 (OER = Rs 22/$1) |
| Cement–II | 952 | (–)684 | 5 | 89 (OER = Rs 22/$1) |

plementation. For the private sector, the same project has a cut-off rate of 15 percent.

At a zero discount rate Fertilizer-II is just giving a positive net present value. At 20 percent the net present value is negative. With respect to the other indicator of financial profitability; the internal financial rate of return (IFRR), only two projects, namely Fertilizer-I and Cement-I have an IFRR greater than the cut-off rate of 20 percent. Looking at the break-even point based on the

percentage of utilised capacity, Fertilizer-II breaks even when it is running at 93 percent of its capacity. Cement-II breaks even at 74 percent and Fertilizef-I at 49 percent approximately. All these break-even points are extremely high. The case of Fertilizer-II is interesting in that it is not financially viable but the internal economic rate of return exceeds the cut-off rate. It is possible, however, that if the discount rate had been lower, at 15 percent as it is for private sector projects, then the results of the financial analysis could be different. However, when performing the economic viability analysis, the project justifies itself. Looking at Fertilizer-III, it like Fertilizer-II has a negative NPV at a 20 percent discount rate as well as having internal financial rates of return below the cut-off rate, which is 20 percent. As far as the cement projects are concerned only Cement-I is profitable in having an internal rate of return greater than the cut-off rate. Cement-II has a negative net present value with the rate of return being below the cut-off rate. It also breaks even at a capacity utilization of 74 percent.

Table 4 presents the results of the economic profitability of the projects. At a 20 percent discount rate Fertilizer-III and Cement-I and Cement-II have negative net present values. They also have low internal economic rates of return varying between 5 and 9 percent, much below the cut-off rate of 20 percent. If we look at the Bruno Ratio, two projects are considered worthwhile, Fertilizer-I and Fertilizer-II. The other three projects expend more in terms of local currency to save one dollar *vis-a-vis* the official exchange rate. For instance, Fertilizer-III uses up of Rs 45 to save one dollar; Cement-I uses Rs 84 to save one dollar and Cement-II Rs 89 to save one dollar, when the official exchange rate is Rs 18, Rs 22 and Rs 22 respectively per dollar at the time when the projects were being prepared.

## CONCLUSIONS

The paper, to reiterate, is a preliminary attempt to evaluate the efficiency of large-scale industrial projects in the public sector. The results show that the industries are not performing as well as they should be. The projects, when examined from the efficiency perspective, reveal that only two projects measure up: Fertilizer-I and Fertilizer-II. The matter assumes greater importance because these five projects have a fixed investment of Rs 7 billion approximately. It is important to mention here that all these five projects have been approved and are in the process of being implemented. Obviously some of them are going to create problems since the criterion on the basis of which they have been approved is not efficiency but other considerations.

Also, very recently the government has announced a new industrial policy which has a three-pronged approach: a variable tax holiday has been introduced for urban and rural areas; larger bank loans have been promised and heavy import duty relief on the machinery to be imported has also been promised. Black money holders are being encouraged also to invest their money in industry. Keeping these very liberal incentives in mind, it is necessary, therefore, that industrial projects be established which are capable of earning substantial surpluses for the economy. For this to pass it is essential that vigorous efficiency analysis of all major projects be undertaken.

## REFERENCES

Guisinger, Stephen E. (1979) Calculating Shadow Prices in Pakistan: Reflection on the Paper by Little Squire and Durdag. *The Pakistan Development Review* 18 : 2.

Khan, Shahrukh Rafi (1974) An Estimate of the Shadow Wage Rate in Pakistan. *The Pakistan Development Review* 13 : 4 389–408.

Khan, Muhammad Zubair (1979) Estimation of Shadow Prices for Project Evaluation. *The Pakistan Development Review* 18 : 2 129–145.

Pakistan. Planning and Development Division, Islamabad. (Various Reports).

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

Squire, L., I. M. D. Little and M. Durdag (1979) Shadow Pricing and Macroeconomic Analysis: Some Illustration is from Pakistan. *The Pakistan Development Review* 18 : 2.

Weiss, John (1979) Project Selection and Equity Objective: The Use of Social Analysis. *The Pakistan Development Review* 18 : 2.

## Comments on "Efficiency Analysis of Projects in the Pakistan Economy"

The conference organizers asked me to be the discussant on the paper "Efficiency Analysis of Projects in the Pakistan Economy" in view of what they perceived to be my competence in this field. I gladly accepted although I lack any competence. Discussants not familiar with the topic raised in papers that they are supposed to comment upon typically learn a lot from studying contributions which otherwise would not have drawn their immediate attention. This applies to the case in point as well. Therefore I would like to congratulate the authors for the interesting, concise and thought provoking analysis of the financial and economic viability of five selected public projects in Pakistan's fertilizer and cement industries. I am sure that what can be done in assessing efficiency aspects at the micro-level has been done in the paper.

My subsequent remarks touch on three issues: (i) methodology, (ii) underlying assumptions, and (iii) some conclusions on the role of public industrial enterprises. My ignorance is greatest as for as the applied methodology is concerned. This provides me with the opportunity to raise some fairly naive questions.

- First, I would like to ask what the financial analysis tells you about efficiency at all. Projects may be financially viable simply because of subsidies, preferential credit, import protection etc.; while the financial viability of economically sound projects may be easily eroded because they have to pay for the privileges granted to the former. Consequently, I would suggest to concentrate on economic efficiency;
- Second: On the other hand, I wonder whether the data – enforced neglect of appraising projects in terms of *social* prices is really a restriction. Social project evaluation involves an immense deal of arbitrariness so that you can be pretty sure to get the results you want to have. Moreover, equity objectives should not be aimed at by public industrial projects. This almost certainly gives rise to severe conflicts and trade-offs between allocative efficiency, economic growth and income distribution. There are clearly superior ways to improve the distribution of income, e.g. tax reform and tax enforcement;
- Third: Though to a lesser extent, arbitrariness is also involved in *economic* efficiency evaluation. As stated by the authors, current market prices have

to be adjusted for distortions in order to correctly assess the economic viability of projects. This is relatively easily done as far as taxes and direct subsidies are concerned. But how to deal with distortions created by restrictive trade policies (especially non-tariff barriers), financial repression, public procurement policies, subsidized inputs, price controls etc.? What is the "true", i.e. undistorted market price in an interventionist economy? In this context, I would like to express my concern about not considering interest payments as costs. This neglect may seriously distort the picture, especially for countries where capital is relatively scarce and the opportunity costs of capital are high; and

- Fourth, some more information should be given on the evidence presented in the appendix tables. For example, it would be most interesting to learn about the basis for the cost and benefit estimates ranging over up to two decades. To me it is somewhat surprising that costs, for example, are assumed to be fairly constant over time, given the experience that the actual *ex-post* costs of public projects have frequently been several times the amount given by the planners *ex ante*.

I will be extremely short as concerns the assumptions underlying the analysis of this paper as well as related work on efficiency evaluation of public projects. There is a very telling sentence in the introduction of the paper. The political and bureaucratic decision-makers are said to be interested in economic rather than financial efficiency since they have "to satisfy themselves that the aims and objectives of development projects mesh in with the economic and social aspirations of the country as a whole and are not the objectives of a single particular group of persons". That appears to be wishful thinking: The politicians and bureaucrats *are* particular groups of persons. It would be a too heroic assumption that they – in contrast to all other interest groups–are interested primarily in social welfare maximization. In the first place, they maximize their own welfare, and public industrial projects may well be an effective means to do so.

Therefore, my question (which admittedly goes for beyond the scope of the paper) is why the five projects considered are in the public sector altogether. I have serious doubts about the economic rationale of the government running fertilizer and cement plants. The empirical results presented in the paper further add to my scepticism. External effects are, of course, one possible justification for public industrial enterprises. Especially the famous infant industry argument has been raised again and again to justify all sorts of state intervention. However,

it is by now well established in the literature that this argument has frequently been overrated seriously. The vast experience with sustained public support for non-viable industries in both developing and industrialized countries seems to suggest that infancy lasts for decades, rather than a predetermined time of a few years. The perversion of the basically valid concept of external effects may easily be explained in terms of political economy. In many cases, it is only in the interest of politicians and bureaucrats, rather than in the public interest, to run state-owned industrial enterprises.

My limited knowledge on Pakistan does not allow definite conclusions as to whether the projects considered in the paper are cases in point. But my guess is that they should be candidates for privatization. Development economists in favour of the mixed economy model cannot avoid the question what is optimally to be done by the public sector and whether we are presently below or above that optimum. The authors' results seem to support the widespread concern that governments are typically overdoing.

**Peter Nunnenkamp**

Kiel Institute of
World Economics,
Kiel, Germany.