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Practical Appraisal of Industrial Projects

Application of Social Cost-Benefit Analysis in Pakistan

UNITED NATIONS

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PRACTICAL APPRAISAL OF INDUSTRIAL PROJECTS

APPLICATION OF SOCIAL COST-BENEFIT ANALYSIS IN PAKISTAN

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Preface

This book, written by John Weiss of the Project Planning Centre, University of Bradford, United Kingdom of Great Britain and Northern Ireland, applies the principles of social cost-benefit analysis in the appraisal of three industrial projects in Pakistan.

In recent years considerable attention has been focused on methods of evaluating new projects in developing countries, particularly those in the public sector. These methods are described conventionally as social cost-benefit analysis, and the increasing interest in them reflects a concern that, from the national viewpoint, methods of financial appraisal fail to capture the full impact of a project. A major contribution to this literature is the *Guidelines for Project Evaluation*, published by the United Nations in 1972. This work, referred to here as the *Guidelines,* sets out a methodology for the quantification and valuation of the different effects of projects in terms of government objectives. The *Guidelines* has been the subject of much academic discussion, in particular, its relationship to another major work, the *Manual for Industrial Project Analysis in Developing Countries,* by Little and Mirrlees, has been examined in detail. In a symposium issue of the *Bulletin of the Oxford Institute of Economics and Statistics,* vol. 34 (February 1972), devoted to the Little-Mirrlees *Manual,* a comparison with the *Guidelines* is given in P. Dasgupta, "A comparative analysis of the UNIDO *Guidelines* and the OECD *Manual*". The papers and proceedings of a symposium organized jointly by UNIDO and the Inter-American Development Bank in 1973 dealing mainly with the *Guidelines,* but also including discussion of the Little-Mirrlees *Manual,* have been published in *Social and Economic Dimensions of Project Evaluation* (Inter-American Development Bank, Washington, 1977). However, relatively little attention has been given to the application of the methodology.

A second United Nations publication, *Guide to Practical Project Appraisal,* has been issued to fill this gap in the literature. The *Guide* follows the original *Guidelines* approach, its major objective is to assist the project appraisal practitioner. The procedure of appraisal is divided into separate stages, and the way data can be organized and adjusted to proceed from one stage to another is discussed in detail. A subsidiary objective is to show the similarity of the *Guidelines* to the subsequent major publications in this area, especially *Project Appraisal and Planning for Developing Countries,* a revision of the original Little-Mirrlees method, and *Economic Analysis of Projects,* by Squire and van der Tak, and to incorporate elements of these analyses into the UNIDO methodology.

The present study must be seen as complementary to the *Guide* and should be read in conjunction with it, since the discussion of the original methodology cannot be repeated here. It shows how the procedures discussed in the *Guide* can be applied to actual projects. Three public-sector industrial projects from one country, Pakistan, have been selected for analysis. A general text on project appraisal, even one oriented to practice, cannot possibly cover all the complexities that arise in an actual

appraisal It is hoped that the case-studies analysed here will provide a useful illustration of the procedures discussed in terms of a hypothetical project in the *Guide,* and at the same time give an insight into some of the short-cuts and approximations that must be resorted to in appraising projects

This study is composed of five chapters Chapter I discusses the principles of social cost-benefit analysis (SCBA) and the modifications to the step-by-step procedures for carrying out an appraisal given in the *Guide* that are used in the case-studies

Chapter II examines the shadow prices relevant for appraising all projects within a single country, these are termed national parameters, and estimates of the parameters required by the approach used in the *Guide* are given for Pakistan It should be noted that these estimates were made after a short field trip to Pakistan, in the absence of firmer data, some should be seen as illustrative of the general procedure of estimation rather than of precise values

Chapters III, IV and V apply shadow prices in the appraisal of three industrial projects in Pakistan The projects examined are a polyester factory, a textile mill and a sugar-mill These projects were chosen for examination after consultation with the Planning Division of the Government of Pakistan Each of the three case-studies illustrates a different use of the *Guide.* Each project is examined from the viewpoint of its contribution to different objectives, and each appraisal illustrates the use of different types of shadow prices

Chapter III, on the polyester project, is a simple stage-two efficiency analysis The issues of growth and equity are not considered The results of the stage-two appraisal are contrasted with those obtained from a stage-one analysis at market prices

The world prices of traded inputs and outputs are substituted for their domestic prices, and the foreign-exchange effects of the project are valued at the shadow price of foreign exchange, rather than at the official exchange rate The treatment of non-traded goods is crude, since their domestic market prices are used as a measure of their value at shadow prices This is the simplest type of appraisal that can be applied using the approach of the *Guide,* and the data requirements are not great However, as the results indicate, a project that looks attractive at domestic prices, inflated above world market levels by high rates of protection, may look considerably less attractive when this simple type of cost-benefit analysis is used

Chapter IV, on the textile mill, uses the alternative estimates of the shadow prices of non-traded items discussed in chapter II These shadow prices are used in both the stage-two efficiency analysis and at stage four, when an attempt is made to quantify the impact of the project on the level of income in the region The problems of identifying the regional impact of a project and of applying regional income weights are discussed This type of appraisal, using shadow prices for general categories of non-traded items, requires more data than that for the simpler appraisal in chapter III The discussion in the appendix to chapter II indicates the type of data needed and some of the estimation problems involved

Chapter V, the appraisal of the sugar-mill project, is the most detailed of the three case-studies, since it covers the effect of the project on the objectives of efficiency, growth and equity in the modified form of stage three and four appraisal The procedures used in this case-study differ from those set out in the *Guide.*

All the income flows created by the project are adjusted by a set of weights, and appendix B to chapter V, written by David Potts of the University of Bradford,

illustrates the detailed analysis of a key non-traded item, the sugar-cane crushed by the mill

None of the case-studies includes an allowance for merit goods, which can be included at stage five of the *Guide*.

Three points should be stressed regarding the limitations of the final results in chapters III-V

First, the shadow prices discussed in chapter II are subject to considerable margins of error, which could have been reduced if additional data could have been obtained from a lengthier stay in Pakistan However, even crude shadow price estimates may not only give a more accurate measure of the real value of resources and commodities than do prevailing market prices, but also permit acceptable appraisals to be carried out whose results differ markedly from those obtained when market prices are used

Secondly, the technical data that form the basis of the appraisals are suspect, in some places As far as possible an attempt has been made to allow for this in the appraisals, and where uncertainty regarding the real figures exists, it has been pointed out Uncertainty regarding the accuracy of technical data, it should be noted, is common to all appraisals, whether at shadow or at market prices

In all cases the results of the appraisals are sensitive to the assumed world market price for the project outputs It was not possible, however, with the time and data available to produce forecast values of these parameters only in the case of sugar could price forecasts produced by others be used in the appraisal For the other two projects current prices were simply projected over the operating lives of the projects It must be stressed that for projects that produce traded goods, data on both future demand and prices on the world market will be a prerequisite for improved cost-benefit analysis

Acknowledgement must be made to the Planning Division of the Government of Pakistan, for its co-operation in allowing access to the basic data on the projects studied and to the project sponsoring authorities and management, for providing additional information The basic data on two of the projects come from planning documents prepared for the Planning Division by the sponsoring authorities For the third project the original feasibility report was made available for this study

Acknowledgement must also be made to the Ministry of Overseas Development of the Government of the United Kingdom of Great Britain and Northern Ireland, which provided funds to help meet the costs of the research for this study

The views expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO or of the Ministry of Overseas Development

EXPLANATORY NOTES

All cash flow tables are in millions of rupees.

References to dollars ($) are to United States dollars.

A slash between dates (e.g., 1970/71) indicates a crop year or financial year

Use of a hyphen between dates (e.g., 1960-1965) indicates the full period involved, including the beginning and end years.

A full stop ( ) is used to indicate decimals.

A comma (,) is used to distinguish thousands and millions.

References to "tons" are to long tons unless otherwise indicated.

26.79 maunds equals 1 metric ton.

The following forms have been used in tables:

Where useful, the numbering of items follows the system used in the *Guide to Practical Project Appraisal.*

A dash (–) indicates that the amount is nil or negligible, or that the item is not applicable.

n.a. indicates that data are not available.

Parentheses around a figure indicate a minus amount (in tables only).

Besides the common abbreviations, symbols and terms, the following have been used in this report

Economic and technical abbreviations

AF	adjustment factor(s)
BIT	before interest and tax
CF	conversion factor
c.i.f.	cost, insurance, freight
DAP	diammonium phosphate
EG	ethylene glycol
f.o.b	free on board
GDP	gross domestic product
IRR	internal rate of return
NPV	net present value
PSF	polyester staple fibre
TPA	terephthalic acid

Organizations

BIM	Board of Industrial Management
EEC	European Economic Community
IMF	International Monetary Fund
IRRI	International Rice Research Institute (Philippines)
NWFP	North-West Frontier Province
OPEC	Organization of Petroleum Exporting Countries
PCI	Planning Commission I
PICIC	Pakistan Industrial Credit and Investment Corporation

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Tables

I. PRINCIPLES OF SOCIAL COST-BENEFIT ANALYSIS AND MODIFICATIONS TO THE *GUIDE*

Social cost-benefit analysis can be defined as the evaluation of a project from the viewpoint of its contribution to government objectives In other words, the government is taken as a representative of the different interests and classes in society,[1] and social benefits and costs are defined in terms of the effect of a project on differing government objectives At least five major objectives are usually linked with the planning of public-sector projects

(a) Commercial viability of a project, for public-sector projects it indicates the contribution of a project to government finance,

(b) Improvement in the allocation of resources, this refers to the possibility of transferring resources from lower to higher productivity activities and thereby increasing the national income,

(c) Increase in the rate of growth of the economy,

(d) A more equitable distribution of income between either classes or regions,

(e) Production of "merit want" goods, these are goods that have a special value to the government, so that their increased availability can be seen as an end in itself

Not all of these objectives may be relevant for any particular government or project Cost-benefit analysis is concerned with showing how, whenever non-commercial objectives are pursued by a government, these can be incorporated into the appraisal of a project Most governments can be assumed to be concerned about the efficiency with which resources are allocated, since reallocation on more efficient lines would provide an increase in real income once for all. However, some may not wish income-distribution issues to be considered in the appraisal of projects—the question of who gains or loses from a project may be judged to be subsidiary to that of whether the project leads to an increase in total national income Also, while many governments may consider higher growth rates of national income to be an important objective, some may not regard project selection as an appropriate means of achieving faster growth, reliance on fiscal policy to raise domestic savings or resort to foreign borrowing may be a preferred strategy The point is, however, that if governments wish these considerations to be brought into the appraisal of projects, cost-benefit analysis shows how it can be done

A project's use of inputs and production of outputs will have an impact on the government objectives relevant to that project For many developing countries it is argued that the social benefit or cost of this impact will not be reflected accurately by the price at which the commodities are bought and sold in the domestic market.

[1] F Stewart gives a critique of this view of the government as representative of a social consensus, "A note on social cost-benefit analysis and class conflict in LDOs", *World Development*, vol. 3, January 1975

For this reason cost-benefit analysis constructs a set of alternative prices, termed shadow prices, to provide a measure of the social benefits and costs involved Because in cost-benefit analysis costs and benefits have meaning only in terms of government objectives, there will be a different set of shadow prices for each combination of government objectives taken into account in relation to any project

GOVERNMENT OBJECTIVES

Efficient allocation of resources

The shadow prices relevant here are based on the principle of opportunity costs, that is, the shadow price of any input into a project is the value of the income lost elsewhere in the economy as a result of transferring the input from its alternative use to the project in question Therefore, if one minimizes the cost of a project in terms of these opportunity-cost shadow prices, one automatically minimizes the losses elsewhere as a result of the project For commodities that can be traded readily internationally, the price of these commodities on the world market is normally taken as an accurate measure of their opportunity costs Therefore, where domestic prices of these commodities differ significantly from their world prices, a strong argument can be made for using shadow prices based on the relevant world prices Such shadow prices are termed "economic" or "efficiency" prices, since economic efficiency in terms of resource allocation is based on the idea of opportunity costs It should be noted that goods produced by a project are not drawn away from alternative users, they therefore cannot be valued on the basis of direct opportunity costs The shadow prices of these outputs must be based either on the resources saved elsewhere as a result of their production, or if they represent a net addition to goods available, on what consumers are willing to pay for them

Growth of income

Where there is a shortage of savings and the government wishes to alleviate this shortage through its selection of projects, the net income flows at market prices expected to result from a project must be revalued in terms of shadow prices If lack of savings is a constraint on growth, extra units of savings will be worth more than extra units of consumption because savings can be invested to create consumption in the future A shadow price of investment can be derived from estimates of the present value of the consumption resulting from an extra unit of investment If one assumes that all savings are invested productively, it is necessary to identify the savings component of the income flows at market prices arising from a project and to revalue the additional savings in the economy resulting from the project by this shadow price The use of this shadow price of investment therefore incorporates into the analysis the expected effect of the project on future income

Distribution of income

If a government is concerned with bringing about a more equitable distribution of income, it will not place the same value on a unit of income going to the rich as

that going to the poor Cost-benefit analysis shows how, on the basis of some simplifying assumptions, sets of income weights can be derived If a set of weights is acceptable to a government, these weights indicate the shadow prices of the units of income, at market prices, going to different groups as a result of the project, for example, if the weight given to the extra income of unskilled workers is 1 1, the value of this income in shadow prices will be 10 per cent greater than the actual money flow involved

Merit wants

If a good has a value to the government above its value on the basis of an analysis of the efficient utilization of resources, it is by definition a merit want In other words, its shadow price will be greater than that derived from an analysis of its impact on resource allocation There are few guidelines for the valuation of merit wants, however.

THE APPROACH TO COST-BENEFIT ANALYSIS OF THE *GUIDELINES FOR PROJECT EVALUATION* AND THE *GUIDE*

One approach to cost-benefit analysis is to appraise a project from the viewpoint of all relevant government objectives, as defined explicitly or implicitly by the government, and to use a system of weighting or shadow pricing for each objective to produce a single measure of the project's desirability, that is, a single social internal rate of return or net present value at shadow prices Another approach is set out in the case-studies in the *Guidelines for Project Evaluation*[2] and adopted by the *Guide to Practical Project Appraisal. Social Benefit-Cost Analysis in Developing Countries,*[3] since the analysis is conducted in a series of stages, each of which provides a measure of the social worth of the project when different combinations of objectives are taken into account The *Guide* argues that this approach is preferable on the grounds that it is important to show the decision takers the impact of a project upon different objectives, only where there is universal agreement on the weights or shadow prices to be applied to the differential effects of a project will it be appropriate to summarize these effects in a single measure of social worth A stage-by-stage approach identifying the different effects of incorporating additional objectives is seen as helping promote a meaningful discussion between project analysts and decision takers on the weights to apply in an appraisal.

Five stages of project appraisal are set out in the *Guide* [4]

1 *Calculation of financial profitability at market prices*

Financial profitability is used here to describe discounted cash-flow analysis of the rate of return on the resources involved in the project over its lifetime when all inputs and outputs are valued at market prices It should not be confused with the

[2] United Nations publication, Sales No. E.72.II.B.11.

[3] United Nations publication, Sales No. E.78.II.B.3.

[4] *Ibid.*, p. 3

financial measure of annual profit on total net fixed assets This first stage shows the commercial viability of the project and provides a starting point for the following stages, when market prices are adjusted to take account of social benefits and costs

2 *Shadow pricing of resources to obtain the net benefit at economic (efficiency) prices*

At stage two the project is evaluated from the viewpoint of the efficient allocation of resources The market prices for inputs and outputs used in stage one are replaced by shadow prices based on opportunity costs, or economic prices The net social benefit of the project at this stage therefore measures its contribution to the real national income

3 *Adjustment for the project's impact on savings and investment*

At stage three the net effect of the project on total savings, and therefore by assumption on investment, is quantified and revalued by the shadow price of investment The extra value, above actual money value, placed on savings through the application of this shadow price represents the social benefit of the project that derives from its contribution to the objective of increasing the rate of growth

4 *Adjustment for the project's impact on income distribution*

At stage four the income flows arising from the project are identified, and income weights or shadow prices are placed on the incomes going to different groups The difference between the value of the income flows in money terms and their value in shadow prices is the net social gain or loss resulting from the effect of the project on the distribution of income For a government concerned about equity, a project that distributes income to well-off groups will produce a net social loss in respect of its effect on income

5 *Adjustment for the project's production or use of goods such as luxury consumer goods and basic needs whose social values are less than or greater than their economic values*

Stage five of the analysis allows for merit goods Economic values refer here to the shadow prices of stage two, which reflect the opportunity costs of commodities Additional merit is attached to a good if it has a special value to the government (merit want) not reflected in its stage-two valuation so that the shadow price assigned to it at stage five is greater than its economic shadow price, similarly, it reflects demerit if its shadow price from stage two exceeds its shadow price at stage five The difference between the net benefit of a project at stage five and at stage two therefore will be the valuation of the contribution of a project to the production of a merit or demerit good

At each stage when converting the value of items at market prices to shadow prices percentage adjustment factors (AFs) are used For any item associated with a project the AF is given by the expression $\left(\frac{\text{shadow price}}{\text{market price}} - 1\right)$ per cent.

At each stage of the analysis the benefit of a project is measured in terms of an objective If a government is concerned simply with the commercial viability of a project, then it will accept the benefit measure derived from the market-price analysis of stage one However, where other objectives are followed, one or more of

the measures from stages two to five will also be relevant If all the government non-commercial objectives identified earlier are judged valid for the project, the final net benefit figure will be the sum of the individual net benefits produced at each of the stages two to five Where a particular objective is not pursued, the stage of the analysis related to that objective can be omitted For example, in the case of a government unconcerned with income distribution, merit wants and commercial profitability, the relevant benefits of a project will be those estimated at stages two and three, that is, the contribution of the project to the efficient use of resources and to growth

In cost-benefit analysis, a common unit of account, or *numéraire,* must be used Whenever dissimilar items are compared, a common unit is necessary so that they can be expressed as equivalent to a certain value of this unit For a commercial appraisal, units of domestic currency at constant prices are an adequate *numéraire.* However, cost-benefit analysis requires a common unit in which the diverse effects of a project, in terms of government objectives, can be expressed readily The *Guidelines* uses units of private consumption at domestic prices as its *numéraire,* on the grounds that consumption is the ultimate motive of economic activity There is a certain ambiguity concerning this *numéraire,* since the recipients of the units of consumption are not specified The *Guide* modifies the original *numéraire* in that the *numéraire* is defined as units of private consumption in domestic prices in the hands of consumers at the "base level of consumption" [5] The concept of a base level of consumption derives from the idea that governments will feel that a rupee going to a private individual at a certain standard of living, or level of consumption, will have the same social value as an extra rupee of income going to the government itself [6] The absolute value of this base level of consumption will vary between governments, in particular, it will be influenced by accepted ideas of what constitutes a minimum standard of living Use of this particular definition of the *numéraire* means that it is identical to units of government income All effects of a project will therefore be translated into an equivalent value in terms of government income

ILLUSTRATION AND MODIFICATION OF THE APPROACH OF THE *GUIDE* IN THE PAKISTAN CASE-STUDIES

The *Guide* maintains the stage-by-stage analysis of the original *Guidelines,* while introducing a revised *numéraire*—units of consumption in the hands of private consumers at the base level By definition these units of consumption are equal to units of government income, so that the *numéraire* of the *Guide* is the same as that used by Little and Mirrlees and Squire and van der Tak.[7] The introduction of a new

[5] The precise definition of the *numéraire* also includes the specification that units of consumption will be present values and will be expressed in constant domestic prices. *Guide,* p. 31 The revised *numéraire* is based on that of I M D Little and J A Mirrlees, *Project Appraisal and Planning for Developing Countries* (London, Heinemann Educational Books, 1974).

[6] Following the *Guide,* units of local currency are referred to as rupees.

[7] Their *numéraire* is units of uncommitted government income. Because these two approaches express all project effects in terms of world prices, their *numéraire* is measured at world rather than domestic prices. See Little and Mirrlees, *op. cit.,* pp. 145-151 and L. Squire and H. G van der Tak, *Economic Analysis of Projects* (Baltimore, Johns Hopkins University Press, 1976), pp. 57-58.

numéraire permits the *Guide* to incorporate the income-weighting system developed in Little and Mirrlees into the general framework of the approach of the *Guidelines*.

The emphasis in the *Guide* is on the problems of organizing data and obtaining approximate values for the parameters required Theoretical refinements are given second place to the application of the techniques of cost-benefit analysis

There are certain theoretical inconsistencies in the way in which the new *numéraire* is introduced by the *Guide* into the system of the *Guidelines*. Three points can be identified, all in relation to the move from stage three to stage four [8]

First, in its evaluation of investment at stage three the *Guidelines* recommends the use of a formula that expresses the value of an additional unit of investment in terms of the number of units of consumption benefits it will create in the future Since the original *numéraire* is consumption in general, or aggregate consumption, there is no need to specify who will receive the consumption gains created by investment The *Guide numéraire* is units of consumption in the hands of those at the base level of consumption, so that in an appraisal under this system, the value of a unit of investment must be expressed in terms of these units and not in terms of undifferentiated, aggregate units of consumption

If an appraisal based on the *Guide* is conducted only up to stage three, so that efficiency in resource use and growth are the relevant objectives, and the question of the distribution of consumption and income between different groups is not considered, there is no problem in applying the original formula to value additional savings In these circumstances all units of consumption will be of equal value Problems arise if a stage-four appraisal is undertaken, since at that point units of consumption will have a different value depending on who receives them, and all savings and consumption effects of a project must be expressed in terms of the *numéraire*, units of consumption at the base level

If one values savings simply on the basis of a crude subjective judgement regarding its scarcity, this distinction is irrelevant However, if one wishes to apply a formula to calculate a value for the shadow price of investment P^{inv}, the question of whether one relates a unit of investment to consumption in general or to the consumption of a particular income group can be significant

One interpretation of the simple formula for P^{inv} given in the *Guide*[9] is that it expresses the value of a unit of investment in terms of units of average consumption, in other words, the gains from investment can be assumed to accrue to average consumers. If the base level of consumption is considerably below the average, the stage-four weighting system will mean that gains, either in income or in consumption, to average consumers will be worth less than gains to those at the base level The more egalitarian the emphasis in the weighting system is the greater will be the divergence between a value of investment in terms of aggregate or average consumption and a value in terms of the *numéraire*.[10]

Secondly, the *Guide* distinguishes between government savings and consumption At stage three government savings are given an extra value in the same way as private savings This procedure is legitimate at stage three, since if savings are scarce there is no reason why government savings, and by assumption investment, should

[8] The *Guide* is not intended to be a theoretical text and these points are raised here not because of their theoretical interest, but because in the application of the method it was found necessary to introduce several modifications to the original approach.

[9] p. 65

[10] Some of the problems in estimating the value of P^{inv} are discussed in chapter II.

not contribute more to aggregate consumption than would government current expenditure However, if one proceeds to a stage-four appraisal, all effects of a project are expressed in terms of the *numéraire* The *Guide numéraire* is equal to units of government income, with no distinction drawn between government income used for different purposes Logically all units of a *numéraire* must be of equal value, and where the *numeraire* is a composite of two units one must be expressed as an equivalent value in terms of the other Therefore, if government investment and current expenditure are not equally valuable, one or other must be used as the basis for the *numeraire* Again, this question is not simply theoretical—it arises in applying the method when one wishes to value government current expenditure in relation to government investment

Thirdly, in the *Guide,* the savings created by a project are revalued twice, once at stage three because of their effect on growth and again at stage four because they are part of the income going to particular groups This treatment can lead to a situation where savings are given a high value at stage three, because there is a savings shortage and investment is taken to be relatively productive, while at stage four they are given a very low value because they are part of the income going to a rich group This can arise even though gains from the savings may accrue to more than the original savers and may be spread to low-income groups, for example, through additional wage payments in new projects financed from the additional savings

This contradictory treatment of savings arises because of the need to balance the potentially conflicting objectives of growth and equity A more satisfactory approach, however, is to separate the savings and consumption effects of a project and to value savings only once, on the basis of their contribution to growth.

The equity objective can be incorporated in the appraisal by adjusting only the direct consumption gains created by the project in the light of the income or consumption levels of the recipients The separate treatment of the effects of a project on consumption and savings means that a set of consumption weights rather than income weights will be required [11]

The use of consumption rather than income weights implies a reinterpretation of the income-weighting formula given in the *Guide.*[12] The average level of consumption of different groups must be compared with the base level *numeraire,* and the elasticity parameter n must refer to the government's utility function with respect to consumption. Therefore, the weighting formula becomes

$$d_i = \left(\frac{b}{c_i}\right)^n$$

where

d_i is the weight placed on a rupee of consumption going to group i

b is the base level of consumption (Rs per year)

c_i is the average consumption level of group i (Rs per year)

and

n is the elasticity of the government utility function with respect to increase in consumption

[11] This approach is followed by Little and Mirrlees, *op. cit.*, and Squire and van der Tak, *op. cit.*

[12] Annex III, p. 97

Only one of the case-studies analysed in chapters III, IV and V includes an appraisal at stages three and four of the *Guide* method In this case-study the *Guide* framework is modified to incorporate the points raised above, no distinction is drawn between stages three and four, and both are combined in a stage-three/four appraisal. The modifications are introduced for the practical purposes of producing a simple set of weights for the various income effects of the project The main procedures in this stage-three/four appraisal are summarized below

No distinction is drawn between government investment and current expenditure, all government income is treated as being of equal value As government income equals the *numéraire,* all government income is given a weight of 1 0

Private savings are also taken to equal the *numéraire,* on the assumption that private and public investment are equally valuable Therefore private savings are also given a value of 1 0

A set of consumption weights are calculated for the consumption changes created by the project by comparing gains to different groups with gains to those on a subsistence income level Under the weighting system used, average consumption, being higher, is worth less than consumption at the base level The assumptions adopted therefore give an implicit premium to investment in relation to average units of consumption and remove the need to calculate a value for investment using the formula for P^{inv}

This approach can be expressed algebraically for a project that affects three groups, government, labour and farmers The total income created by the project is distributed among these groups so that

$$Y_2 = Y_G + Y_L + Y_F$$

where Y_2 is the stage-two NPV of the project and Y_G, Y_L and Y_F are the income changes for government, labour and farmers, respectively, any of which can of course be negative

Private savings resulting from the project are

$$S_P = s_L\ Y_L + s_F\ Y_F$$

where

S_P is total private savings

s_L, s_F are the marginal propensities to save of labour and farmers

Private savings and government income have weights of 1 0, and therefore are not adjusted at stage three/four The only non-zero adjustment factors used are for the consumption gains of labour and farmers The NPV for the combined stage-three/four appraisal is

$$Y_4 = Y_G + S_P + \left[(1 - s_L)\ Y_L + AF_{dL}\right] + \left[(1 - s_F)\ Y_F + AF_{dF}\right]$$

where

Y_4 is the final NPV of the project

$(1 - s_L)$ and $(1 - s_F)$ are the marginal propensities to consume of labour and farmers

and

AF_{dL} and AF_{dF} are the adjustment factors derived from the consumption weights given to labour and farmers in relation to the *numéraire.*

Further details of this weighting system are given in chapters II and V

A major advantage of a stage-by-stage approach to cost-benefit analysis is that projects can be appraised at different stages in the light of current government objectives and the availability of data For example, if a government feels that efficiency is the most important objective in selecting projects, or, alternatively, where the data required for evaluating the savings and distributional effects of projects are lacking, a stage-two appraisal may be all that is possible However, if government objectives are broadened to include non-efficiency objectives or where the data base is improved, analysis of projects beyond stage two can be introduced It is clearly desirable that consistency should be applied in the selection of projects, so that all projects competing for the same funds are examined from the same perspective, that is, at the same stage of the appraisal However, it may be neither possible nor necessary to appraise projects using all the stages set out in the *Guide*

II. NATIONAL PARAMETERS FOR APPLYING COST-BENEFIT ANALYSIS IN PAKISTAN

This chapter discusses possible values for Pakistan of the national parameters required to carry out a cost-benefit analysis following the approach of the *Guide*. The parameters used at the different stages of the appraisal are examined in the light of government objectives and the aspects of the economy likely to determine their values. Trade policies in Pakistan are first described briefly.

TRADE POLICIES

Government policy towards international trade changed significantly in Pakistan during the 1970s. In the 1960s, a complex system of import controls, in the form of quantitative quotas and tariffs, and export subsidies was developed [1]. The domestic prices of imported items were raised substantially above their c.i.f. import prices through high tariffs and the monopoly profits obtained by the holders of import licences. Because only limited supplies of imported items were allowed into the country, importers could charge a price that equated domestic demand with the limited supply available [2]. The export bonus system ensured that exporters received differential rates of subsidy varying with the product so that the rupee value of exports was above the export price converted into rupees at the official exchange rate. The effect of this trade control system was, first, to create a wide divergence between the domestic selling prices in Pakistan and world market prices for many traded items, and, secondly, to permit the maintenance of an exchange rate that was recognized as being overvalued. In other words, for most of the 1960s, the official exchange rate was Rs 4.76 per dollar, while the ratio of rupee to dollar prices of traded items in Pakistan was very much higher [3].

In 1972, balance-of-payments policies altered significantly. The rigid system of import controls was abolished, and the rupee was devalued substantially to Rs 11 per dollar. Price policies in the form of import tariffs were substituted for quantitative

[1] Details of the trade control system in Pakistan as it operated in the 1960s are given in S. R. Lewis, *Pakistan Industrialisation and Trade Policies* (London, Oxford University Press, 1970).

[2] See M. L. Pal, "Determinants of domestic prices of imports", *Pakistan Development Review*, winter 1964. Pal analysed the impact of the system of physical quotas on the domestic selling prices of various imports.

[3] S. R. Lewis and S. Guisinger in *Structure of Protection in Developing Countries* (Baltimore, Johns Hopkins University Press, 1971) calculated many direct comparisons of domestic and world prices for Pakistan and for 1963/64 found the median value for all industries surveyed to be a ratio of 1.6 to 1.0.

controls as a means of influencing the demand for foreign exchange The complicated bonus voucher system of export subsidies was also abolished

The liberalization of trade policy has continued since 1972, so that at present the import of only a few items is banned, and quota restrictions are relatively uncommon Thus, import licences are issued for most items Importable goods are classed as free or tied The vast majority are on the free list and can be obtained without restriction from any source Goods on the tied list can be imported only from tied sources, under special arrangements

In 1973, the dollar was devalued in relation to other currencies, and the rupee-dollar exchange rate appreciated to approximately Rs 9 9 per dollar, and this has remained the official exchange rate ever since

The main factors influencing the domestic selling prices of imports are now import duties and domestic sales taxes Although importers' mark-up remains, it is not likely to approach the margins prevailing under the import quota system The average rate of import duty in 1976/77 was approximately 24 per cent, but around one-third of total imports, by value, was imported duty-free [4] In 1976/77, the total sales tax collected on imports was below 5 per cent of their total c i f value [5]

The Government has kept down, through subsidies, the domestic selling price of certain imports, particularly imports of wheat, fertilizers and edible oil The prices of these commodities on the world market rose substantially during 1973/74 and 1974/75, and the Government protected domestic consumers from these increases by selling these items at controlled prices considerably below the prevailing c i f import prices The subsidy on edible oil was removed in 1975, but fertilizers and wheat were still subsidized in 1976/77 [6]

Export duties have been used as a means of transferring to the Government some of the additional income received by exporters from higher world prices This source of revenue comes largely from duties on Pakistan's three main exports—rice, raw cotton and cotton textiles However, because of the recession in the Pakistan textile industry, export duties on textile products and desi grades of raw cotton were abolished in 1976/77, and the bulk of revenue now comes from duties on rice and staple grades of cotton [7] In 1976/77, total export duties were less than 3 per cent of the total value of exports [8]

Exporters receive no direct subsidies However, manufactured exports are indirectly subsidized first, the tax rate on income and profits is 50 per cent lower for all income and profits derived from most manufactured exports, secondly, the payment of the excise duty on domestic sales is waived if manufactured goods are exported Manufactured goods accounted for 42 per cent of the total value of

[4] The average rate of import duty was calculated as the ratio of the value of total duties paid to total c.i.f value of imports, *Monthly Statistical Bulletin*, vol. 25, Nos. 5-6 (May-June 1977), pp. 30 and 115 The main items of duty-free imports were wheat, edible oil, fertilizers and crude oil.

[5] Data supplied by the Government of Pakistan, Planning Division

[6] Over the period 1970-1975, the wheat subsidy was estimated to be 70 per cent of the total value of federal government subsidies, *Draft Fifth Five-Year Plan, 1976-81*, vol. I (first version) (Islamabad, Government of Pakistan). This plan was revised twice before it was launched officially in July 1978.

[7] *Pakistan Economic Survey 1976/77* (Islamabad, Government of Pakistan, Finance Division, 1977), p. 118.

[8] Calculated from *Monthly Statistical Bulletin, op. cit.*, pp. 31 and 115

exports in 1976/77 [9] Although the quantitative impact of these subsidies is not clear, the real rupee value (to the manufacturer) of an export sale is likely to be above its f.o.b value at the official exchange rate, for some items at least

This liberalized trade policy has been maintained despite a rising deficit in the current account of the balance of payments Since the formation of the State of Pakistan, in 1947, the current account of the balance of payments has been positive in only three years, one of which was 1972/73, when it was only slightly positive In the following years imports rose in value by considerably more than exports Table 1 shows the balance of visible trade from 1971/72 to 1976/77 Rather than return to a policy of more rigid import controls or reduce public investment, the Government financed the current-account deficits by overseas borrowing As table 2 shows, the amount of external finance received by Pakistan more than doubled in monetary terms between 1973/74 and 1974/75 Funds were obtained from the Organization of Petroleum Exporting Countries (OPEC) and the Aid Consortium (World Bank and several developed countries) on concessionary terms, but at commercial interest rates from the International Monetary Fund (IMF) and short-term credit suppliers [10]

TABLE 1 BALANCE OF VISIBLE TRADE

(Millions of rupees)

Year	*Imports*[a]	*Exports*[b]	*Balance of trade*
1971/72[c]	3 495	3 423	−72
1972/73	8 399	8 623	224
1973/74	13 483	10 237	−3 246
1974/75	20 929	10 460	−10 469
1975/76	20 510	11 420	−9 090
1976/77	23 015	11 586	−11 429

Source *Monthly Statistical Bulletin*, various issues.

[a] Imports include re-imports.

[b] Exports include re-exports.

[c] Values for 1971/72 are at the exchange rate $1 00 = Rs 4 76.

TABLE 2 SOURCES OF EXTERNAL FINANCE FOR PAKISTAN, 1972/73-1975/76

(Millions of dollars)

Source	*1972/73*	*1973/74*	*1974/75*	*1975/76*
Aid Consortium	297	321	535	652
Other aid donors	49	24	74	114
OPEC	–	30	410	525
IMF	84	75	200	150
Short-term credits	9	122	116	45
Total	439	572	1 335	1 486

Source *Draft Fifth Five-Year Plan, 1976-81* (Government of Pakistan)

[9] *Ibid.*, p. 160.

[10] The balance of payments was also helped by a large inflow of remittances from Pakistan workers abroad, especially in the Middle East. These remittances have become a major source of foreign exchange. In 1975/76, they were estimated to be over 30 per cent of the total value of exports. *Pakistan Economic Survey 1976/77, op. cit.*, p. 116.

The main change in import policy in response to the current-account deficits was an increase in rates of import duty on dutiable imports Average rates of duty paid on imports rose from 18 per cent in 1972/73 to 24 per cent in 1976/77, further increases were announced in the 1978 budget [11] If past policy can be used as a guide to the future, relatively moderate increases in import duties rather than the reintroduction of a rigid system of import controls appear a more likely consequence of a failure to reduce the current-account deficit

NATIONAL PARAMETERS[12] AT STAGE TWO

At stage two of an appraisal, market prices are replaced by economic-efficiency shadow prices, which reflect the real income loss or gain to the economy resulting from a project The appraisal at this stage has as its objective a more efficient allocation of resources, since, when market and shadow prices differ, projects selected on the basis of economic-efficiency criteria will lead to a greater national income than projects selected on the basis of market prices Allocating an investment budget to the most efficient projects valued at these shadow prices will ensure the maximum contribution of this investment to total national income

The stage-two shadow prices examined in detail in this study are the shadow price of foreign exchange, the discount rate, and the shadow prices of several broad categories of non-traded goods used as inputs by most projects The non-traded goods examined are construction, local trade, electricity and road and rail transport [13] The shadow prices of the main commodities produced or used by the projects appraised in chapters III, IV and V are classed as specific rather than national parameters, and their valuation is discussed in these chapters Unskilled labour used by the projects is also treated as a specific parameter, since the opportunity cost of labour is likely to show significant regional variation Finally, since skilled labour costs are not a significant element in total costs for any of the case-study projects, it is assumed that the market wages of skilled workers can be taken as a measure of their cost to the economy at shadow prices

The shadow price of foreign exchange

The shadow price of foreign exchange, in both the *Guidelines* and the *Guide*, is derived from a comparison of domestic and world prices for traded goods Following this procedure, foreign exchange is judged to be valuable because of the goods it makes available to domestic consumers or users The domestic selling price of these goods is used as a proxy for their contribution to the domestic economy This approach to the valuation of foreign exchange does not attempt to estimate an exchange rate that would prevail in the absence of government controls on

[11] In the first draft of the fifth plan, the average rate of import duty was projected to rise to 33 per cent over the period 1976-1981 *Draft Fifth Five-Year Plan, 1976-81, op. cit*, p 86

[12] National parameters are defined as national shadow prices common to all or to most projects, they can be contrasted with parameters of relevance only to specific projects.

[13] The ratio of the costs in each sector valued at estimated shadow prices to the value of sectoral output at market prices gives a general AF for each broad category of non-traded goods.

international trade, rather it uses government-imposed trade restrictions to estimate the premium to be placed on foreign exchange

Methods of estimation

The *Guide* puts forward a simple formula for calculating the shadow price of foreign exchange based on the average rates of import tariff and export subsidy on traded goods The ratio of the shadow to the official exchange rate is given by

$$\frac{\text{Shadow price of foreign exchange}}{\text{Official exchange rate}} = \frac{(M + T_M) + (X + S_X)}{M + X}$$

where

M = the total c i f value of imports

T_M = the total value of all taxes on imports, both import duties and domestic taxes, any import subsidies can be treated as negative taxes

X = the total f o b value of exports

S_X = the total value of all subsidies on exports, any export taxes can be treated as negative subsidies

Use of this formula, which can be termed the basic tariff-*cum*-subsidy formula for calculating the shadow price of foreign exchange, is based on at least five simplifying assumptions

(a) Domestic market prices for all traded items are taken as a measure of their social worth,

(b) The divergence between domestic prices and c i f or f o b prices is assumed to be accounted for solely by the taxes and subsidies on traded goods Import taxes will raise the domestic price of an import above its c i f price Therefore, for imported good i

$$D_{pi} = W_{pi} + T_{mi} + T_{di}$$

where

D_{pi} = the domestic selling price of good i

W_{pi} = the c i f import price of i

T_{mi} = the import duty on i

T_{di} = the domestic tax on i

If imports are subsidized domestic prices will be brought below world prices, so that

$$D_{pi} = W_{pi} - S_{mi}$$

where

S_{mi} = the import subsidy on i

For exports, it is assumed that over time the price of an export item in the domestic market will equal the net value per unit received by the exporter Therefore, export subsidies will raise domestic prices above f o b prices, and, conversely, export taxes will reduce domestic prices below export prices Therefore, for export good x

$$D_{px} = W_{px} + S_{Xx}$$

and

$$D_{px} = W_{px} - T_{Xx}$$

where

D_{px} = the domestic selling price of x
W_{px} = the f o b export price of x
S_{Xx} = the export subsidy on i
T_{Xx} = the export tax on i

(c) The share of different commodities in total current or past trade is assumed to equal their share in additional or marginal trade, which implies an income elasticity of demand for all commodities of unity,

(d) The average rates of tax and subsidy on traded goods in past years are assumed to reflect trade policy over the life of a project,

(e) The elasticities of import demand and export supply are assumed to be infinitely elastic, so that the c.i f and f.o b prices of imports and exports do not rise in response to an increase in demand

The logic behind this formula is that if the domestic selling prices of traded goods made available to the economy by additional units of foreign exchange are used as a measure of their social worth, and if traded goods are made available in proportion to their share in current trade, then a weighted comparison of domestic to world prices for all commodities traded by an economy will give a measure of the social worth of an extra unit of foreign exchange

Two alternative methods of estimating the shadow price of foreign exchange should also be mentioned, although neither has been used in this study to estimate a value for Pakistan First, it has been argued that if the level of the exchange rate is likely to change as a result of the foreign-exchange impact of a project, the relevant weights to use in comparing domestic and world prices are the import demand and export supply elasticities of the major commodities traded by an economy The ratio of the shadow price of foreign exchange to the official exchange rate is given by the formula[14]

$$\frac{\text{Shadow price of foreign exchange}}{\text{Official exchange rate}} = \frac{\sum_i \epsilon_f X_i (1+S) + \sum_i \eta_m M_i (1+T)}{\sum_i \epsilon_f X_i + \sum_i \eta_m M_i}$$

where

ϵ_f = the elasticity of supply of foreign exchange
η_m = the elasticity of import demand
X_i and M_i = exports and imports of good i
T and S = the rates of taxes and subsidies for different goods and
$\sum_i$ = all traded commodities

ϵ_f the elasticity of supply of foreign exchange is itself determined by ϵ_x the elasticity of domestic supply and η_x the elasticity of foreign demand for exports, so that

$$\epsilon_f = \frac{\epsilon_x (\eta_x - 1)}{\epsilon_x + \eta_x}$$

[14] This formula is given in B Balassa, "Estimating the shadow price of foreign exchange in project appraisal", *Oxford Economic Papers*, vol 26, No 2 (July 1974), p 153 It is described as a "second-best" exchange rate, since it assumes the continuation of policies of protection rather than a move to free trade.

This elasticity-weighted formula could not be applied in this study because of lack of data on trade elasticities. It should be noted, however, that use of the formula implies that each project has a non-marginal impact upon the balance of payments, so that the additional demand for or supply of foreign exchange arising from the project changes the level of the exchange rate. If such substantial non-marginal changes do not occur, the use of demand income elasticities for traded goods would appear to be more appropriate.

The second method of estimating the shadow price of foreign exchange is related to that suggested in the *Guidelines*. While the *Guidelines* recognizes that in some circumstances both exports and imports can be affected by the availability of additional foreign exchange, it argues that usually only imports will be affected [15]. In these circumstances the relevant comparison is between the domestic selling prices and world prices of imports alone, therefore,

$$\frac{\text{Shadow price of foreign exchange}}{\text{Official exchange rate}} = \sum_i f_i \frac{D_{pi}}{W_{pi}}$$

where

f_i = the share of good i in the marginal import bill
D_{pi} = the domestic selling price of good i and
W_{pi} = the c i f import price of i

If one uses the same assumptions as the basic average rate of tariff-*cum*-subsidy formula for all traded goods, this ratio can be approximated by

$$\frac{M + T_M + T_D}{M}$$

where

T_M = the total value of import duties and
T_D = the total value of domestic taxes on imports

This method of valuing the shadow price of foreign exchange normally gives a higher value than the basic formula,

$$\frac{(M + T_M + T_D) + (X + S_X)}{M + X}$$

since rates of duties and sales taxes on imports are generally above the rates of subsidy on exports. The assumption that imports alone respond to an increase in the availability of foreign exchange has been criticized on the grounds that it is only relevant for economies in which the government exercises strict control over the allocation of foreign exchange [16]. Where this is not the case, extra foreign exchange leads to an increase in domestic expenditure that can divert exportable items away from the export market. Since a rigid system of allocating foreign exchange is not in force in Pakistan, the modified version of the basic tariff-*cum*-subsidy formula, which excludes exports, has not been used in this study.

[15] *Guidelines*, p. 216.

[16] M. F. Scott, "How to use and estimate shadow exchange rates", *Oxford Economic Papers*, vol. 26, No. 2 (July 1974), p. 172.

Calculation of the shadow price of foreign exchange for Pakistan

In calculating the shadow price of foreign exchange for Pakistan, several variations on the basic formula have been examined This approach, although simpler than any other in terms of data requirements, none the less involves the use of some fairly arbitrary assumptions The resulting measure, a weighted average ratio of domestic to world prices, is no more than a crude estimate of the value of foreign exchange in terms of local resources

Table 3 contains the data for applying the basic formula As we have seen, the domestic selling prices of imports are determined largely by the rates of import duty and domestic sales tax on imports, these rose gradually from an average rate of total taxation on imports of 22 per cent in 1972/73 to 29 per cent in 1976/77 Over this period the average rate of export tax fell from 13 to 2 per cent, this was a response by the Government to the decline in world prices for Pakistan's traditional exports

The main problem in applying the formula is to estimate the level of import and export subsidies Imports of wheat, fertilizers and edible oil were subsidized during the period, so that their controlled domestic selling prices were below their average import prices For fertilizers and edible oil, the total published subsidy figure is assumed to cover the difference between domestic and import prices, for wheat, the subsidy has been calculated from a direct comparison of c.i.f and domestic ration shop prices (see table 3).[17] Although no direct subsidies are paid to exporters, there are two main indirect forms of subsidy *(a)* profits and income from manufactured exports are taxed at 50 per cent of the normal rate, and *(b)* manufactured exports

TABLE 3 ESTIMATES OF THE SHADOW PRICE OF FOREIGN EXCHANGE FOR PAKISTAN

Item	*1972/73*	*1973/74*	*1974/75*	*1975/76*	*1976/77*
Imports (M) (million Rs)	8 399.5	13 483.9	20 929.4	20 510.6	23 015.4
Net import duties (T_M) (million Rs)	1 551.9	2 357.2	3 746.5	4 348.1	5 469.2
T_M/M (%)	18.5	17.5	17.9	21.2	23.8
Domestic indirect taxes on imports (T_D) (million Rs)	312.0	533.0	765.0	886.0	1 122.3
T_D/M (%)	3.7	3.9	3.6	4.3	4.9
Import subsidy (S_M)[a] (million Rs)	960.0	1 971.0	1 896.0	1 287.0	555.0
S_M/M (%)	11.4	14.6	9.1	6.2	2.4
Exports (X) (million Rs)	8 623.5	10 237.6	10 460.9	11 420.0	11 586.0
Net export tax (T_X) (million Rs)	1 059.2	1 782.0	1 025.7	738.5	249.3
T_X/X (%)	12.3	17.4	9.8	6.5	2.1
Export subsidy (S_X)[b] (million Rs)	431.1	511.9	523.0	571.0	579.3

[17] It should be noted that the *Guidelines*, pp 223-224, argues that goods subject to price controls should not be included in the comparison of domestic to world prices used to obtain an estimate of the shadow price of foreign exchange because controlled prices are unlikely to reflect the value of goods to consumers. In this study the weighted average ratio of domestic to world prices for all goods traded by the economy has been estimated

TABLE 3 *(continued)*

Item	*1972/73*	*1973/74*	*1974/75*	*1975/76*	*1976/77*
S_X/X (%)	5 0	5 0	5 0	5 0	5 0
Shadow price to official price of foreign exchange					
With export subsidy (S_X)	1 02	0 98	1 07	1 12	1 18
Without export subsidy (S_X)	0 99	0 96	1 05	1 10	1 17

[a]Value of import subsidies for three products is given below

Product	*1972/73*	*1973/74*	*1974/75*	*1975/76*	*1976/77*
Wheat	732	1 584	1 127	680	185
Fertilizers	228	118	326	607	370
Edible oil	–	269	443	–	–

The subsidy on imported wheat, fertilizers and edible oil has been defined as the difference between the c.i.f price and the controlled domestic price. Not all the costs of the subsidies in the government accounts represent a subsidy in this sense, since published subsidy costs are the difference between total revenue from sales of wheat, fertilizers and edible oil at the controlled price minus total costs of procurement. Total procurement costs cover more than the foreign-exchange costs of imports, the domestic costs of transport and distribution in moving imports to ration shops and costs of purchasing domestic supplies of wheat, fertilizers and edible oil are also included. Also, because wheat is imported unmilled but sold domestically as milled flour, the costs of milling are included in total procurement costs.

The subsidy on imports of wheat has been calculated by directly comparing the average unit value of wheat imports with the controlled domestic ration shop price, which gives a rate of subsidy per ton of imports. The total value of the subsidy is found by multiplying the rate of subsidy per ton by the tonnage imported. This price comparison underestimates the actual value of the subsidy, since the ration shop price also covers milling costs. This underestimate has been used, however, since the treatment of fertilizer and edible oil subsidies involves an overestimate. In 1974/75, the ration shop price was approximately 50 per cent of the average unit value of wheat imports, in 1975/76, it was 62 per cent and in 1976/77, 72 per cent. Data on ration shop prices are from *Pakistan Economic Survey*, various issues, and average c.i.f prices from *Monthly Statistical Bulletin*, various issues. This price comparison could not be carried out for 1972/73 and 1973/74 because of lack of the relevant price data. The total value of published wheat subsidies in these years was allocated to imports.

For fertilizers and edible oil, the relevant price data could not be obtained, and again the total published value of subsidies for these items has been allocated to imports. This clearly involves an overestimate of the total import subsidy because of the domestic cost items included in procurement costs.

Published subsidy data are given in *Pakistan Economic Survey*, various issues, and the *Draft Fifth Five-Year Plan, 1976-81*, first version.

[b]The two main export subsidies, a 50 per cent lower rate of profit tax and exemption from the indirect taxes on domestic sales, relate to manufactured exports only. Manufactured exports are approximately 40 per cent of total exports in terms of value.

An examination of the balance sheets for 1970-1974 of companies registered on the Karachi Stock Exchange revealed an average ratio of taxable profits to sales of only 5 per cent, for companies in sectors likely to be concerned with manufactured exports. *Balance Sheet Analysis of Joint Stock Companies listed on Karachi Stock Exchange* (State Bank of Pakistan, Statistics Department). Since profits tax is at the rate of 55 per cent of taxable profits, a reduction of 50 per cent would imply a saving of only around 1 per cent of total sales value. However, the ratio of profits to sales may have risen since 1974, and this would increase the effect of a lower rate of profits tax.

The basic rate of sales tax on manufactured goods is 20 per cent, although different rates apply to different categories of goods. Even if all manufactured exports were subject to a 20 per cent tax, since manufactures are approximately 40 per cent of the total value of exports, the tax saving would be no more than 8 per cent of total export value. The average rate of sales tax paid on imports in 1976/77 was less than 5 per cent.

Given the difficulty in identifying a substantial subsidy effect for exports, two values have been used for the export subsidy in the calculations: the subsidy is assumed to be 5 per cent of the total value of exports and zero. The premium on foreign exchange is not sensitive to the value of the export subsidy within this range.

are not liable to the tax payable on domestic sales of the same item Because of the difficulty in estimating the amount of these subsidies in terms of the total value of exports, a rough estimate of 5 per cent has been used The effect of assuming a zero value for the export subsidy has also been examined

Table 3 shows that the estimated ratio of the shadow price to the official value of foreign exchange rose from around 1 0 in 1972/73 to 1 18 in 1976/77 The explanation for this trend is that the rate of taxation on imports rose, while the rates of export taxes and import subsidies fell Taxes and duties on imports raise domestic prices in relation to world prices, while export taxes and import subsidies reduce domestic prices in relation to world prices If one assumes that export subsidies are negligible, the simple average ratio for the period 1974/75-1976/77 is 1 11, while a weighted average ratio for the same period is 1 13 [18] Calculation of the same averages including export subsidies in the formula gives the slightly higher values of 1 13 and 1 14, respectively

Since a forecast for the shadow price of foreign exchange rather than a past average value is required in appraising projects, data from the fifth plan document have been used to produce one for the period 1978-1983 [19] The final version of the fifth plan document forecasts values for total imports and exports over the period 1978-1983, and these have been used as values for M and X in the formula [20] Two alternative average rates of import duty have been used The lower, 29 per cent, is the average rate for 1976/77 increased to allow for the average increase in import duties of 20 per cent announced in the 1978 budget Use of this rate implies that the average rate of import duties will remain constant over the plan period A second, higher rate of 33 per cent has also been used to allow for the possibility of an increase in import duties over this period The first version of the fifth plan document projected the rise of the average rate of import duty to 33 per cent from 1976 to 1981 [21] The two alternative rates of 29 per cent and 33 per cent have been applied to the forecast value of total imports to obtain total import duties paid, T_M

The 1976/77 rate of subsidy on imports of approximately 2 5 per cent has been applied to the forecast value of imports to obtain a value for the import subsidy, S_M However, one of the targets of the plan is to end wheat imports, and if it is achieved the wheat subsidy on imports will be eliminated The sensitivity of the results to the elimination of all import subsidies has been tested The average rate of domestic indirect taxes on imports in 1976/77 of 5 per cent has been projected over the period 1978-1983 to estimate T_D, total domestic indirect taxes on imports

A forecast average rate of export tax has been obtained by weighting the 1977 rates of taxes on exports by the projected shares of several commodities in total exports over the period 1978-1983 [22] This approach assumes that the export taxes on raw cotton and cotton textiles eliminated in 1975 will not be reimposed The

[18] The simple average ratio is obtained by summing all the items in the formula over the three-year period and using the total values for each item in the calculations. The weighted average ratio is obtained by giving a weight of 1 to the ratio calculated for 1974/75, a weight of 2 to the ratio for 1975/76 and a weight of 3 to that for 1976/77

[19] The first version of the fifth plan was prepared in 1976. The plan was finally launched in July 1978 with a revised set of targets and projections. These are contained in the *Fifth Five-Year Plan, 1978-83* (Islamabad, Government of Pakistan, Planning Commission, June 1978).

[20] The total current-account deficit is forecast to rise from Rs 7,920 million in 1977/78 to Rs 9,920 million in 1982/83. *Fifth Five-Year Plan, 1978-83, op. cit.*, p 53.

[21] *Draft Fifth Five-Year Plan, 1976-81*, first version, *op. cit.*, p 100.

[22] *Fifth Five-Year Plan, 1978-83, op. cit.*, p. 53.

average rate of export tax estimated in this way is 5 per cent, it has been used to obtain a value for total export taxes, T_X. Finally, since the inclusion of export subsidies in the previous calculations for the period 1972/73-1976/77 does not significantly affect the results, export subsidies have been assumed to be negligible and have been omitted from the formula. Table 4 gives the results of the calculations for the forecast value.

All the cases examined give a ratio of the shadow to the official price of foreign exchange of approximately 1.2, the results are greater than 1.2 if one assumes a 33 per cent average rate of import duty and slightly below if one uses 29 per cent as the average rate. Inclusion or exclusion of import subsidies changes the ratio, but not significantly above or below 1.2. The basic forecast value can thus be taken as 1.2, which is in line with the trend of rising estimates from 1974/75 on.

However, a significant number of simplifying assumptions have had to be adopted, both to derive the formula used for the shadow price of foreign exchange and to calculate values with the formula. Although a ratio of 1.2, implying a premium on foreign exchange of 20 per cent above its official price, has been taken as the most

TABLE 4 FORECAST VALUE FOR THE SHADOW PRICE OF FOREIGN EXCHANGE, 1978-1983

		Millions of rupees at current prices
Total imports (M)		35 570
Net import duties[a] (T_M)	(i)	10 315
	(ii)	11 738
Domestic indirect taxes[b] (T_D)		1 778
Import subsidies[c] (S_M)		889
Total exports 1978-1983 (X)		18 980
Net export taxes[d] (T_X)		949
Export subsidies (S_X)		0

$$\frac{\text{Shadow price of foreign exchange}}{\text{Official value of foreign exchange}} = \frac{(M + T_M + T_D - S_M) + (X - T_X + S_X)}{M + X}$$

Case[e]	*Ratio of shadow to official price*	*Premium on foreign exchange (percentage)*
1	1.19	19
2	1.21	21
3	1.20	20
4	1.23	23

Source Total imports and exports over the period 1978-1983 are taken from *Fifth Five-Year Plan, 1978-83* (Government of Pakistan, Planning Commission)

[a] Calculated at 29 per cent of total imports, T_M (i), and at 33 per cent of total imports T_M (ii)

[b] Calculated at 5 per cent of M

[c] Calculated at 2.5 per cent of M

[d] Calculated at 5 per cent of X

[e] Case 1 uses T_M (i), an average rate of import duty of 29 per cent and all other values as given above.

Case 2 uses T_M (ii), an average rate of import duty of 33 per cent and all other values as given above.

Case 3 uses T_M (i) and no import subsidy ($S_M = 0$)

Case 4 uses T_M (ii) and no import subsidy ($S_M = 0$)

likely value, sensitivity analysis has been applied in each appraisal discussed in the later chapters to test the effect of using alternative premiums of 15 per cent and 25 per cent In other words, given the estimation procedures used, it is difficult to do more than argue that the shadow price of foreign exchange is likely to be 15-25 per cent above the official rate

The discount rate

The discount rate used at stage two of the appraisals in the case-studies is an estimate of the opportunity cost of public investment in Pakistan The *Guidelines* uses a social rate of discount reflecting the government's time preference for consumption, however, where there is no shortage of savings as at stage two, the time preference and the opportunity cost discount rates will be equal In an appraisal concerned with public-sector projects, where the problem is one of allocating a given public investment budget, the relevant opportunity cost is the internal rate of return (IRR) obtainable on the marginal public-sector project, the project forgone as a result of committing funds to the project under appraisal In most mixed economies the government invests in a wide range of activities, and the average, and possibly marginal returns also, are likely to vary between sectors Industrial investment is commonly taken as representative of public investment in general, particularly since more data are often available on industrial than on other investment In Pakistan during the period 1972/73-1976/77, expenditure on industrial projects took an increasing share of additional public-sector investment [23]

Even narrowing the focus of attention to public industrial investment alone does not solve many of the data problems connected with an estimate of the opportunity cost of investment In principle, such an estimate involves the valuation at shadow prices of the inputs and outputs of industrial projects and an adjustment for all foreign-exchange effects These data can be obtained only from comprehensive surveys of the industrial sector or from reports on individual projects However, if project reports are to be used to estimate the marginal return on industrial investment, a representative sample must be collected [24]

In this study, in the absence of more satisfactory data, the returns on public industrial investment have been crudely estimated at market prices and then adjusted to take account of divergences between market and shadow prices Information on returns on various investments at market prices can be obtained from several sources, as discussed below

[23] The share of industry in the public-sector annual development programme rose from around 6 per cent in 1972/73 to 14 per cent in 1975/76 and was 28 per cent in 1976/77 *Pakistan Economic Survey, 1976/77, op. cit.*, pp. 252-254.

This trend will almost certainly be reversed with the change of regime from the civilian government to the martial law administration, which took power in 1977 The civilian government pursued a policy of nationalization and public-sector industrial expansion, while the military government has stressed its belief in the need to revive the private sector

[24] S. R. Khan, "Estimates of the shadow wage rate in Pakistan", *Pakistan Development Review*, winter 1974, used the 1969/70 Census of Manufacturing Industry data to produce an estimate of the opportunity cost of investment. The calculations are now rather out of date, since they used an estimated average ratio of domestic to world prices for the 1960s. After the devaluation of 1972 and change of trade policy, this ratio was reduced substantially The most recent *Census of Manufacturing Industry* available to the author at the time of writing was for 1971/72 it was not used in the calculations because of lack of accurate shadow price data on many of the outputs of and inputs into the manufacturing sector

Commercial interest rates in real terms give an indication of returns on various forms of financial investment After they are adjusted for inflation, commercial interest rates in Pakistan are low or negative During 1977, the Government granted loans to public-sector projects at interest rates of between 10 and 13 per cent These rates were negative or zero in real terms, since the consumer price index rose by 13 per cent during 1976/77 Over the same period the real rate of interest for long-term savers was zero, and that received by holders of government bonds was 2 per cent [25] The highest nominal rate of interest the Government paid on external borrowing in 1976/77 was 10 5 per cent [26] To obtain a real value, this figure would have to be deflated by an index of international inflation, but the real interest charge is also likely to be low

The published accounts of public- and private-sector industrial companies give information on the average return on the book value of assets In 1976, net profits before taxes and interest earned by public-sector companies controlled by the Board of Industrial Management (BIM) were approximately 10 per cent of net assets [27] A survey of the published company balance sheets of private-sector companies listed on the Karachi stock exchange revealed that over the period 1972-1974, the average ratio of gross income to gross assets was also 10 per cent, for 1974, the most recent year for which data were available, the ratio was 14 per cent [28] Information from company accounts must be used with caution as an indicator of the returns to capital, however, since published asset figures reflect historical and not replacement values, and depreciation allowances may reflect bookkeeping entries rather than the reduced productivity of assets

The IRR identified in project appraisals gives an indication of the returns to be obtained on investment, provided that a representative sample of appraisal reports is considered and that actual project performance does not differ markedly from the assumptions used in the project report In appraising the directly productive public-sector projects, the Planning Division of the Government of Pakistan employed a test discount rate of 12 per cent during 1977 Projects that did not have an IRR at constant market prices, before deductions for taxes on profits greater than or equal to 12 per cent, were rejected In other words, if this criterion were applied consistently, the least attractive public-sector project accepted in 1977 would have an estimated IRR of 12 per cent

Data on appraisals in the private sector were obtained from the Pakistan Industrial Credit and Investment Corporation (PICIC), one of the major credit corporations that provide finance to the private sector In 1977, a test discount rate of 15 per cent was used in appraisals, projects that did not have, after taxes, an IRR at constant market prices of at least 15 per cent were not given funds A survey of past appraisals shows that over the period 1973-1975 the minimum acceptable IRR was 10 per cent

In this study the IRR on the marginal public-sector project at market prices is taken to be 10 per cent This rate is used, rather than the government test rate of

[25] Data taken from *Pakistan Economic Survey, 1976/77, op. cit.*

[26] *Ibid.*, p 127

[27] Data communicated by Government of Pakistan, Planning Division.

[28] This ratio was calculated from *Balance Sheet Analysis of Joint Stock Companies Listed on Karachi Stock Exchange* (State Bank of Pakistan, Statistics Department). Gross income was defined as operating profits, before deductions for taxes, interest and depreciation. Gross assets were the book value of assets inclusive of depreciation allowances. Gross income and gross assets were deflated to 1959/60 constant prices and were a weighted average for all companies listed.

12 per cent, because the feasibility reports on public-sector projects in Pakistan often underestimate production costs and overestimate benefits; the test rate of 12 per cent has been adjusted downwards as a crude attempt to compensate for this over-optimism [29]

The evidence summarized above shows that the marginal IRR may be higher in the private sector than in the public sector If so, and public- and private-sector projects compete for the same resources, the relevant opportunity cost at market prices will be the returns forgone in the private sector However, since there is considerable uncertainty regarding the real returns to investment, differences between the productivity of public and private investment have been ignored in this study

The IRR can be interpreted as the ratio of value added, minus wage costs, to capital stock Several factors cause a divergence between the value of this ratio at market prices and its value at shadow prices

(a) If outputs and inputs of industrial projects are assumed to be traded goods, value added at domestic prices must be converted to value added at world prices The divergence between the two as a percentage of value added at world prices is termed the effective rate of protection Value added at world prices must be adjusted by the premium on foreign exchange, and this adjustment will partially offset the reduction in value added caused by the move from domestic to world prices,

(b) The wage costs of industrial projects must be adjusted to allow for a shadow wage for unskilled labour below the market wage Other things being equal, this adjustment will raise the numerator at shadow prices in relation to its value at market prices,

(c) The capital stock of industrial projects must be expressed in terms of shadow prices The equipment items of capital can be distinguished from buildings and other non-traded costs Equipment items, as traded goods, must be valued at their world prices and then adjusted by the premium on foreign exchange The simplest approach to revaluing the non-traded costs is to assume that all of them are buildings, and therefore can be valued by an AF for construction The foreign-exchange content of construction costs at shadow prices must also be adjusted by the foreign-exchange premium The effect of these adjustments may be either to raise or lower the value of capital at shadow prices in relation to its value at market prices

In this study these three adjustments have been made on the estimated IRR of industrial projects at market prices The approach used has had to be approximate owing to lack of detailed information The effective rate of protection on industrial value added is taken to be 50 per cent, implying that value added at world prices is 67 per cent of value added at domestic prices The effective rate of protection has been derived by assuming a 30 per cent nominal rate of protection on industrial output and a 16 per cent rate on material inputs used in production Since the *Census of Manufacturing Industry* shows the latter to be approximately 60 per cent of value added at domestic prices, these rates give an effective protection rate of 50 per cent

[29] The original data on the case-study projects in chapters III, IV and V have had to be adjusted to reflect more realistic assumptions regarding capital costs, capacity utilization rates and other items. The extent to which all project reports suffer from such shortcomings and the quantitative significance of these shortcomings are not known.

Wage costs are given in the *Census of Manufacturing Industry* as approximately 30 per cent of value added at domestic prices Two-thirds of wage costs have been assumed arbitrarily to cover payments to semi-skilled or unskilled workers, and these have been valued at three shadow wage rates, 66 per cent and 33 per cent of the market wage and zero, to test the sensitivity of the results to the treatment of unskilled labour

The capital stock is divided between equipment and buildings in the proportion of 65 per cent and 35 per cent, respectively, as given in the *Census of Manufacturing Industry* Capital equipment is valued at world prices on the assumption that the average rate of import duty on equipment over the period 1972/73-1975/76 can be used as a measure of the divergence between its domestic and world prices Buildings have been revalued by the three AFs for construction discussed in the next section These AFs have been derived using the same treatment for unskilled construction labour as for unskilled industrial workers Finally, all the foreign-exchange effects of industrial projects have been adjusted by a single premium on foreign exchange of 20 per cent [30]

The resulting values for the IRR at shadow prices range from 9 6 per cent at the highest shadow wage to 12 0 per cent, when the shadow wage is zero The latter can be taken as an extreme situation, and for purposes of the appraisals, the stage-two discount rate has been taken to lie within 10-12 per cent However, the approach adopted here is approximate, it suggests that when allowance is made for an overvaluation of labour costs by the market wage, the IRR at shadow prices is more likely to be above than below the rate at market prices However, there is considerable uncertainty regarding the correct market price value for the IRR on the marginal project and the exact magnitudes of the adjustments required to move from market to shadow prices Changes in several key assumptions will alter the estimated value of the discount rate Thus, despite the importance of this parameter, it is not easy to estimate [31] Furthermore, the estimates produced here are equal to some of the possible values at market prices discussed initially, which suggests that in some circumstances it may be sufficient simply to concentrate on obtaining accurate estimates of the opportunity cost rate of return at market prices

Non-traded goods

The other national parameters estimated for stage two are the values of several non-traded goods AFs have been calculated for construction, electricity, road and rail transport, and local trade, on the assumption that the estimated average ratio of

[30] The nominal rate of protection on industrial output of 30 per cent is the average rate of import duty paid on non-food imports in 1975/76 This rate and the average rates of duty on intermediate imports and capital goods are based on data in *Monthly Statistical Bulletin,* various issues. Data on material inputs and capital stock are taken from *Census of Manufacturing Industry, 1969/70* (Government of Pakistan, Statistical Division) Data on wage costs in industry are from the more recent 1975/76 *Census,* which was not available to the author at the time of writing. The wage data used here are taken from an unpublished paper The general AF for construction is discussed in the next section.

[31] The estimates of Khan, *loc. cit.,* put the opportunity costs of capital in Pakistan at between 11 and 15 per cent. It should be noted that even the authors of a very detailed study of shadow pricing in Kenya had difficulty in estimating a value for this parameter See M Fg Scott, J D MacArthur and D M F Newberry, *Project Appraisal in Practice* (London, Heinemann Educational Books, 1976), pp. 39-48.

shadow to domestic prices for each of these non-traded sectors can be used for all projects to convert the costs of these items at market prices into costs at shadow prices For example, if the average ratio of shadow to domestic prices for the construction sector is 0 7, this ratio is assumed to prevail for all projects, so that the construction costs of all projects can be converted to shadow prices by an AF of −30 per cent

The treatment of these non-traded goods in this study illustrates a general approach only, since the data used in this section are unreliable Details of the calculations of the AFs are given in the appendix to this chapter The procedure is described below

The total value of output in each sector is divided among several categories of inputs The value of each category at market prices is converted to a shadow price and the total costs of inputs at shadow prices estimated Finally, the foreign-exchange content of each category of costs is adjusted to allow for the premium on foreign exchange If one distinguishes between the inputs of traded and non-traded goods into each sector, and the labour and capital resources involved, the shadow price of each item can be expressed as

$$\mathrm{Sp}_i = \sum_j [(x_{ji}\,\mathrm{Dp}_j + \mathrm{AF}_j) + \mathrm{AF_f}] + \sum_n [(x_{ni}\,\mathrm{Dp}_n + \mathrm{AF}_n) + \mathrm{AF_f}] + [(L + \mathrm{AF}_L) + \mathrm{AF_f}] + [(K\,r + \mathrm{AF}_K) + \mathrm{AF_f}]$$

where

- Sp_i = the shadow price of non-traded good i
- x_{ji} = the units of traded good input j required per unit of i
- Dp_j = the domestic market price of j
- AF_j = the adjustment factor required to express the value of j at world prices
- $\sum_j$ = all traded good inputs used in sector i
- x_{ni} = the units of non-traded good n required per unit of i
- Dp_n = the domestic market price of n
- AF_n = the adjustment factor required to express the value of n at shadow prices
- $\sum_n$ = all non-traded good inputs used in sector i
- L = the total market wage costs per unit of i
- AF_L = the adjustment factor required to convert market wages to a value at shadow prices
- K = the total capital stock at market prices in sector i
- r = the annual opportunity cost rate of return on capital
- AF_K = the adjustment factor required to convert the value of the annual opportunity cost of capital at market prices to shadow prices
- $\mathrm{AF_f}$ = the foreign-exchange adjustment factor, it is given by multiplying the foreign-exchange content of each item by the premium on foreign exchange It varies, therefore, between the different items, depending on foreign-exchange content

In calculating the AFs for the various sectors, it is assumed that

(a) The average rate of import duty on traded-good inputs, in the absence of detailed price comparison, is a measure of the divergence of their domestic from their equivalent world prices,

(b) For non-traded inputs into the non-traded sector under examination, domestic market prices are equal to shadow prices, and the inputs have a zero foreign-exchange content Therefore, no AF is required to convert their costs at domestic market prices into shadow prices,

(c) All labour used in these sectors is unskilled In the absence of reliable estimates of the shadow wage, three alternative assumptions regarding the ratio of the shadow price of unskilled labour to its market wage have been made in case 1, the shadow wage rate is assumed to be zero, in case 2, it is assumed to be 33 per cent of the market wage, and in case 3, 66 per cent The sensitivity of the AF for each sector to the assumption used regarding the valuation of unskilled labour is examined The AFs for the various non-traded sectors are used primarily to illustrate the effect of the textile project examined in chapter III on regional income. The different ratios of the shadow wage to the market wage in cases 1, 2 and 3 reflect alternative assumptions regarding the source of supply of labour to the textile project In the estimation of the cost of non-traded items at shadow prices, the opportunity cost of labour is assumed to have a zero foreign-exchange content,

(d) Finally, the annual capital costs in each sector are estimated by applying a 12 per cent annual rate of return to the value of the capital stock This 12 per cent annual return was used to reflect the opportunity costs of employing the assets in the particular non-traded sector rather than elsewhere A project with an IRR of 10 per cent and a 20-year life will have an annual return of approximately 12 per cent [32] As we have seen, an IRR of 10 per cent is the bottom of the range of returns estimated for marginal public-sector projects, and it is used to reflect the returns available on investment at shadow prices in other sectors of the economy

The annual opportunity cost of the capital employed in each sector is converted into a value at shadow prices by using an AF based on the estimated ratio of the value of total capital stock at shadow prices to its market price value It is assumed that the maintenance costs of capital are covered by the various items in operating cost, so that capital costs, as defined here, refer only to opportunity costs

The AFs for each non-traded sector examined are given in table 5 Three alternative AFs are shown for each sector, varying with the value assumed for unskilled labour The foreign-exchange content of the various costs at shadow prices in each sector are also given, to permit the premium on foreign exchange to be applied By assumption, the foreign-exchange costs involved are the traded-good inputs used in production in the non-traded sectors with some capital costs treated as traded goods

The AFs compare the average cost in each sector at shadow prices with the average value at market prices Except for electricity in case 3, the cost at shadow prices is below that at market prices The adjustment for the premium on foreign exchange increases the average cost at shadow prices, but if premiums of 15-25 per cent are used, it remains below the cost at market prices The implication is that the real income lost elsewhere in the economy as a result of the expansion of production of these sectors is less than the costs of expansion at market prices Considerable uncertainty, however, surrounds the true value of these AFs, particularly since all, apart from that for rail transport, are sensitive to the shadow price used for labour

These AFs have not been applied in the polyester case-study in chapter III, where it is assumed that the domestic market prices of non-traded items equal their

[32] Over a 20-year period annual returns on an investment of 100 with an IRR of 10 per cent can be found by dividing 100 by the annuity factor for 20 years at 10 per cent, which is 8 513

TABLE 5 ADJUSTMENT FACTORS FOR FIVE NON-TRADED SECTORS

(Percentage)

Sector and case[a]	*AF*[b]	*Foreign-exchange content*[c]
Construction		
1	−46	65
2	−39	58
3	−33	52
Electricity		
1	−20	51
2	−10	45
3	0	41
Local trade		
1	−85	45
2	−71	24
3	−57	16
Road transport		
1	−55	61
2	−49	54
3	−43	49
Rail transport		
1	−31	96
2	−30	94
3	−29	93

Source The derivation of these AFs is discussed in detail in the appendix to this chapter

[a]Case 1 assumes a zero shadow wage, case 2, a shadow wage 33 per cent of the market wage, and case 3, a shadow wage 66 per cent of the market wage

[b]The AF is before any foreign-exchange adjustment

[c]Foreign-exchange content is the value of the traded-good items at their equivalent world prices, as a percentage of the final shadow price for the sector

shadow prices The crude evidence from the analysis of costs in these sectors suggests that the shadow price of a number of non-traded goods is likely to be below the market price, so that the assumption used in chapter III gives an overestimate of project costs The exact divergence of the shadow from the market price of the main non-traded items is not clear However, the AFs have been used chiefly in the textile mill case-study in chapter IV, where the regional income effects of the project have been estimated using the data on production costs in these non-traded sectors and different assumptions regarding the shadow price of labour The AFs have also been used to value relatively minor items in the sugar-mill case-study in chapter V, there the shadow price of the main non-traded item, sugar-cane, has been estimated in detail

To conclude the discussion of the stage-two national parameters, the stage-two appraisal procedures used in this study may be summarized as follows

(a) All traded goods are valued at their world prices, either c i f or f o b ,

(b) Non-traded goods are either

(i) Converted to shadow prices by the relevant AF,

(ii) Not adjusted, so that their value at market prices is used as a measure of their value at shadow prices, or

(iii) Examined in detail if they are significant items in the appraisal,

(c) It was not possible to quantify and value any external effects created by projects,

(d) The market wage rate for skilled labour is assumed to equal the shadow wage rate,

(e) The shadow price of unskilled labour is treated as an unknown, and different assumptions are used regarding the ratio of the shadow to the market wage,

(f) The foreign-exchange content of the shadow price of each item in the real cash flow of a project is adjusted by a premium on foreign exchange [33] The ratio of the shadow price to the official price of foreign exchange has been estimated at between 1 15 and 1 25, so that the premiums applied to foreign exchange range from 15 to 25 per cent, with 20 per cent taken as the most likely value,

(g) The IRR of a project at shadow prices is compared with a measure of the opportunity cost of investment of 10-12 per cent If a project has an IRR of more than 12 per cent, it is clearly acceptable in terms of the stage-two criteria, if the IRR is between 10 and 12 per cent, a project should be examined in detail and its sensitivity to particular parameters tested

NATIONAL PARAMETERS AT STAGE THREE

Stage three of the approach followed in the *Guide* covers situations where a shortage of domestic savings is seen as a constraint on growth and the government wishes to select projects that will increase savings in the economy Savings are treated as more valuable than average units of consumption because they can be invested to create future income and consumption Therefore, at stage three, projects that lead to increases in savings have an extra benefit term added to their stage-two NPV, and projects that reduce savings have an additional cost item subtracted from their stage-two NPV Since all savings are assumed to be invested, the value of savings is determined by the value of investment, and the national parameter required at stage three is the shadow price of investment, P^{inv}

Domestic savings in Pakistan during the 1970s accounted for a low percentage of national income, and thus external sources, both aid and overseas borrowing, were required to finance a significant amount of investment expenditure Table 6 gives the share of fixed investment, domestic savings and foreign savings in total GDP The final version of the fifth five-year plan (1978-1983) stresses the need to increase domestic savings, both absolutely and as a proportion of national income The target set for the average rate of domestic savings in 1982/83 is 12 5 per cent of national income, which implies that the marginal rate of savings, that is, savings as a proportion of additional income, will be 23 per cent over the period 1978-1983 [34] This is an ambitious target in relation to past levels, since marginal savings rates were negative in 1973/74 and 1974/75, and the marginal rate over the period 1972/73-1975/76 was only 7 per cent However, given the debt-repayment problems associated with past foreign capital inflows, it is unlikely that external finance could be found to make up any shortfalls in domestic savings below these target levels [35]

[33] For a discussion of the items that go into the real cash flow of a project, see the *Guide*, p 9

[34] *Fifth Five-Year Plan, 1978-83, op. cit*, p 8

[35] Calculated from data in *Pakistan Economic Survey*, various issues. In 1976/77, debt repayments were 18 per cent of export earnings, *Pakistan Economic Survey, 1976/77, op. cit.*, p 136.

TABLE 6 SHARE OF INVESTMENT AND SAVINGS IN GDP AT CURRENT PRICES

(Percentage)

Item	*1969/70*	*1972/73*	*1973/74*	*1974/75*	*1975/76*
Fixed investment	14 3	11 5	12 3	14 0	15 2
Domestic savings	9 0	10 0	6 2	3 7	8 6
Foreign savings[a]	5 3	1 5	6 1	10 3	6 6

Source *Pakistan Economic Survey, 1976/77* (Government of Pakistan, Finance Division), p 14

[a] Difference between fixed investment and domestic savings

In these circumstances if the ambitious domestic savings targets are not achieved, growth of the economy will almost certainly be below the rate projected in the plan In such a situation project appraisal can be used as a means of influencing the level of domestic savings by weighting the appraisal of projects in favour of those that will bring substantial savings, as opposed to projects that will immediately increase consumption The weighting procedure is through the application of the national parameter, the shadow price of investment (P^{inv})

The *Guide* puts forward a simple formula for calculating P^{inv}

$$P^{inv} = \frac{(1-s)\,q}{i - sq}$$

where

s = the marginal propensity to save out of additional income created by a project

q = the marginal productivity of capital

i = the consumption rate of interest and P^{inv} is the number of units of aggregated consumption equal to one unit of investment

The rationale for the formula is that the value of a unit of investment in relation to units of consumption depends on the rate of return on the investment each year q, the proportion of the returns from the investment consumed $(1-s)q$, the proportion saved and reinvested to create future consumption sq, and the discount rate the government uses to convert the stream of consumption generated by a unit of investment into a present value of consumption i. P^{inv} is therefore the present value of the number of units of consumption generated by a unit of investment The formula is derived from the simplifying assumption that all the parameters remain constant over time, so that the shortage of savings, implied whenever P^{inv} is above one, is assumed to persist indefinitely [36]

In principle, it is possible to distinguish between shadow prices for public and private investment using different values for s and q for the public and private sectors in applying the formula for P^{inv} If one considers a single value of P^{inv} for all investment in the economy, which is the case in the example given in the *Guide*,[37] s and q will be marginal values for the economy as a whole In other words, q will

[36] When the parameters in the formula are taken to change in value over time, the expression for P^{inv} becomes more complex, see the discussion in the *Guidelines*, pp 194-198

[37] *Guide*, p 90 The *Guidelines* case-studies also use a single value for P^{inv} rather than distinguishing between values for the public and private sectors

reflect the marginal return on investment averaged over public and private sectors, and s will be an average of the marginal public and private-sector rates

Significant problems arise in estimating P^{inv}, even when the formula is used where all parameters remain constant and a single value of P^{inv} is taken for all investment in the economy Of the parameters in the formula, q and s are objective parameters that can be estimated from observable data The value of q, the opportunity cost of investment at shadow prices, is the stage-two discount rate Hence, estimates of q are central to the whole appraisal, although they can be subject to considerable uncertainty Estimates of the future marginal propensity to save s can be taken from plan targets, although if these are felt to be unrealistically high, they must be adjusted downwards to allow for savings rates closer to those achieved in the past The consumption rate of interest i is a subjective parameter, however, which expresses the government's valuation of units of consumption at different times The approach of inferring a value for i from an analysis of past government decisions on projects, suggested in the *Guidelines,* is difficult to apply in practice As an alternative, a formula is often suggested as a means of calculating i, so that

where $$i = ng + p$$

i = the consumption rate of interest

n = the elasticity of the government's social utility function for consumption

g = the annual rate of growth of *per capita* consumption and

p = the government rate of pure time preference

The logic of this formula is that the rate at which the government discounts future consumption will depend upon the extent to which average consumption grows over time g, the rate at which the government's valuation of extra consumption falls as the living standard of the individual consumers who receive it rises n, and the extent to which the government feels that future consumption is less valuable because it occurs in the future rather than in the present p. A value for g can be obtained from past national income statistics or projected over the future on the basis of different growth forecasts. A value for n must be obtained to derive a set of consumption weights for a stage-four appraisal, the implication of alternative values of n are discussed in the next section It has been suggested that a reasonable range of values will be between 0 5 and 1 5, with 2 0 as a possible extreme value [38] In the case of p, however, there is little to suggest its likely numerical value, and for this reason the formula has not been used here for calculating i. As an alternative, i is treated as an unknown, and the sensitivity of P^{inv} calculated from the formula $P^{inv} = \frac{(1-s)q}{i-sq}$ is tested for different values of i [39]

The guide to the possible range of values for i is that if one uses the constant parameter formula to calculate the value of P^{inv}, the value of i must lie within a particular range, i must be greater than sq and less than q The lower value of i is

[38] L. Squire and H G van der Tak, *Economic Analysis of Projects* (Baltimore, Johns Hopkins University Press, 1976), p. 103

[39] An earlier estimate of i for Pakistan was 4 per cent, Khan, *loc. cit* The approach used ignored pure time preference p, derived a value for n of approximately 1 0, and assumed that the relatively high average rates of growth of consumption *per capita* of 3 7 per cent per year, achieved over the period 1959/60-1969/70, could be projected over the future. The real average annual growth of consumption *per capita* in Pakistan over the period 1971/72-1975/76 was approximately 2 per cent, calculated from data in *Pakistan Economic Survey, 1976/77, op. cit.*

given by the fact that if i is less than sq, the consumption created by a unit of investment will grow at a faster rate than the rate used to discount it to the present, in these circumstances the value of P^{inv} will be infinite The upper value of i is determined by the fact that if i equals q, P^{inv} will equal 1 0, so that a unit of investment and a unit of aggregate consumption will be of equal value If so, savings are no more valuable than consumption, and the justification for a stage-three appraisal is removed This range of values for i can be wide, however

In calculating P^{inv}, two values of q, 12 per cent and 10 per cent, have been used these are the estimates of the opportunity cost of public industrial investment discussed above These estimates are assumed to reflect the marginal returns in the economy as a whole Two alternative values of s, the marginal propensity to save in the economy as a whole, have been used, the higher, s = 23 per cent, represents a situation where the Government's ambitious savings target for the fifth plan has been achieved, while the lower, s = 15 per cent, has been used to allow for the possible underfulfilment of the target The sensitivity of P^{inv} has been tested for three alternative values of i, 3 per cent, 5 per cent and 7 5 per cent, which are within the possible range of values for i, specified by the mathematical constraint that $i > sq$, and $i < q$ The results of the calculations of P^{inv} are given in table 7.

TABLE 7 ALTERNATIVE VALUES FOR THE SHADOW PRICE OF INVESTMENT[a]

	s = 15%		s = 23%	
	q = 10%	q = 12%	q = 10%	q = 12%
i = 3%	5 7	8 5	11 0	38 5
i = 5%	2 4	3 2	2 8	4 1
i = 7 5%	1 4	1 8	1 5	1 9

[a] Using the formula $P^{inv} = \frac{(1-s)q}{i - sq}$

It can be seen that the values of P^{inv} are sensitive to the choice of the consumption rate of interest i, and that when i is only slightly above sq the value for P^{inv} will be very high Given this range of possible values, it is difficult to estimate P^{inv} precisely even when the simple formula is used where all parameters are constant and marginal public investment and marginal private investment are taken to be of equal value

In addition to these practical problems of estimating P^{inv}, the theoretical problem mentioned in chapter I remains The P^{inv} formula used above relates the value of a unit of investment to that of units of aggregate consumption, since the recipients of the future consumption generated by investment are not specified This is a correct procedure at stage three, since at that stage all consumption is judged to be of equal value regardless of the recipient However, when one proceeds to stage four all effects of a project must be expressed in terms of the *numéraire*, units of consumption in the hands of those at the base level of consumption At stage four, therefore, P^{inv} must express the value of a unit of investment in terms of the *numéraire* rather than of aggregate consumption

In the appraisal of the sugar-mill project in chapter V, which is the only case-study that deals with both stages three and four of the *Guide*, this problem is

overcome by combining these stages, so that changes in both savings and consumption resulting from the project have been revalued in terms of the *numéraire*. Using this approach, the value of investment in relation to average consumption, which is equivalent to the P^{inv} of stage three, is found indirectly from the weighting system adopted. The procedure is discussed more fully in the next section, but in summary, all investment, whether public or private, is treated as equivalent to the *numéraire*. The weighting system adopted for the consumption gains received by different groups gives a weight for the gains of average consumers in relation to the *numéraire* of 0.67. This implies that Rs 1 of the *numéraire* is equivalent to Rs 1.5 in the hands of average consumers. Since all investment is equal to the *numéraire*, the value of investment in relation to units of average consumption is 1.5. This method of valuing investment is based on the assumptions implicit in the set of consumption weights rather than on estimates of the productivity of investment.[40]

The two key assumptions required to identify a set of consumption weights are, first, a value for n, the elasticity parameter of the government's utility function with respect to consumption, and, secondly, a value for b, the base level of consumption, the government considers a rupee spent as consumption by individuals at this income level as valuable as a rupee under the control of the government itself.

An alternative approach to that used here is to take investment as equivalent to units of the *numéraire*, but to find a value for investment in terms of average consumption, directly, through the P^{inv} formula. The consumption weighting system can then be used to express the gains to different groups in terms of gains to average consumers. This approach has not been adopted here[41] because of the uncertainty surrounding the value of P^{inv}, the main cause of this uncertainty is the parameter i, the consumption rate of interest, for which it is difficult to infer a particular value. As we have seen, the value of P^{inv} is highly sensitive to the choice of values for i.

The approach of Squire and van der Tak involves two basic judgements, one on the value for i, which is required to calculate P^{inv}, and the other on the value for n. In this study, judgement on b has been substituted for a judgement on i. While it is theoretically preferable to identify a value for i, to permit savings and investment to be valued in terms of their contribution to future growth, it may be easier for the decision takers to agree on the base level of consumption, which can be interpreted as a poverty line or subsistence income level, rather than on a time preference discount rate.

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[40] It would not be correct to use the value of 1.5, which expresses the relationship between investment and average consumption, to derive an implicit value for i. The value for investment of 1.5 units of average consumption is based on judgements regarding the relative social value of different current incomes, it is not derived from estimates of the discounted value of the stream of consumption benefits generated by a unit of investment. In other words, 1.5 cannot be set equal to the formula $\frac{(1-s)q}{i-sq}$, to solve it for i, when s and q are known.

[41] This is the method set out in Squire and van der Tak, *op. cit.*, pp. 57-77, where

(a) Investment is equivalent to government income,

(b) Investment is valued in terms of average consumption through the parameter V (P^{inv}),

(c) Consumption gains to different groups are expressed initially in terms of gains to average consumers,

(d) Finally, through the relationship between average consumption and government income, gains to different groups can be expressed in terms of the *numéraire*, government income.

NATIONAL PARAMETERS AT STAGE FOUR

At stage four of the *Guide*, the impact of projects is valued in terms of their contribution to an equitable distribution of income This stage is relevant to an appraisal whenever a government includes greater equity in income distribution as one of the objectives to be considered in the selection of projects The national parameters at this stage are the weights used to value income going to different groups.

Statements of officials of the Government of Pakistan suggest that equity in income distribution is an important policy objective, desired along with greater efficiency in resource utilization and higher growth of national income The final version of the fifth plan stresses the need for a fairer distribution of income both between classes and between regions of the country than exists at present In a speech to launch the plan, the Chief Martial Law Administrator's Adviser for Planning and Co-ordination stated

> "The strategy of the Fifth Plan lays as much stress on equitable distribution as on economic growth The long-term objective is to build a prosperous and disciplined society based on the principles of Islamic equality and justice. The development programme for backward areas incorporated in the Fifth Plan would ensure a fairer distribution of economic growth among different regions of the country."[42]

If stated objectives on redistribution accurately reflect policy, the selection of projects is one way in which this policy can be implemented The weighting system applied at stage four of the appraisal is biased in favour of those projects that benefit low-income groups and against those that create gains for groups that already enjoy a high standard of living.

The approach to the distributional aspects of projects adopted in this study differs from that of the *Guide*. The *Guide* suggests that the total income changes created by a project should be adjusted by a set of income weights to allow for the effect of the project on the distribution of income This means that savings are revalued twice, once at stage three, because they affect growth, and again at stage four, because they are part of the income received by particular groups. In the analysis in chapter V of this study, stages three and four are combined A distinction is drawn between the savings and consumption changes resulting from a project, since the former contribute to growth and the latter are the direct gains received by groups affected by a project. Instead of adjusting the total income changes for different groups to take account of their existing income levels, only the changes in consumption have been revalued in this way. Therefore, the distribution weights involved in this appraisal are consumption and not income weights.

As we have seen, the *numéraire* in the *Guide* is units of consumption in the hands of individuals at the base level. Therefore, the *numéraire* is equal to both rupees of private consumption, going to a particular group, and to rupees in the

[42] Text of speech reported in *Dawn. Overseas Weekly Issue* (Karachi), 5 July 1978 Although the ideology and many of the policies of the present Martial Law Administration and the previous governments of Z. A. Bhutto differ widely, the official statements on broad development objectives are similar A comparison of the objectives given in the version of the fifth plan prepared in 1976 for the Bhutto government and those in the final version launched in 1978 by the Martial Law Administration illustrates this point.

hands of the government In the stage-four weighting system, units of the *numéraire* have a weight of 1 0, and all other incomes have a weight determined by their value to the government in relation to the *numéraire* In the stage-three/four appraisal used in chapter V, all government income and all private savings are given weights of 1 0 Use of a weight of 1 0 for all government income, however, implies a rational allocation of resources within the public sector, so that at the margin additional current and capital expenditures have an equal value for the government [43] All private savings have also been given a weight of 1 0. The approach of treating savings as equal to the *numéraire* is based on the following assumptions

(a) If the government is allocating its resources rationally, all units of government income, whether used for investment or current expenditure, will be of equal value,

(b) Therefore, units of consumption at the base level will equal both government investment and current expenditure,

(c) If government investment is taken to have a value equal to private investment, a unit of the *numéraire* will also equal a unit of private investment,

(d) Since all savings are assumed to be invested, a rupee of savings can be considered equal to a unit of the *numéraire.*

The assumption of the equal social worth of marginal public and private investment is a strong one, since it implies an optimal allocation of investment between public and private sectors Not all of the evidence on the returns in the public and private sectors, summarized in the earlier section, supports this assumption. However, there is so much uncertainty regarding the real value of the opportunity cost of investment, either public or private, that the assumption is used for the sake of simplicity Furthermore, changes in private savings are a small item in the total income flows created by the sugar-mill project analysed in chapter V, and this may be the case for many public-sector projects.

Consumption weights for the stage-three/four appraisal have been obtained using the formula

$$d_i = \left(\frac{b}{c_i}\right)^n$$

where

b = the base level of consumption

c_i = the average consumption level per person of group i

n = the elasticity of the government's utility function with respect to consumption

d_i = the weight given an additional unit of consumption going to group i

Applying this formula, the value of an additional rupee of consumption going to a particular group depends, first, upon the level of their current consumption in relation to the base level $\left(\frac{b}{c_i}\right)$ At the assumed base level for Pakistan, average savings rates are likely to be zero, so that the terms "base level of income" and "base level of consumption" can be used interchangeably The second factor determining the value of an additional rupee of consumption is the rate at which the government's valuation of an extra rupee is assumed to decline for every percentage rise in the

[43] Although the realism of this assumption can be questioned, it is used frequently Squire and van der Tak, *op. cit*, p. 68 and Little and Mirrlees, *op. cit*, pp. 245-246.

current level of consumption of the recipient n This parameter is the elasticity of the government's utility function with respect to consumption increases

The average levels of consumption for different groups can be estimated from objective data obtained from sources such as household budget surveys Therefore, the set of consumption weights depends upon the choice of values assumed for the subjective parameters, b and n Also, as was pointed out in the previous section, the values of b and n determine the premium placed on savings and investment as opposed to average consumption. In other words, in the approach used in chapter V, the identification of weights for the distribution and growth aspects of the appraisal depends upon the assumptions adopted regarding these two parameters One way of valuing the base level of income is to infer a value through an analysis of past government policies affecting income transfers between the government and different groups.[44] Using this approach, the base level of income will lie somewhere between the minimum level of income at which the government imposes income taxes and the maximum level at which consumers receive government subsidies

This approach does not appear useful in the case of Pakistan, however The main government subsidies to consumers, in the form of the purchase of wheat and sugar at controlled prices from ration shops, are available to all, irrespective of income Furthermore, it may be misleading to infer values for one government from the policies of a previous government, the food subsidies were introduced by the civilian government to keep down the cost of living, particularly for urban working class and low income groups The present military administration may decide to alter policies in this area The level at which income tax commences is also not useful in identifying a value for the base level. The minimum income at which income tax is paid is Rs 12,000 per year, which implies an income per family member of Rs 3,517 per year, an income considerably higher than the 1976/77 national average income of Rs 1,840 per year[45] If a value of around Rs 3,500 per year were used as the base level it would imply giving weights of more than 1.0 to consumers who are considerably better-off than the average This appears incompatible with a consistent commitment to achieve a fairer distribution of income stressed in the new fifth plan

In this study the base level of income is defined as a subsistence level, or poverty line In other words, a rupee of consumption going to someone having an income above the subsistence level is given a weight of less than 1.0, while a rupee of consumption going to an individual whose income is below the subsistence level has a weight of more than 1.0 The first draft of the fifth plan document estimated a subsistence income at Rs 400 per month at 1976 prices for a family of five, with one income earner[46] This figure was raised to mid-1977 prices by the increase in the

[44] This approach was followed by Scott, MacArthur and Newberry in their study on Kenya *Op cit*, pp 49-63

[45] When Rs 12,000 per year is adjusted for the average number of workers per household of 1 7 and the average household size of 5 8, it implies an annual income per family member of Rs 3,517 Data on households are taken from *Household Income and Expenditure Survey, 1971/72* (Islamabad, Ministry of Finance, Planning and Development, Statistical Division)

[46] *Draft Fifth Five-Year Plan, 1976-81, op. cit*, p 15 This income refers to that required to sustain a "life without privation" At this income the average rate of savings is zero or negative, therefore, the base level of income can also be termed the base level of consumption, since all income is consumed In the formula $d_i = \left(\frac{b}{c}\right)^n$, in principle b should refer to a level of consumption rather than income. Data on savings were obtained from *Household Income and Expenditure Survey, 1971/72, op. cit*

wholesale price index between January 1976 and July 1977 to give a monthly value of Rs 450 Therefore, on a *per capita* annual basis, the estimated subsistence level of income is Rs 1,080 While the exact number of persons living at or below this level is not known, evidence suggests that a substantial proportion of the population falls in that category [47]

To specify precise values for the weights given to different groups above or below the base level estimate of Rs 1,080 per year, a value is required for the elasticity parameter n The stronger the government's commitment to redistribute income, the higher will be its valuation of n. There appears to be no way of identifying a precise value for n apart from examining the weights derived from the use of alternative values to see whether they are broadly in line with government income distribution objectives. It is normally argued that values of n greater than 2 0 will be unlikely because of the very high and low weights they produce for low- and high-income groups, respectively [48] In this study a value of $n = 1$ has been used, since it produced the most readily understandable set of weights, $n = 1$ implies that if groups are differentiated by their average level of consumption, the weight placed by the government on an additional rupee of consumption will fall in direct proportion to the rise in the group's consumption In other words, a rupee of consumption received by someone in a group with an average consumption level of Rs 600 will be worth twice as much as that received by someone in a group with an average level of Rs 1,200 The implications of the choice of a particular value for n should be made clear to decision takers, and consistency should be observed in the application of a weighting system to projects If use of one value of n produces weights that are not acceptable to decision takers, another value should be applied in the appraisal of all projects Table 8 shows the sensitivity of consumption weights for different groups to different values of n, when b is taken to be Rs 1,080 per year

The average level of consumption *per capita* in 1977 was Rs 1,620, for a value of $n = 1$ this implies a weight of $d_i = 0\ 67$ In other words, one rupee of consumption going to an average consumer is equivalent to Rs 0 67 of consumption going to someone having a subsistence income Conversely, one rupee at the subsistence level is worth approximately Rs 1 5 of consumption going to an average consumer As discussed in the previous section, the choice of values for b and n specifies a value for the *numéraire* in relation to average consumption Since private savings have been assumed to equal the *numéraire*, the value of the *numéraire* in terms of an average unit of consumption gives a value equivalent to the stage-three shadow price of investment P^{inv} This relationship between investment and consumption, which implies a premium on investment of 50 per cent, is derived in the same way as the other stage-four weights, that is, from judgements on b and n It does not reflect

[47] One study has estimated that in 1971/72 around 20 per cent of the rural population and 25 per cent of the urban population had a real income on or below a poverty-line estimate Two poverty-line estimates, at 1959/60 constant prices, were used, the one for the urban areas corresponded closely with the figure of Rs 1,080 *per capita,* after an adjustment was made for the different price levels The rural estimate was rather lower than Rs 1,080, however, after the adjustment for price differences T Alauddin, "Mass poverty in Pakistan a further study", *Pakistan Development Review,* vol XIV, No 4 (1975)

[48] Squire and van der Tak, *op cit*, p 103 The authors suggest using values of $n = 1$ and testing the sensitivity of projects to values of 0 5 and 1 5 Given the uncertainty regarding the values of many other important parameters, such sensitivity testing for n was not introduced here Scott, MacArthur and Newberry, *op cit*, uses a single value of $n = 1$

TABLE 8 CONSUMPTION WEIGHTS FOR DIFFERENT GROUPS[a]

Average consumption level of group (c_i)	*Base level of income* (b)	*Value of* n		
		0.5	*1.0*	*1.5*
— *Rupees per year* —		——— *Consumption weight* (d_i) ———		
600	1 080	1.34	1.8	2.4
800	1 080	1.16	1.35	1.57
1 080	1 080	1.0	1.0	1.0
1 200	1 080	0.95	0.9	0.85
1 600	1 080	0.82	0.67	0.55
2 000	1 080	0.73	0.54	0.40
4 000	1 080	0.52	0.27	0.14
8 000	1 080	0.37	0.13	0.05

[a]Where $d_i = \left(\frac{b}{c_i}\right)^n$

estimates of the productivity of a unit of investment and judgements on the government's time preference for consumption [49]

One national parameter used at stage two must be adjusted at stage four to take account of the weighting system that has been introduced. The discount rate at stage two reflects the opportunity cost of public investment, where the returns on investment are defined in terms of the stage-two objective of efficient use of resources. At stage four, however, the relevant discount rate is the returns on the marginal public-sector project, where these returns cover the impact of the project on all the objectives included at this stage.

The stage-two discount rate has been estimated at approximately 10-12 per cent, returns on public-sector industrial projects have been used as a guide to returns on public-sector investment in general. The main groups whose incomes are likely to be most affected by a public-sector industrial project are the government and industrial workers. These income changes must be adjusted by the appropriate stage-four AFs to revalue the returns to public-sector investment to include the stage-four objectives. All government income, whether used for savings or current expenditure, has a weight of 1.0 and is not adjusted at stage four. If the increased income of industrial workers is assumed to be consumed totally, their income change must be revalued by the stage-four AF derived from the relevant consumption weight for industrial workers.

If it is assumed that government and industrial workers are the only groups whose income is affected by a public-sector industrial project, the stage-four discount rate, sometimes termed the accounting rate of interest, can be written as

$$r = (1 - g)\, q\, d_w + gq$$

[49] In this study a rising value of n means that the *numéraire* is judged to be increasingly valuable in relation to average consumption. This is the result of a judgement that bears no relation to the values of i, q and s in the formula for P^{inv}. In the calculation of P^{inv} through the formula $P^{inv} = \frac{(1 - s)q}{1 - sq}$ a rise in n reduces the value of P^{inv} because i will rise with n, since $i = ng + p$.

where

r = the stage-four discount rate

q = the stage-two discount rate, that is, the opportunity cost IRR on a public-sector industrial project

g = the proportion of the returns on the project that accrues to the government

$(1-g)$ = the proportion that accrues to workers

d_w = the stage-four weight given to the consumption gains of workers, who are assumed to have a zero savings rate

The increase in income industrial workers receive can be taken as the difference between their wages on the project and their cost at shadow prices, where the latter reflects the income they would have earned elsewhere in the absence of the project Data from the *1975/76 Census of Manufacturing Industry* cited earlier shows wages to be approximately 30 per cent of value added at market prices In the earlier discussion on the discount rate, the value added produced by industrial projects at domestic prices was assumed to be 67 per cent higher than its value at world prices, it was adjusted by a 20 per cent premium on foreign exchange, so that value added at shadow prices was approximately 80 per cent of value added at domestic prices Unskilled labour costs were assumed to be 66 per cent of total wage costs, given these assumptions wages paid to unskilled workers will be approximately 25 per cent of value added at shadow prices

The precise value of income gains per industrial worker cannot be known For the purposes of the calculation it has been assumed that only unskilled workers receive an income above what they would have earned in the absence of the project and that the gains workers receive are, alternatively, 33 per cent and 66 per cent of the market wage Since unskilled wage costs have been taken to be 25 per cent of value added at shadow prices, gains to workers are, alternatively, 8 per cent and 16 per cent of stage-two returns at shadow prices Also, since the previous consumption level of unskilled industrial workers cannot be specified, it has been assumed to lie between the base level and the national average level of consumption Using the stage-four consumption weighting system, the relevant weights are 1 0 and 0 67 for a value of $n = 1$ The values of r, calculated from the expression $r = (1-g)\,q\,d_w + gq$, for the different values of q, d_w and $(1-g)$ are given below

q (%)	10				12			
$(1-g)$ (%)	8		16		8		16	
d_w	1 0	0 67	1 0	0.67	1 0	0 67	1 0	0 67
r (%)	10	9 7	10	9 5	12	11 7	12	11 4

It can be seen that the new discount rate r is equal to only slightly less than the stage-two discount rate q If industrial unskilled workers have a consumption level equal to the base level, their consumption weight d_w equals 1 0 In this case none of the income changes by the project will be adjusted at stage four, so that the stage-two and stage-four discount rates will be equal Where industrial workers have a

consumption equal to the national average level of consumption, their weight d_w equals 0 67, so that their income changes are revalued by an AF of −33 3 per cent However, their income gains will be a small proportion of total returns on an industrial project Assuming net gains per worker of 66 per cent of the market wage, gains of workers are 16 per cent of total returns, so that applying an AF of −33.3 per cent reduces total returns on a project by only 5 per cent Even in the extreme case where all wage costs are taken as gains to workers, when d_w equals 0 67, the total returns on a project will be reduced by only 8 per cent

Although the gains per worker or their previous consumption level cannot be estimated precisely, variations within a fairly wide range clearly have only a small impact on the estimated returns on a project [50] Incorporating income-distribution considerations into the calculation of the discount rate reduces the stage-two value by less than 1 per cent given the margins of error in the original stage-two estimates it does not appear worth while to adjust these to obtain new values at stage four

In conclusion, therefore, the approach put forward here for anlaysing the distribution impact of projects is that project analysts should derive their set of weights from a judgement on the value of b, the base level of income, and on n, the elasticity of the government's utility function with respect to consumption It is suggested that b be identified through a subsistence level of income, a readily identifiable level that can be used as a *numéraire* The justification for giving weights greater or less than one depending upon the present consumption of individuals in relation to a subsistence level should be obvious The choice of value for n will depend on whether the weights derived from the use of a particular value of n, combined with a subsistence level for b, are acceptable to decision takers

The procedures for the combined stage-three/four appraisal in chapter V can be summarized as follows

(a) The values b = Rs 1,080 per year in 1977 prices and n = 1.0 are used to derive a set of consumption weights to value gains to private individuals,

(b) All government income is treated equally and has a weight of 1.0, since it is equivalent to units of the *numéraire,*

(c) All private savings are assumed to equal the *numéraire,* and therefore have a weight of 1.0 A premium on private savings in relation to average consumption is derived indirectly, since average consumption is less valuable than the *numéraire,*

(d) A discount rate of 10-12 per cent, identical to that at stage two, is used as a test rate.

[50] The previous consumption level of industrial workers is unlikely to be much above the national average, which itself is 50 per cent above the base level. In principle, non-marginal consumption weights should be applied to the gains industrial workers receive, since these are assumed to be large in relation to previous consumption levels. The use of non-marginal weights is discussed further in chapter V

In a complete treatment the consumption gains to workers in related activities such as construction also have to be taken into account.

Appendix

ADJUSTMENT FACTORS FOR NON-TRADED GOODS

The main non-traded goods examined are construction, electricity, local trade, road transport and rail transport [a] The procedure for estimating their shadow prices is as follows

(a) For each non-traded sector the value of output is disaggregated into several categories of costs plus profits These categories are traded-good inputs, non-traded-good inputs, unskilled labour, capital and surplus profits The percentage share of each category in the total value of output of the sector is estimated,

(b) An AF is estimated for each category of costs The AF for each non-traded sector as a whole is the weighted average of the AFs for each category,

(c) The foreign-exchange content of the resulting shadow price of each non-traded good is taken to be the value of inputs of traded goods into the sector as a proportion of the total shadow price

The calculations are based on poor data and a number of crude assumptions The AFs have been estimated for 1977, the base year for analysis However, the percentage shares of the different cost categories in sectoral output relate to years before 1977, for construction, electricity and local trade, data from 1969/70 have had to be used on the assumption that shares did not change between 1969/70 and 1977 In principle, the non-traded sectors examined can be disaggregated into traded goods and domestic value added, thus removing the category of inputs of non-traded goods into other non-traded goods [b] However, this proved impossible because of lack of data, and for these inputs domestic market prices have been used as a measure of their shadow prices Labour costs are assumed to cover only unskilled workers and have been revalued at the three alternative AFs based on the three assumptions regarding the shadow price of labour discussed in chapter II Finally, the AFs calculated here do not take account of the effect of expanding production of these non-traded goods on the level of savings and the distribution of income, in other words, they are relevant only for a stage-two appraisal In this analysis labour is valued at a shadow price based simply on output forgone, and surplus profits are treated as costless In the stage-four analysis in chapter IV and the stage-three/four analysis in chapter V, some, although not all, of the income effects resulting from the expansion in the production of these non-traded goods have been adjusted to take account of the weights given to the recipients of income in terms of the *numéraire* of the appraisal

Construction

The main data source for the construction sector is a revised version of the Pakistan input-output table [c] It gives estimates of the value of inputs into the sector, workers employed and capital stock for 1969/70 In the absence of further

[a] A similar analysis for a number of non-traded goods in Pakistan using data from the mid-1960s is given in I M D Little and J A. Mirrlees, *Manual of Industrial Project Analysis in Developing Countries,* vol II (Paris, OECD Development Centre, 1968), pp 222-236

[b] This approach was followed in the earlier study in Little and Mirrlees, *Manual, op. cit.*

[c] S. M Hamdani, "Structural basis of Pakistan's foreign trade" (Pakistan Institute of Development Economics, October 1977)

information, estimates of percentage shares for that year have been projected to 1977

The share of traded and non-traded material inputs in sectoral output is taken from the input-output table The share of labour cost is derived by mutliplying an estimate of the numbers of workers employed in construction in 1969/70 by an estimate of the average wage in construction in the same year[d] Capital costs are defined as the opportunity cost of capital and measured by a 12 per cent rate of return on the estimated capital stock[e] All profits above this opportunity cost of capital are classed as surplus profits

Table 9 gives the estimated share of each category in the total value of output Traded-good inputs are composed of both direct imports into the construction sector and traded goods produced domestically[f] In the absence of further data, the import duties paid on direct imports are assumed to be 25 per cent of c.i.f value, since this was approximately the average rate of indirect taxation on imports in 1975/76 The traded-good inputs produced in Pakistan are metals and metal products, their equivalent world prices are assumed to equal their domestic prices minus import duties The average rate of import duty on these items in 1975/76 was 35 per cent[g] The non-traded inputs employed in construction are valued at their domestic market prices in the absence of a more detailed disaggregation of their input structure in the input-output table Labour costs are assumed to be composed entirely of costs for unskilled workers, and three alternative shadow prices are used to value labour zero in case 1, 33 per cent of the market wage in case 2 and 66 per cent of the market wage in case 3

Not all capital employed in construction is equipment However, capital costs are a small proportion of the total value of output in the sector, and it did not appear useful to distinguish between capital items Equipment is classed as a traded good, and its shadow price is its assumed equivalent world price, domestic equipment prices are assumed to equal c.i.f prices plus import duty The average rate of duty on equipment was 20 per cent in 1975/76, and an AF based on this assumed ratio of world to domestic prices is used to convert capital costs to shadow prices Finally, surplus profits are treated as costless on the grounds that the analysis of the non-traded goods is conducted from a resource-efficiency viewpoint, and by definition surplus profits are transfer payments rather than opportunity costs Three AFs are estimated for construction, each varying with the assumed shadow price of labour

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[d]The estimate of the numbers employed in construction is taken from *Fourth Five-Year Plan, 1970/75* (Islamabad, Government of Pakistan, Planning Commission, July 1970) The employment figures in the input-output table appear unrealistically high The average wage used for construction in 1969/70 was Rs 1,625 It was estimated by inflating the average wage for construction in 1965 of Rs 1,300, cited in Little and Mirrlees, *Manual, op. cit*, according to the cost-of-living index for production workers over that period This index is given in S. Guisinger and M. Irfan, "Real wages of industrial workers in Pakistan, 1954-70", *Pakistan Development Review*, vol. XIII, No 4 (1974)

[e]The original source for the capital stock values given in the revised input-output table is A. R. Khan and A. MacEwan, "A multisectoral analysis of capital requirements for development planning in Pakistan", *Pakistan Development Review*, vol. VII, No 4 (1967)

[f]The revised input-output table does not identify direct imports into different sectors The import figures used for construction are taken from the estimated share of imports in value of sectoral output given in Little-Mirrlees, *Manual, op cit* This estimate is derived from the 1962/63 input-output table

[g]See *Monthly Statistical Bulletin*, vol. 24, March-June 1976

TABLE 9 ADJUSTMENT FACTOR FOR CONSTRUCTION

Item	*Value at 1969/70 market prices (millions of rupees)*	*Share of sectoral output (%)*		*AF (%)*		*Value at shadow prices (millions of rupees)*	*Foreign-exchange content (%)*	*Foreign-exchange value (millions of rupees)*
Traded-good inputs								
Direct imports	876 9	16 2		−20 0		701.5	100	701.5
Metals, metal products	1 396 7	25 8		−25 9		1 034 9	100	1 034 9
Non-traded-good inputs	1 006 9	18 6		0		1 006 9	0	0
Labour costs	1 082 7	20 0	*Case* 1	−100.0	*Case* 1	0	0	0
			2	−66 6	2	360.5	0	0
			3	−33 3	3	721 1	0	0
Capital costs	205 7	3 8		−17 0		170 7	100	170 7
Surplus profits	844 6	15 6		−100 0		0	0	0
Total	5 413 5	100 0			*Case* 1	2 914 0		1 907 1
					2	3 274 5		
					3	3 635 1		

$$AF = \frac{\text{Value of total costs at shadow prices}}{\text{Value of total costs at market prices}} - 1$$

Case	AF for construction (before adjustment for foreign exchange)	Foreign-exchange content of value at shadow prices
1	$\left(\frac{2\,914\,0}{5\,413\,5} - 1\right)\% = -46\,1\%$	$\frac{1\,907\,1}{2\,914\,0} = 65\%$
2	$\left(\frac{3\,274\,5}{5\,413\,5} - 1\right)\% = -39\,5\%$	$\frac{1\,907\,1}{3\,274\,5} = 58\%$
3	$\left(\frac{3\,635\,1}{5\,413\,5} - 1\right)\% = -32\,8\%$	$\frac{1\,907\,1}{3\,635\,1} = 52\%$

Note The import duty paid on imports into construction is assumed to be 25 per cent The assumed ratio of world to domestic prices is therefore $\frac{100}{125} = 0\,8$ The AF required to reduce domestic prices to world prices is $0\,8 - 1\,0 = -0\,2$ The average rate of import duty on metals is calculated to be 35 per cent, the assumed ratio of world to domestic prices is therefore $\frac{100}{135} = 0\,741$ The AF required to convert domestic prices to world prices is $0.741 - 1\,0 = -0\,259$

The domestic prices of non-traded inputs into construction are assumed to equal their shadow prices, the relevant AF is therefore zero These goods are also assumed to have a zero traded-good content in their production

The three cases given refer to different values for the shadow price of labour A shadow price of zero (case 1) gives an AF of $-1\,0$, a shadow price of 33 per cent of the market wage (case 2) gives an AF of $0\,33 - 1\,0 = -0\,66$, similarly, a shadow price of 66 per cent of the market wage (case 3) gives an AF of $0\,66 - 1\,0 = -0\,33$ Labour costs are also assumed to have a zero foreign-exchange content

The average rate of import duty on equipment is calculated to be 20 per cent Since domestic prices are assumed to equal world prices plus import duty, the ratio of world to domestic prices is $\frac{100}{120} = 0\,83$ The AF required to convert domestic to world prices is $0\,83 - 1\,0 = -0\,17$ Surplus profits are treated as a transfer payment and not a cost They therefore have an AF of -100 per cent

Electricity

The main source of data for the electricity sector is also the revised input-output table, which shows material inputs produced domestically as 29 per cent of the value of sectoral output These cannot be disaggregated into traded and non-traded inputs, since the electricity sector itself is identified as the main source of inputs to electricity The proportion of material inputs that are traded goods is likely to depend on whether the source of electricity is thermal (coal-based) or hydro The electricity AF is used only in the appraisal of the textile project in chapter V, and the feasibility report of that project states that it will receive its electricity from a thermal power station. Coal is classed as a non-traded good, and its domestic price is used to equal its shadow price All other domestically produced material inputs are treated in the same way The only traded-good inputs identified are the direct imports into the sector A crude estimate of the share of imports in sectoral output has had to be used, an average duty of 25 per cent on these imports is assumed [h]

The share of unskilled labour costs in the value of output is obtained by multiplying an estimate of the number of workers employed in the sector by an estimate of their average wage [i] These labour costs are revalued by AFs based on the three alternative values for the shadow price of unskilled labour

Capital costs are estimated as a return of 12 per cent on total capital in the sector The capital stock figure is taken from the input-output table The estimated capital costs are in fact greater than the actual profits left after the estimated wage costs have been subtracted from value added This implies either that wage costs are overestimated[j] or that electricity is being sold in the market at a price that does not permit a return on capital at the opportunity cost rate Capital in electricity is judged to be composed of 45 per cent equipment and 55 per cent buildings [k] The AF used for capital costs is therefore a weighted average of the AF for equipment used previously and the intermediate of the three AFs calculated for construction The latter was used as the relevant AF for the buildings items in capital cost The uncertainty regarding the real AF for construction clearly reduces the accuracy of the electricity AF Table 10 gives the AFs for electricity

Local trade

The input-output table is also the main source of data on local trade Since material inputs account for only 5 per cent of the total value of sectoral output, they do not receive close attention They are assumed to be non-traded items, and their domestic prices are used as their shadow prices As in the case of the other non-traded sectors, the revised input-output table gives no data on direct imports Because the material inputs are such a small proportion of the value of output in the sector, no attempt is made to identify direct imports Therefore, no traded-good inputs into the sector are shown in table 11

[h] As in the case of construction, estimated import shares were taken from the figures in Little and Mirrlees, *Manual, op. cit*

[i] Numbers employed in electricity in 1969/70 were taken from *Fourth Five-Year Plan, 1970/75, op cit* The average wage was taken to be Rs 1,932 per year, which was the average wage for industrial workers in 1969/70, given in Guisinger and Irfan, *op cit*

[j] The estimated share of labour costs in total value of output, 30 per cent, is high in comparison with the estimate for construction Also, the analysis in Little and Mirrlees, *Manual, op cit* cited earlier estimated the share of labour costs at 24 per cent

[k] Khan and MacEwan, *loc cit*, p 460

TABLE 10 ADJUSTMENT FACTOR FOR ELECTRICITY

Item	*Value at 1969/70 market prices (millions of rupees)*	*Share of sectoral output (%)*	*AF (%)*	*Value at shadow prices (millions of rupees)*	*Foreign-exchange content (%)*	*Foreign-exchange value (millions of rupees)*
Traded-good inputs	38 2	9 0	−20 0	30 6	100	30 6
Non-traded-good inputs	123 2	29 0	0	123 2	0	0
Labour costs	127 4	30 0	*Case*	*Case*		
			1 −100 0	1 0	0	0
			2 −66 6	2 42 4	0	0
			3 −33 3	3 84 8	0	0
Capital costs	263 4	62 0	−29 0	187 0	77	144 0
Total	552 2	130 0	*Case*	*Case*		174 6
			1	1 340 8		
			2	2 383 2		
			3	3 425 6		

$$AF = \frac{\text{Value of total costs at shadow prices}}{\text{Value of total costs at market prices}} - 1$$

AF for electricity (before adjustment for foreign exchange)

Case

1 $\left(\frac{340\,8}{424\,8} - 1\right)\% = -19\,8\%$

2 $\left(\frac{383\,2}{424\,8} - 1\right)\% = -9\,8\%$

3 $\left(\frac{425\,6}{424\,8} - 1\right)\% = 0$

Foreign-exchange content of value at shadow prices

Case

1 $\frac{174\,6}{340\,8} = 51\%$

2 $\frac{174\,6}{383\,2} = 46\%$

3 $\frac{174\,6}{425\,6} = 41\%$

Note The AF is derived from a comparison of the value of inputs at shadow prices with the value of sectoral output at market prices The value of inputs at market prices, Rs 552 2 million, exceeds the value of sectoral output at market prices, Rs 424 8 million, since actual profits are less than estimated capital costs at a 12 per cent return on capital

As in the case of construction, the import duty on direct imports into the electricity sector is assumed to be 25 per cent, which gives an AF for imports of −0 2

For non-traded-good inputs, domestic prices are assumed to equal shadow prices, and the items are assumed to have a zero traded-good content in their production

Labour costs are treated as in table 9

The AF for capital costs is a weighted average of the AF for equipment, −17 per cent, and the intermediate AF for construction −39 per cent, see table 9 The weights are given by the estimated share of equipment and buildings in total capital stock in electricity The foreign-exchange content of capital costs is also a weighted average of the foreign-exchange content of equipment and buildings, the estimated foreign-exchange content of construction at the intermediate AF is used as the foreign-exchange content of buildings.

TABLE 11 ADJUSTMENT FACTOR FOR LOCAL TRADE

Item	*Value at 1969/70 market prices (millions of rupees)*	*Share of sectoral output (%)*		*AF (%)*		*Value at shadow prices (millions of rupees)*	*Foreign-exchange content (%)*	*Foreign-exchange value (millions of rupees)*
Non-traded-good inputs	180 9	5	*Case*	0	*Case*	180 9	0	0
Labour	1 519 7	42	1	−100 0	1	0	0	0
			2	−66 6	2	506 1	0	0
			3	−33 3	3	1 012 1	0	0
Capital costs	578 9	16		−35 0		376 3	67	252 1
Surplus profits	1 338 8	37		−100 0	*Case*	0	0	0
Total	3 618 3	100			1	557 2		252 1
					2	1 063 3		
					3	1 569 3		

$$AF = \frac{\text{Value of total costs at shadow prices}}{\text{Value of total costs at market prices}} - 1$$

AF for local trade (before adjustment for foreign exchange)

Case

1 $\left(\frac{557\ 2}{3\ 618\ 3} - 1\right)\% = -84\ 6\%$

2 $\left(\frac{1\ 063\ 3}{3\ 618\ 3} - 1\right)\% = -70\ 6\%$

3 $\left(\frac{1\ 569\ 3}{3\ 618\ 3} - 1\right)\% = -56\ 6\%$

Foreign-exchange content of value at shadow prices

Case

1 $\frac{252\ 1}{557\ 2} = 45\%$

2 $\frac{252\ 1}{1\ 063\ 3} = 24\%$

3 $\frac{252\ 1}{1\ 569\ 3} = 16\%$

Note For non-traded items, domestic prices are assumed to equal shadow prices, and these items are assumed to have a zero traded-good content in their production.

Labour costs are treated in the same way as in tables 9 and 10

The AF for capital costs is a weighted average of the AFs for equipment and construction, the treatment is identical to that described in table 10 except that the weights given to buildings and equipment are different for the trade and electricity sectors

The number of workers in the sector is taken from the input-output table, their average wage in 1969/70 is assumed to be that for workers in miscellaneous industries [l] Labour costs are revalued at the three AFs

Capital stock in the sector is judged to be approximately 80 per cent buildings and 20 per cent other items, chiefly machinery and transport equipment [m] The total value of capital employed is taken from the input-output table, and capital costs are 12 per cent of this capital stock figure The AF for capital costs is a weighted average of the AFs for buildings and equipment, again, the intermediate AF calculated for construction is used as the AF for buildings The three AFs for local trade are given in table 11

Road transport

The input-output table does not distinguish between modes of transport and is therefore unsatisfactory as a means of identifying the input structure of transport activities Hence two separate cost studies have been used in the analysis of road and rail transport The road study gives the cost of operating a truck of a particular size over a particular distance;[n] it gives little more than a crude indication of the percentage share of items in road-transport costs.

The cost data in the study are grouped into four categories fuel and oil, vehicles, labour and others The fuel and oil costs are classed as traded-good inputs, and the category of other costs, which refers to tyre costs and overhead expenses, are classed as non-traded inputs Vehicle costs cover vehicle wear and tear and interest charges These are taken to correspond to capital costs No surplus profits can be identified from the cost study Although the actual interest rate used to compute interest charges on vehicles is not known, it is unlikely to be significantly above 12 per cent, the opportunity cost rate of return used to estimate capital costs [o]

The traded-good inputs are adjusted by an AF derived from a comparison of the domestic retail price of petrol with an estimate of the c.i f import price of petrol to Pakistan in mid-1977 [p] Because of the high domestic taxes, the domestic price is considerably above the estimated world price The capital costs are revalued by an AF derived from a comparison of the domestic retail price of a Bedford truck with its c i f import price plus an allowance for the local costs of assembly [q] Labour costs

[l]Guisinger and Irfan, *op cit* This wage was Rs 1,500 per year and was lower than that used for workers in construction and electricity The resulting share of labour costs in total value of output, 42 per cent, was none the less very high

[m]Khan and MacEwan, *loc cit*

[n]The cost data are given in the *Draft Fifth Five-Year Plan, 1976,* first version, vol. I (Islamabad, Government of Pakistan, Planning Commission), p 52 The costs refer to the operation of trucks of 4 5-ton capacity, per 1,000 miles at 40 miles per hour

[o]Cost data relate to 1974/75, in September 1974, a minimum and maximum range of rates of 10 per cent to 13 per cent was prescribed for the lending rates of commercial banks.

[p]The domestic retail price is taken from *Pakistan Economic Survey 1976/77* (Islamabad, Government of Pakistan, Finance Division, 1977) The c i.f price is based on the mid-1977 f o.b world price of petrol taken from *Monthly Bulletin of Statistics,* vol XXXI, No 12 (United Nations publication, ST/ESA/STAT/SER.Q /60) plus a 10 per cent allowance for costs of shipment to Pakistan.

[q]The data are taken from the Planning Commission, Government of Pakistan The price comparison for trucks refers to 1976 prices. The difference between import price plus cost of local assembly and final retail price is composed of import duty, local tax and profit margin

are revalued by the three alternative AFs, and the domestic prices of non-traded items are again assumed to equal their shadow prices Table 12 gives the AF for road transport

Rail transport

Cost data for rail transport are taken from a study of operations on one particular line at a particular level of traffic As was true for the road study, the cost breakdown may be unrepresentative As with electricity, the rail transport AF is mainly used in the appraisal of the textile mill project Since the rail link for the project is more likely to be based on diesel fuel than on electricity,[r] the cost of diesel traction alone is examined Costs in the study are grouped into three broad categories fuel, maintenance and locomotive costs

Fuel is composed primarily of diesel oil and is classed as a traded-good input It is expressed in shadow prices by an AF based on a comparison of the estimated c i f import price of diesel oil in 1977 with the domestic retail price in the same year[s] Maintenance costs are assumed to be divided equally between labour and non-labour costs, the latter are treated as non-traded inputs Maintenance is a relatively minor item in total costs, however Locomotive costs are treated as capital costs, it is assumed that no surplus profits are generated in the sector Locomotives are treated as traded goods, their domestic prices are taken to equal their import prices plus the average rate of duty on railway equipment imports[t] The AFs for rail transport are given in table 13 The foreign-exchange content of the rail transport sector calculated here appears to be unrealistically high However, because rail transport costs are a relatively small item in total costs of the projects examined, no attempt has been made to revise the figures for foreign exchange given in table 13

[r] *Economics of Electrification, Comparative Costs of Diesel and Electric Traction on Khanewal-Samasetta Section of Pakistan Railways* (Islamabad, Government of Pakistan, Planning and Development Division, National Transport Research Centre, February 1975)

[s] The domestic selling price of high-speed diesel oil is given in *Pakistan Economic Survey 1976/77, op cit*, the assumed c i f price to Pakistan in 1977 is based on the mid-1977 f o b prices of gas oil taken from the *Monthly Bulletin of Statistics, loc cit* plus an allowance for insurance and freight costs

[t] The average rate of duty on railway equipment imports in 1975/76 was calculated to be 29 5 per cent, *Monthly Statistical Bulletin*, vol 24, March-June 1976

TABLE 12 ADJUSTMENT FACTOR FOR ROAD TRANSPORT

Item	*Value of costs at 1975 market prices (rupees per 1 000 miles)*	*Share of costs (%)*		*AF (%)*		*Value at shadow prices (rupees per 1 000 miles)*	*Foreign-exchange content (%)*	*Foreign-exchange value (rupees per 1 000 miles)*
Traded-good inputs	521 6	25		−77 0		120 0	100	120 0
Non-traded-good inputs	250 4	12	*Case*	0	*Case*	250 4	0	0
Labour costs	354 7	17	1	−100 0	1	0	0	0
			2	−66 6	2	118 1	0	0
			3	−33 3	3	236 2	0	0
Capital costs	959 7	46		−40 0		575 8	80	460 6
Total	2 086 4	100			*Case*			580 6
					1	946 2		
					2	1 064 3		
					3	1 182 4		

$$AF = \frac{\text{Value of total costs at shadow prices}}{\text{Value of total costs at market prices}} - 1$$

AF for road transport (before adjustment for foreign exchange)

Case

1 $\left(\frac{946\ 2}{2\ 086\ 4} - 1\right)\% = -54\ 6\%$

2 $\left(\frac{1\ 064\ 3}{2\ 086\ 4} - 1\right)\% = -49\ 0\%$

3 $\left(\frac{1\ 182\ 4}{2\ 086\ 4} - 1\right)\% = -43\ 3\%$

Foreign-exchange content of value at shadow prices

Case

1 $\frac{580\ 6}{946\ 2} = 61\%$

2 $\frac{580\ 6}{1\ 064\ 3} = 55\%$

3 $\frac{580\ 6}{1\ 182\ 4} = 49\%$

Note Traded-good inputs are fuel and oil. The AF for both of these is based on a comparison of the estimated c.i.f import price of 100 octane petrol of Rs 3 6 per gallon with the domestic retail price of Rs 15 4 per gallon (1977 prices) $\left(\frac{3\ 6}{15\ 4} - 1 = -0\ 77\right)$

Non-traded inputs are valued at their domestic prices and are assumed to have a zero foreign-exchange content

Labour costs are treated as in tables 9, 10 and 11

Capital costs refer to the cost of vehicles. The AF for vehicles is derived from a comparison of the c.i.f import price plus cost of local assembly, Rs 77,960, with the retail price of Rs 129,500 $\left(\frac{77\ 96}{129\ 5} - 1 = -0\ 40\right)$ These prices are for NJM Bedford trucks in 1976/77

The c.i.f price of the truck is approximately 80 per cent of the estimated cost of Rs 77,960, and the foreign-exchange content of the capital cost is therefore shown as 80 per cent

TABLE 13 ADJUSTMENT FACTOR FOR RAIL TRANSPORT

Item	*Value of costs at 1975 market prices (millions of rupees)*	*Share of costs (%)*		*AF (%)*		*Value at shadow prices (millions of rupees)*	*Foreign-exchange content (%)*	*Foreign-exchange value (millions of rupees)*
Traded-good inputs (fuel)	98 983	45		−37 0		62 359	100	62 359
Non-traded-good inputs	6 599	3	*Case*	0	*Case*	6 599	0	0
Labour costs	6 599	3	1	−100 0	1	0	0	0
			2	−66 6	2	2 197	0	0
			3	−33 3	3	4 395	0	0
Capital costs	107 781	49		−23 0	*Case*	82 991	100	82 991
Total	219 962	100			1	151 949		145 350
					2	154 146		
					3	156 344		

$$AF = \frac{\text{Value of total costs at shadow prices}}{\text{Value of total costs at market prices}} - 1$$

AF for rail transport (before adjustment for foreign exchange)

Case

1 $\left(\frac{151\,949}{219\,962} - 1\right)\% = -30\,9\%$

2 $\left(\frac{154\,146}{219\,962} - 1\right)\% = -29\,9\%$

3 $\left(\frac{156\,344}{219\,962} - 1\right)\% = -28\,9\%$

Foreign-exchange content of value at shadow prices

Case

1 $\frac{145\,350}{151\,949} = 96\%$

2 $\frac{145\,350}{154\,146} = 94\%$

3 $\frac{145\,350}{156\,344} = 93\%$

Note The AF of −37 per cent for fuel is based on a comparison between domestic retail price of high-speed diesel oil of Rs 6 35 per gallon and an estimated import price of Rs 4 0 per gallon $\left(\frac{4\,0}{6\,35} - 1 = -0\,37\right)$

The domestic prices of non-traded goods are assumed to equal their shadow prices, again a zero foreign-exchange content is assumed

Labour is treated as in the previous four tables

The AF for locomotives is based on a comparison between assumed c i f import prices and domestic prices, the average rate of import duty on locomotives in 1975/76 is 29 5 per cent Domestic prices are assumed to be 29 5 per cent higher than c i f import prices, the AF used is −23 per cent, since $\left(\frac{1\,0}{1\,29} - 1 = -0\,23\right)$

III. THE POLYESTER PROJECT

BACKGROUND

Polyester is one of the man-made fibres that can be blended with natural fibres—cotton, wool or silk to produce blended fibres Two main forms of polyester fibre are used in Pakistan polyester staple fibre (PSF) and polyester filament yarn The first is blended with raw cotton in the cotton textile industry and the second is woven with raw silk in the art-silk sector

The only man-made fibres produced at present in Pakistan are small quantities of nylon and rayon All polyester is imported It is difficult to establish the exact quantity imported because a high proportion is smuggled into the country, chiefly through Afghanistan, to avoid the payment of import duties A rough estimate of total imports (recorded and unrecorded) over the period 1970/71-1976/77 is given below (tons)[1]

1970/71	1 125
1971/72	3 305
1972/73	4 358
1973/74	6 040
1974/75	6 600
1975/76	6 650
1976/77	23 000

Although the figures are fairly crude estimates, there appears to be general agreement that in the mid-1970s total use of polyester in Pakistan was only around 6,000-7,000 tons per year, a very low figure for a major cotton textile producing economy The apparent explanation is that textile mills in Pakistan were much slower than mills elsewhere to switch to production of blends of cotton and polyester,[2] and this delay has put the Pakistan industry at a disadvantage in selling to world markets [3]

[1] Data from the revised PCI document on the polyester project. The original project document was prepared in September 1974, a revised version was produced in July 1977 The relationship between the data used in this study and the revised version is discussed in detail in the appendix to this chapter Henceforth the revised version will be referred to as the PCI document.

[2] It has been estimated that in 1975 only 3 per cent of total spindles in the cotton textile industry in Pakistan were capable of handling polyester, as compared with 25 per cent in the industries of some developed countries. Data supplied by the Government of Pakistan, Planning Division

[3] The All-Pakistan Textile Mills Association has commented " the new trends point towards blended goods, and therefore machinery required for producing blends must receive top priority , we also failed to jump the quota restrictions on cotton textiles by exporting blended fabrics to the developed world. Our competitors have been far ahead of us in reacting quickly to the changing demands of the world cotton situation" All-Pakistan Textile Mills Association, *Annual Report 1976*, p 23

The data on imports indicate a substantial increase in 1976/77, which was due to the effect of poor cotton crops in two successive years [4] Because cotton prices rose considerably and there were shortages of raw cotton, some mills switched to the blending of PSF with cotton [5] Many of the small-scale cotton-weaving units switched to the production of art-silk products, which increased substantially the demand for filament yarn [6]

Plans to establish a polyester plant in Pakistan were already under discussion in the early 1960s, but only in 1975 was a proposal for a public-sector plant to produce annually 10,000 tons of PSF and 2,000 tons of filament yarn approved This plant was small by world standards, but a larger scale of production did not appear to be justified by the existing size of the market Subsequently Imperial Chemical Industries (ICI) Pakistan put forward to the Government a proposal for a second polyester plant This proposal was finally approved in 1977 Thus in the next few years two plants for the production of polyester will come on-stream

As yet the situation regarding demand for polyester remains unclear, the level of demand in the future will be determined by the availability and price of cotton, the speed at which cotton textile mills adapt existing machinery to produce blended fabrics, the rate at which new machinery designed to handle man-made fibres is installed, and the extent to which the small-scale art-silk sector expands The company responsible for the new public-sector polyester plant estimates that in 1977 approximately 300,000 spindles in the cotton textile industry, roughly 11 per cent of total working spindles, were capable of using PSF [7] If all these spindles were to spin PSF, annual demand would be around 11,000 tons [8] The fifth plan contained a substantial expansion and modernization programme for the cotton textile industry, new projects containing a total of 0 87 million spindles were sanctioned and due for completion over the period 1977-1983 [9] An extra 0 25 million spindles capable of handling PSF would create an extra annual demand of 9,200 tons, an extra 0 4 million spindles would raise annual demand by 14,720 tons, and an extra 0 6 million spindles would raise demand by 22,080 tons [8]

For filament yarn, the growth of demand will be linked to the number of new looms installed in the art-silk sector In 1977, the import quota for filament yarn was set at 110 kg per loom per quarter It was estimated that in 1977 approximately 30,000 looms were operating in the sector,[10] giving a potential import demand of 13,200 tons of filament yarn per year, which is considerably above the planned capacity of the public-sector project to produce filament yarn

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[4] Total cotton production fell from 3 5 million bales in 1974/75 to 2 9 million in 1975/76 and 2 4 million in 1976/77 *Pakistan Economic Survey, 1976/77* (Islamabad, Government of Pakistan, Finance Division, 1977)

[5] "During the year under review we were faced with an acute shortage of raw cotton, and the industry of its own accord imported large quantities of man-made fibres to keep the industry going Mills which could not utilize man-made fibres for want of necessary equipment had to close down partially as not enough cotton was readily available" All-Pakistan Textile Mills Association, *Annual Report, 1976, op cit*, p 23

[6] PCI document, p 3

[7] In 1977, 2 8 million spindles, out of a total installed capacity of 3 6 million, were operating Data obtained from All-Pakistan Textile Mills Association

[8] On the basis of 4 oz of PSF per spindle day and 330 working days per year

[9] Government of Pakistan, Industrial Sub-Sector for the Fifth Plan 1977-83, *Report of the Expert Working Group on Textiles* (Karachi, Printing Corporation of Pakistan Press, 1977)

[10] *Report of the Expert Working Group on Textiles, op cit*

THE PROJECT

The project examined here is the public-sector polyester plant Its planned capacity output has been revised above the original levels, and the plant will have a rated capacity of 11,880 tons of PSF and 2,970 tons of filament yarn per year Commercial production is expected to begin in 1979 The project is located in an industrial estate approximately 15 miles outside Karachi, the centre of the textile industry A location near Karachi was chosen, since the imported inputs would enter Pakistan through the port of Karachi and many of the users of PSF would be located in the area

While the domestic production of PSF and filament yarn substitutes for imports of these items, the production process depends heavily on imports All the machinery and the two main raw material inputs, terephthalic acid (TPA) and ethylene glycol (EG), must be imported Both the final products of the project and the raw material inputs receive considerable tariff protection In mid-1977, PSF and filament yarn were subject to a 60 per cent import duty, plus a 10 per cent tax on the total of their c i f import price and import duty TPA and EG were subject to a 35 per cent import duty [11] These duties were largely responsible for pushing the domestic selling prices of these goods above their c.i f import prices Table 14 gives a comparison of domestic and import prices for the output and the two main material inputs of the project The c i f import prices to Pakistan in mid-1977 for PSF and filament yarn

TABLE 14 COMPARISON OF WORLD AND DOMESTIC PRICES FOR THE MAIN PROJECT OUTPUTS AND INPUTS, MID-1977

(Rupees per pound)

Input	*World price (c i f Karachi)*	*Domestic market price*	
PSF	5 0	Price received by project	10 0
Filament yarn	15 0	Price received by project	29 0
TPA	2.4	C.i.f price	2 4
		Import duty	0 8
		Price paid by project	3 2
EG	2.7	C i.f price	2 7
		Import duty	0 9
		Price paid by project	3 6

Source Project authorities.

Note Import prices for PSF and filament yarn were estimated by the project management The domestic market prices of Rs 10.0 and Rs 29 0 per lb are taken from the revised PCI document, these are the prices to be paid to the project for domestic sales of PSF and filament yarn

The price paid by the project for TPA and EG is the landed cost value of the items inclusive of import duty

The cost of port handling and transport to the project site for TPA and EG is given in the PCI document as approximately 8 per cent of the c i.f value of these items The prices paid by the project shown above exclude these costs, which are entered separately in table 17 under "Other costs of material inputs"

[11] PCI document on polyester plant

were Rs 5 0 per lb and Rs 15 0 per lb, respectively The prices for TPA and EG were the most competitive prices quoted to the company by prospective suppliers Both prices were for purchase in drums [12]

All prices used in the appraisal are in constant mid-1977 values No attempt has been made to forecast the future movements of the world prices of PSF, filament yarn, TPA and EG in relation to inflation In other words, the mid-1977 c i f prices are projected over the life of the project on the assumption that the rise in their values at current prices will be in line with inflation in Pakistan However, world prices of PSF and filament yarn have been stable in recent years, apparently owing to the depressed state of the world textile industry Therefore, their prices have not kept up with inflation, either internationally or in Pakistan [13] Table 15 gives the relevant data on past world prices

Because of the low level of international demand for these fibres, sensitivity analysis has been applied to test the effect of reductions in the relative price of the project outputs on the net worth of the project

Data on capital costs and the operations of the project are discussed in detail in the appendix to this chapter The data given in the revised PCI document have been amended in the light of additional information obtained from the project authorities The main change has been to assume a phased build-up of capacity working Production is assumed to begin in year 4 of the project's life, and utilization rates are taken to be (per cent) year 4, 60, year 5, 70, year 6, 80, and year 7, 90

Since this plant will be the first of its kind in Pakistan, technical and marketing problems may keep output below full capacity over the entire working life of the plant [14] To test the sensitivity of the appraisal results to these assumptions regarding capacity utilization, two additional cases are examined, one where production reaches full capacity from year 7 onwards and the other where it remains at 80 per cent of capacity

APPRAISAL OF THE PROJECT

The polyester project has been appraised using the approach of the *Guide*. The analysis has been taken only to stage two, however, in other words, the project has been appraised to take account of its impact on the efficient allocation of resources The government objectives of growth and income redistribution, which are incorporated at stages three and four, respectively, have not been considered in this analysis

[12] In the case of EG, bulk purchase is an option that offers a reduction of 25 per cent below the non-bulk c.i.f price. This possibility has not been considered in the appraisal of the project, since bulk purchase would involve the construction of a bulk terminal. No estimates of the costs of such a terminal are available, and the revised PCI document is based on the assumption of non-bulk purchases. Therefore, because the effect of bulk purchases of EG could not be assessed realistically in the absence of data on investment costs involved, this possibility has been ignored. At the time of writing it was not known whether the bulk-purchase option would in fact be pursued by the project

[13] It has been estimated that owing to lack of demand during 1976 and 1977, synthetic fibre plants in Western Europe were operating at 60-70 per cent of capacity, *European Chemical News*, various issues.

[14] The PCI document assumed 100 per cent capacity utilization from the first full year of production.

TABLE 15 WORLD YARN PRICE AND INFLATION, 1970-1977

A. World prices for PSF (1.5 denier) and filament yarn (75 denier)

(Cents/lb)

Year	*PSF*	*Filament yarn*	
1970	61	1975	103
1971	62	1976	107
1972	61	1977 (July)	105
1973	61		
1974	61		
1975	58		
1976 (Jan.)	58		

Source Monthly Bulletin of Statistics, vol XXXI, No 12 (United Nations publication, ST/ESA/STAT/SER Q /60), p 165

B. Inflation in Pakistan and internationally

Pakistan general consumer price index 1969/70 = 100		*Unit value index manufactured goods exports from developed countries 1970 = 100*	
1970/71	105 7	1973	133
1971/72	110 7	1974	162
1972/73	121 4	1975	182
1973/74	157 8	1976	183
1974/75	199 9		
1975/76	232.2		
July 1976	228 2		

Sources Pakistan Economic Survey, various issues (Government of Pakistan, Finance Division), *Monthly Bulletin of Statistics,* vol XXXI, No 12 (United Nations publication, ST/ESA/STAT/SER Q /60), p XXIV

Stage one

All the outputs and inputs of the project are valued at their domestic market prices Thus, the prices of all items include duties and taxes The outputs PSF and filament yarn are valued at Rs 10 and Rs 29 per lb, respectively Similarly, the material inputs TPA and EG are valued at Rs 3 4 and Rs 3 8 per lb, respectively These are the domestic market prices used in the PCI document Following the procedure outlined in the *Guide,* two cash flows, real and financial, are used Table 16 gives the real cash flow, relating to the physical transactions associated with the project Operating profit is the difference between the value of sales and operating costs, before interest charges and taxes are deducted It is shown in more detail in table 17, from that table the relative importance of various items for operating profit can be seen The material inputs TPA and EG are by far the most important items, direct labour costs are relatively insignificant It should also be noted that filament yarn provides over 40 per cent of total revenue, despite being only 20 per cent of total tonnage produced

TABLE 16 STAGE-ONE CASH FLOW–REAL

(Millions of rupees)

Item	Year															
	0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
1 Net cash flow – real (1 1 –1 2.)	–46 1	–138 5	–103 8	–33 0	103 5	161 3	187 3	213 5	219 8	219 8	219 8	219 8	219 8	219 8	219 8	322 3
1 Sources																
1/ Operating profit BIT[a]					141 3	167 6	193 6	219 8	219 8	219 8	219 8	219 8	219 8	219 8	219 8	219 8
2/ Terminal value[a]																102 5
2 Uses																
1/ Current assets[a]																
/1 Inventories					37 8	6 3	6 3	6 3								
.2/ Fixed assets[a]																
/1 Land	0 7	2.1	1 6													
/2. Buildings	4 9	14.7	11 0	33 0												
/3 Equipment	38.7	116 2	87 1													
/4 Other	1.8	5 5	4 1													

[a] Supporting documentation is provided in tables 17, 18, 19 and 20

TABLE 17 OPERATING PROFIT BIT

(Millions of rupees)

Item	Year				Present value at		
	4	*5*	*6*	*7-15*	*10%*	*15%*	*20%*
1 1 1/ Operating profit (/1 –/2.)	141 3	167 6	193 6	219 8	1 024 4	701 3	497 0
/1 Sales at market prices	*275.4*	*321 3*	*367 2*	*413.1*	*1 937 8*	*1 328.1*	*942.5*
1 PSF	159 7	186 3	212.9	239 5	1 123 5	770 0	546.4
2 Filament yarn	115 7	135 0	154 3	173 6	814.3	558.1	396 1
/2. Costs (1 + 2. + 3)	*134.1*	*153. 7*	*173.6*	*193 3*	*913 4*	*626.8*	*445.5*
1 Material inputs	105 5	123.0	140 7	158.2	742.1	508 6	361 0
1/ TPA	65 9	76 8	87 8	98 7	463 1	317 4	225 3
2/ EG	28.8	33 6	38 4	43 2	202.6	138 9	98 6
3/ Packing materials	2.6	3 0	3 5	3 9	18 3	12.5	8 9
4/ Others	8 2	9 6	11 0	12 4	58 1	39 8	28 2
2 Operating expenses	20 8	22 9	25 1	27 3	131 4	90 4	64 5
1/ Fuel, water and power	8.4	9 8	11 2	12 6	59 1	40 5	28.7
2/ Labour	4 1	4 1	4 1	4 1	21 0	14 6	10 5
3/ Maintenance	3 8	3 8	3 8	3 8	19 5	13 5	9 8
4/ Distribution and marketing	4.5	5 2	6 0	6 8	31 8	21 8	15 5
3 Overheads	7 8	7 8	7 8	7 8	39 9	27 8	20 0
1/ Production	2 0	2 0	2.0	2.0	10 2	7 1	5 1
2/ Administration	5 8	5 8	5 8	5 8	29 7	20 7	14 9

Details on the terminal value are given in table 18 Inventories are the only form of working capital included as a cost in the real cash flow A breakdown of the stocks of goods involved is given in table 19 The various elements in the capital costs of the project, land, buildings, equipment and others are shown in more detail in table 20

The financial cash flow of the project is given in table 21 This cash flow is of interest when the income-distribution effects of a project are considered This project is analysed only up to stage two, and its financial cash flow is shown for illustrative purposes [15]

The results of the stage-one appraisal of the project at market prices are given in table 22, only the present value figures from the real cash flow have been shown Three discount rates, 10 per cent, 15 per cent and 20 per cent have been used, and the NPV of the project net cash flow given in the first row of the table is positive at each of these, the project has an IRR of approximately 32 per cent This rate of return is considerably higher than market rates of interest in Pakistan,[16] and in an appraisal at market prices the project is clearly justified

Stage two

The *Guide* suggests that a stage-two appraisal be conducted in two parts In the first, AFs are applied to the market prices of all commodities to express them in shadow prices [17] The results are described as preliminary economic values In the second part, the foreign-exchange component of goods is revalued by the foreign-exchange AF to allow for any divergence of the official price of foreign

TABLE 18 TERMINAL VALUE

(Millions of rupees)

Item	*Year 15*	*Present value at*		
		10%	*15%*	*20%*
1 1 2/ Terminal value				
/1 Inventories[a]	56 5	13 5	6 9	3 7
/2 Resale of equipment and buildings[b]	46 0	11 0	5 6	3 0
	102 5	24 5	12 5	6 7

[a] All inventories are assumed to be available for resale at the end of the project's life

[b] The scrap or resale value of equipment and buildings is estimated arbitrarily at 15 per cent of the original total value of these items at market prices Since equipment costs are approximately 80 per cent of the original total value, the resale value of equipment is taken to be 80 per cent of the resale value of equipment and buildings

[15] The financial plan for the project is partly hypothetical, since the appraisal assumes an increase in costs in real terms above those given in the PCI document, sources of finance have to be assumed for these additional costs Discussions with the project management revealed that the PCI cost figures were underestimates

[16] See the discussion in chapter II on interest rates in Pakistan

[17] As we have seen, the AF of an item is defined as $\left(\frac{\text{shadow price}}{\text{market price}} - 1\right)$ per cent

TABLE 19 CURRENT ASSETS

(Millions of rupees)

Item	Year				Present value at		
	4	*5*	*6*	*7*	*10%*	*15%*	*20%*
1 2 1/ Current assets							
/1 Inventories							
1 TPA	18 3	3 0	3 0	3 0	17 6	14 4	11 9
2 EG	8 1	1 4	1 4	1 4	7 9	6 5	5 3
3 Other costs of material inputs	2 3	0 4	0 4	0 4	2 2	1 8	1 5
4 Packaging materials	0 3	0 05	0 05	0 05	0 3	0 2	0 2
5 PSF	5 1	0 8	0 8	0 8	4 8	3 9	3 3
6 Filament yarn	3 7	0 6	0 6	0 6	3 6	2 9	2 4
	37 8	6 2	6 2	6 2	36 4	29 7	24 5

Note Inventory requirements are given in the PCI document as follows

IPA and EG—three months' supply
Packing materials—one month's supply
PSF and filament yarn—half a month's output

The value of total stocks of items in a year is calculated as a percentage of the value of the item, for example, the value of TPA and EG stocks in year 4 is 25 per cent of the total cost of these two items in year 4 The total value of stocks held rises with output, until year 7, when the capacity utilization rate is assumed to remain constant

The port handling and costs of transporting TPA and EG to the project are shown under the heading "Other costs of material inputs"

TABLE 20 FIXED ASSETS

(Millions of rupees)

Item	Year				Present value at		
	0	*1*	*2*	*3*	*10%*	*15%*	*20%*
1 2 2/ Fixed assets							
/1 Land	0 7	2 1	1 6		3 9	3 7	3 6
/2 Buildings	4 9	14 7	11 0	33 0	52 1	47 7	43 9
/3 Equipment							
1 Local[a]	3 7	11 0	8 3		20 5	19 5	18 6
2 Imported	29 7	89 4	66 9		166 2	158 0	150 6
3 Import duty	5 3	15 8	11 9		29 5	28 0	26 7
/4 Others[b]	1 8	5 5	4 1		10 2	9 7	9 2

[a] Including port charges, transport costs to the site and installation expenses

[b] Refers to miscellaneous capital cost items

TABLE 21 STAGE-ONE CASH FLOW–FINANCIAL

(Millions of rupees)

Item	Year															
	0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
2 Net cash flow – financial	46 1	138 5	103 8	33 0	103 5	−161 3	−187 3	−213 5	−219 8	−219 8	−219 8	−219 8	−219 8	−219 8	−219 8	−322 3
1 Sources																
1/ Borrowings[a]	46 1	78 5	103 8	33 0												
2/ Equity[b]		60 0														
2 Uses																
1/ Working capital[c]																
/1 Cash and receivables					13 2	2 2	2 2	2 2								
2/ Debt service[d]					26 2	26 2	26 2	26 2	26 2	26 2	26 2	26 2	26 2	26 2	26 2	26 2
3/ Deductions[e]					6 4	8 3	10 3	12 3	12 3	12 3	12 3	12 3	12 3	12 3	12 3	12 3
4/ Taxes[f]					43 1	56 7	69 9	83 2	83 2	83 2	83 2	83 2	83 2	83 2	83 2	83 2
5/ Dividends and retained earnings[g]					14 6	67 9	78 7	89 6	98 1	98 1	98 1	98 1	98 1	98 1	98 1	200 6

[a] The project will receive loans from a number of sources at interest rates of 8-13 per cent The total loans shown here are higher than those given in the PCI document because the capital costs used in this appraisal are higher than those in the PCI The appendix to this chapter gives further details of the assumptions regarding capital costs

[b] All equity in the company will be owned by Pakistan nationals, the PCI document states that 60 per cent of equity will be owned by the Government

[c] Refers to the cash and receivables held by the project These items are taken to increase in proportion with the increase in capacity utilization

[d] Covers the repayment of the interest and principal on the various loans Because of inflation over the life of the project, the real rate of interest will be low or negative In this appraisal a rate of inflation of 10 per cent per year and a nominal interest rate of 13 per cent on all loans are assumed, therefore, the real rate of interest paid by the project is only 3 per cent per year The choice of inflation rate is arbitrary, an inflation-adjusted interest rate is included simply to illustrate the effect of inflation on the financing of a project Since a distribution analysis has not been conducted on the project, the value of the real interest charges paid by the project does not affect the results of the appraisal A total loan of Rs 261 4 million repaid over a 12-year period at an interest rate of 3 per cent gives an annual debt service cost of Rs 26 2 million

[e] Refers to payments to the work force of the project through bonuses and payments to a welfare and profit-sharing fund These are calculated at 7 5 per cent of operating profits net of depreciation and debt service, the approximate percentage given in the PCI document, although the PCI percentage figure varies slightly from year to year

[f] Taxes on profits calculated at 55 per cent of operating profits after the deductions for depreciation, debt service and the items in (*e*)

[g] Refers to the income remaining with the project after the payment of taxes, debt service and deductions No attempt has been made to distinguish between these two uses of funds, though a distribution analysis would require such a distinction In year 15 the terminal value of the project is included in this item.

TABLE 22 STAGE-ONE APPRAISAL

Item	*NPV at* 10%	15%	20%	*IRR* (%)
1 Net cash flow – real (1 1–1 2)[a]	730 1	417 5	226 6	32
1 Sources	1 048 9	713 8	503 7	
1/ Operation profit	1 024 4	701 3	497 0	
2/ Terminal value	24 5	12 5	6 7	
2 Uses	318 8	296 3	277 1	
1/ Current assets				
/1 Inventories	36 4	29 7	24 5	
2/ Fixed assets				
/1 Land	3 9	3 7	3 6	
/2 Buildings	52 1	47 7	43 9	
/3 Equipment	216 2	205 5	195 9	
/4 Others	10 2	9 7	9 2	

[a]There was some slight rounding in the calculation of NPV of the real cash flow

exchange from its shadow price The main adjustments to the project data to move from an analysis at market prices to one at shadow prices are described below

All indirect taxes imposed on the outputs of the project are deducted from costs because they are simply transfers between one branch of government and another The taxes involved are the import duties on the imported machinery and the material inputs TPA and EG Since these taxes are deducted from the stage-one costs, they have an AF of −100 per cent

All traded goods are valued at their world prices The traded goods associated directly with the project are the imported equipment, imported inputs TPA and EG, and the final outputs PSF and filament yarn The outputs PSF and filament yarn are classed as traded goods, since the alternative to their local production by the new project is continued reliance on imports They are not import substitutes in the strict sense that imports would fall by a quantity exactly equal to their total output because in normal years the level of imports has been below the output level of the project However, the domestic market for these commodities should expand, particularly with the modernization and expansion of the textile industry, and the gain to the economy from their local production can be taken as the resources saved from not having to import to meet this future demand

The production or use of a traded commodity usually involves benefits or costs in the form of non-traded goods For example, domestic production of traded goods saves port handling and transport costs involved in moving imported items from the port to domestic consumers Similarly, the use of imported inputs by a project involves local costs in moving these items from the port to the project In the appraisal the savings in costs for non-traded goods resulting from the domestic production of PSF and filament yarn are ignored First, port handling costs are likely to be only a small proportion of the c.i f. value of the items Secondly, because the project is itself located near the port of Karachi, the cost of transporting the outputs of the project to local users is likely to be close to the cost of transporting imported supplies, thus no transport cost saving will arise as a result of the switch from imports to a domestic supplier The shadow prices of PSF and filament yarn are therefore

their c i f import prices, since the benefit from their domestic production is taken to be their value on the world market The shadow prices of the imported inputs used by the project, TPA and EG, are also their c i f import prices The costs of transporting these inputs from the port of Karachi to the project are entered as separate items and are treated in the same way as the costs of other non-traded goods

All the other project items are classed as non-traded goods The most important of these are the inputs fuel, power and water, administrative overheads, distribution and marketing expenses, and the buildings items in capital costs Non-traded items are approximately 27 per cent of the present value of total project costs at market prices In the appraisal it is assumed that the domestic market prices of these items are a satisfactory indicator of their shadow prices Non-traded goods can be valued at shadow prices in two ways If their use by a project means that they are diverted from other activities to the project under examination, the relevant shadow price will be the value of the goods to other users Their domestic selling prices inclusive of indirect taxes are often used as a measure of this value Alternatively, if their use by a project means that their production is increased in response to the extra demand created by the project, their shadow prices will be the total value of resources committed to their production

It is assumed here that domestic selling prices equal both types of shadow price, a major simplification adopted in the absence of more detailed information [18] Since the domestic prices of these goods are used as a measure of their shadow prices, their stage-one values are not adjusted at stage two, which is equivalent to using an AF of zero

In the second part of the analysis, the foreign-exchange impact of the project is revalued by the AF for foreign exchange The procedure set out in the *Guide* is to identify the foreign-exchange content in the preliminary adjusted shadow price of each item and to revalue it by the premium placed on foreign exchange The shadow prices of the traded goods produced and used by the project are their c i f import prices, since these represent the foreign-exchange benefits or costs of producing or using the items The preliminary adjusted value of these items at shadow prices therefore has a 100 per cent foreign-exchange content

Domestic production of most non-traded goods will certainly involve some indirect foreign-exchange costs Whenever a traded good is used in the production of a non-traded item, a foreign-exchange cost to the economy is created The treatment of non-traded goods in the appraisal ignores this problem through the assumption that the domestic market prices of these goods equal their shadow prices [19] The foreign-exchange component in their production is not estimated, and no foreign-exchange adjustment is made to their domestic market prices

[18] Because non-traded goods are 27 per cent of total costs it would take a 40 per cent error in their valuation to produce a 10 per cent error in total costs Some of the problems involved in the estimation of shadow prices for non-traded goods have been discussed in chapter II. The approach used here is the crudest way of valuing non-traded items.

[19] This assumption can imply either that production of these goods has a zero foreign-exchange content or that if one estimated their cost of production at shadow prices, including an adjustment for a premium on foreign exchange, the shadow price value of these items would equal their domestic market price. In chapters IV and V estimates are made of the costs of producing various non-traded items, there the foreign-exchange content of these items is adjusted by the premium on foreign exchange.

An important omission may appear to be in the treatment of unskilled labour, since the analysis makes no allowance for a shadow price of labour different from its market wage The labour element in operating costs is small, and most of the workers involved are skilled rather than unskilled, any adjustment made to this small element of total costs would have an insignificant effect on the appraisal results Unskilled labour is likely to be a more significant element in the production cost of non-traded goods used by the project The problem of how to value labour used in the production of these goods is avoided by the assumption that their domestic prices can be used to approximate their shadow prices The divergence of the shadow wage from the market wage will be incorporated in an estimate of cost of production of non-traded goods at shadow prices [20] In the absence of firm data, no adjustments have been made to the value of labour used on the project and in the production of non-traded goods The results of the appraisal do not appear to be affected significantly by this treatment of labour, however Non-traded items are 27 per cent of total costs If labour costs are assumed to be 20 per cent of production costs, and the extreme value of a zero shadow wage is used, the total costs of the project would be reduced at most by 5 per cent [21]

Table 23 gives the AFs for the traded goods associated with the project These AFs are the ratios of the c i f import prices of the items to their domestic prices minus 1 0 They are used to convert the market price of the items to their stage-two preliminary adjusted economic values The AFs relevant to the inventories and the equipment items in capital costs are weighted averages of the AFs of the components of these items The non-traded goods items are not adjusted, since their domestic prices are assumed to equal their shadow prices Table 24 gives the preliminary adjusted economic values for the real cash flow of the project

The second part of the stage-two adjustment is the allowance for the extra value placed on the foreign-exchange benefits or costs of the project All items in the cash flow are revalued by a weighted AF for foreign exchange, which is the product of the percentage of foreign-exchange content of each item and the premium on foreign exchange

The traded items—PSF, filament yarn, TPA and EG—have a foreign-exchange content of 100 per cent since their c i f import price is their shadow price Inventories have a foreign-exchange content of 90 per cent, with the remaining 10 per cent being taken up by the non-traded items, packing materials and other costs of material inputs The foreign-exchange content of equipment is the value of actual imports of equipment A zero foreign-exchange content is assumed for all non-traded items A 20 per cent premium on the value of foreign exchange above its official price is used, although sensitivity analysis is also undertaken at premiums of 15 per cent and 25 per cent The foreign-exchange adjustments to the cash flow are given in detail in table 26 for a 20 per cent premium on foreign exchange

[20] The shadow wage must be based on a worker's opportunity cost, that is, the value of the output he would have produced in an alternative occupation This output must be valued at shadow prices, including an allowance for foreign exchange, if the worker would have produced traded goods in his alternative activity Other definitions of the shadow wage incorporating savings and income-distribution considerations are not relevant at a stage-two analysis.

[21] In chapter IV the sensitivity of the project under appraisal to different values of the shadow wage is tested The assumptions adopted regarding the shadow wage have important implications for the effect of the project on regional income, so that detailed treatment of unskilled labour appears necessary in that case

TABLE 23 ADJUSTMENT FACTORS FOR TRADED GOODS (STAGE-TWO PRELIMINARY ADJUSTMENT)

Item	*World price (Rs/lb)*	*Domestic market price[a] (Rs/lb)*	*AF (%)*	*Share of total value (%)*	*Weighted average AF (%)*
Inventories[b]					−29 2
TPA	2 4	3 2	−25	48	−12 0
EG	2 7	3 6	−25	21	−5 2
Other costs of material inputs[c]			–	6	
Packing materials[c]			–	1	
PSF	5 0	10 0	−50	14	−7 0
Filament yarn	15 0	29 0	−50[g]	10	−5 0
Equipment[d]					−13 6
Local[e]			–	9 5	
Imported[f]			–	76 9	
Import duty			−100	13 6	−13 6

[a] Same as in the stage-one appraisal

[b] Details of the costs of inventories at market prices are given in table 19 There was some rounding in the calculation of the percentage shares of different items in the total value of inventories

[c] Non-traded items

[d] Table 20 gives details of equipment costs at market prices

[e] Port charges, transport costs to site and installation expenses—non-traded costs

[f] Imported equipment is valued in table 20 at its c i f import price, its shadow price The only item of equipment costs that was adjusted was import duties, since they are transfer payments they have an AF of −100 per cent

[g] Rounded to −50 per cent

The data on the project given in the tables 16-27 have been used on assumptions that have been taken to be the most realistic, as far as the project is concerned These data can be termed the base case When all the stage-two adjustments have been incorporated into the appraisal, the NPV project is Rs 41 million at a 10 per cent discount rate, Rs −55 million at 15 per cent, and Rs −109 million at 20 per cent The IRR is 12 per cent

Sensitivity analysis is used to examine how changed assumptions regarding the project data affect the results of the appraisal Four parameters are altered from the base case

(a) Capacity utilization rate for years 7-15 In the base case, case 1, it is assumed that capacity utilization will gradually increase and that from year 7 a rate of 90 per cent will be reached and maintained over the rest of the working life of the project Because of uncertainty regarding the utilization rate of the project, two alternative cases are examined in case 2, an 80 per cent capacity utilization rate is assumed for years 7-15, in case 3, 100 per cent is assumed for those years,

(b) Premium on foreign exchange In the base case the shadow price of foreign exchange is assumed to be 20 per cent above its official price However, in the discussion in chapter II it has been argued that the shadow price of foreign exchange is likely to be between 15 and 25 per cent above the official price Case 4 uses a premium of 15 per cent for foreign exchange and case 5 a premium of 25 per cent,

TABLE 24 PRELIMINARY ADJUSTMENT OF REAL CASH FLOW

Item	*Stage-one market price present value at*			*AF*	*Adjustment to cash flow at*			*Preliminary adjusted economic present values*		
	10%	*15%*	*20%*	*(%)*	*10%*	*15%*	*20%*	*10%*	*15%*	*20%*
1 Net cash flow – real (1 1–1 2)	730 1	417.5	226 6					–21 7	–88 1	–124 2
1 Sources	1 048 9	713 8	503 7					257 0	171.5	119 1
1/ Operating profit BIT[a]	1 024 4	701 3	497 0		–788 6	–540 6	383 6	235 8	160 7	113.4
2/ Terminal value										
/1 Inventories[b]	13 5	6 9	3 7	–29 2	–3 9	–2 0	–1 1	9 6	4 9	2 6
/2 Equipment and buildings[b]	11 0	5 6	3 0	0	0	0	0	11 6	5 9	3 1
2. Uses	318 8	296 3	277 1					278 7	259 6	243 3
1/ Current assets										
/1 Inventories	36 4	29 7	24 5	–29 2	–10 6	–8 7	–7 1	25 8	21 0	17 4
2/ Fixed assets										
/1 Land	3 9	3 7	3 6	0	0	0	0	3 9	3 7	3 6
/2 Buildings	52 1	47 7	43 9	0	0	0	0	52 1	47 7	43 9
/3 Equipment	216 2	205 5	195 9	–13 6	–29.5	–28 0	–26 7	186 7	177 5	169 2
/4 Others	10 2	9 7	9 2	0	0	0	0	10 2	9 7	9 2

[a] Supporting information is given in table 25

[b] The AFs for inventories and equipment are given in table 23

TABLE 25 PRELIMINARY ADJUSTMENT TO OPERATING PROFIT BIT

(Millions of rupees)

Item	*Stage-one market price present value at*			AF^a	*Adjustment to cash flow at*			*Preliminary adjusted economic present values*		
	10%	*15%*	*20%*	*(%)*	*10%*	*15%*	*20%*	*10%*	*15%*	*20%*
1 1 1/ Operating profit (/1 −/2)	1 024 4	701 3	497 0		−788 6	−540 6	−383 6	235 8	160 7	113 4
/1 Sales	*1 937 8*	*1 328.1*	*942.5*		*−955 0*	*−654.6*	*−464.5*	*982 8*	*673 5*	*478.0*
1 PSF	1 123.5	770 0	546 4	−50	−561 7	−385 0	−273 2	561 8	385 0	273 2
2 Filament yarn	814 3	558 1	396 1	−48 3	−393 3	−269 6	−191 3	421 0	288 5	204 8
/2 Costs (1 + 2.+ 3)	*913 4*	*626.8*	*445.5*		*−166.4*	*−114.0*	*−80.9*	*747 0*	*512.8*	*364.6*
1 Material inputs	742.1	508 6	361 0		−166 4	−114 0	−80 9	575 7	394 6	280 1
1/ TPA	463.1	317.4	225 3	−25	−115 8	−79 3	−56 3	347 3	238 1	169 0
2/ EG	202.6	138.9	98 6	−25	−50 6	−34 7	−24 6	152 0	104 2	74 0
3/ Packing materials	18.3	12.5	8 9	–	–	–	–	18 3	12.5	8.9
4/ Others	58 1	39 8	28 2	–	–	–	–	58 1	39 8	28 2
2 Operating expenses	131 4	90 4	64.5		–	–	–	131.4	90 4	64.5
1/ Fuel, water and power	59 1	40.5	28 7	–	–	–	–	59 1	40 5	28 7
2/ Labour	21 0	14 6	10 5	–	–	–	–	21 0	14 6	10.5
3/ Maintenance	19.5	13.5	9 8	–	–	–	–	19.5	13.5	9 8
4/ Distribution and marketing	31 8	21 8	15.5	–	–	–	–	31 8	21 8	15.5
3 Overheads	39 9	27 8	20 0		–	–	–	39 9	27 8	20 0
1/ Production	10 2	7 1	5 1	–	–	–	–	10 2	7 1	5 1
2/ Administration	29 7	20 7	14 9	–	–	–	–	29 7	20 7	14 9

[a] The AFs for PSF, filament yarn, TPA and EG are given in table 23

TABLE 26 FOREIGN-EXCHANGE ADJUSTMENT TO REAL CASH FLOW

Item	Preliminary adjusted economic present value at			Foreign-exchange			Adjustment at			Stage-two economic present value at		
	10%	15%	20%	Content (%)	Premium (%)	AF (%)	10%	15%	20%	10%	15%	20%
1 Net cash flow – real (1 1–1 2)	−21 7	−88 1	−124 2							40 7	−55 4	−109 4
1 Sources	257 0	171 5	119 1							357 2	239 6	167 1
1/ Operating profit BIT[a]	235 8	160 7	113 4				96 7	66 3	47 0	332.5	227 0	160 4
2/ Terminal value[b]												
/1 Inventories	9 6	4 9	2 6	90	20	18	1 7	0 9	0.5	11 3	5 8	3 1
/2 Equipment and buildings	11 6	5 9	3 1	80	20	16	1 8	0 9	0.5	13 4	6.8	3 6
2 Uses	278 7	259 6	243 3							316 5	295 0	276.5
1/ Current assets												
/1 Inventories	25 8	21 0	17 4	90	20	18	4 6	3 8	3 1	30.4	24 8	20.5
2/ Fixed assets[c]												
/1 Land	3 9	3 7	3 6	0	20	0	0	0	0	3 9	3 7	3 6
/2 Buildings	52 1	47 7	43 9	0	20	0	0	0	0	52 1	47 7	43 9
/3 Equipment	186 7	177 5	162 9	89	20	17 8	33 2	31 6	30 1	219 9	209 1	199 3
/4 Others	10 2	9 7	9 2	0	20	0	0	0	0	10 2	9 7	9 2

[a] Supporting information is given in table 27

[b] The foreign-exchange content of inventories is the value of all traded-good inventories at shadow prices. The only non-traded inventory items are packing materials and other costs of material inputs. Table 19 shows that at a 10 per cent discount rate their present value at market prices is Rs 2 5 million Since they are non-traded goods their shadow prices are taken to equal their market prices The value of these non-traded items of inventories at shadow prices is approximately 10 per cent of the total value of inventories, since at a 10 per cent discount rate the total value of inventories at shadow prices is Rs 25 8 million Traded goods are therefore 90 per cent of the value of inventories The foreign-exchange content in the terminal value of equipment and buildings is the resale value of equipment, since it is a traded item It was assumed that the resale value of equipment was 80 per cent of the total resale value of the project, see table 18

[c] The foreign-exchange content of the equipment item in fixed assets is the import value of plant and machinery The local cost item shown in table 20 refers to the cost of transport and installation of equipment The import value of equipment is shown in table 20 under the heading imported equipment, at a 10 per cent discount rate it is Rs 166 2 million, which is 89 per cent of the total value of equipment at shadow prices, Rs 186 7 million This latter figure is the total value of equipment at market prices minus import duty All non-traded items are treated as if they have a zero foreign-exchange content

TABLE 27 FOREIGN-EXCHANGE ADJUSTMENT TO OPERATING PROFIT

Item	Preliminary adjusted economic present value at			Foreign-exchange			Adjustment at			Stage-two economic present value at		
	10%	15%	20%	Content (%)	Premium (%)	AF (%)	10%	15%	20%	10%	15%	20%
1 1 1/ Operating profit (/1 −/2)	235 8	160 7	113 4				96.7	66.3	47.0	332.5	227.0	160.4
/1 Sales	*982 8*	*673 5*	*478 0*				*196 6*	*134 7*	*95 6*	*1 179 4*	*808 2*	*573 6*
1 PSF	561 8	385 0	273 2	100	20	20	112 4	77 0	54 6	674 2	462 0	327 8
2 Filament yarn	421 0	288 5	204 8	100	20	20	84 2	57 7	41 0	505 2	346 2	245 8
/2 Costs (1+ 2+ 3)	*747 0*	*512 8*	*364 6*				*99 9*	*68 4*	*48 6*	*846 9*	*581 2*	*413 2*
1 Material imputs	575 7	394 6	280 1				99 9	68 4	48 6	675 6	463 0	328 7
1/ TPA	347 3	238 1	169 0	100	20	20	69 5	47 6	33 8	416 8	285 7	202 8
2/ EG	152 0	104 2	74 0	100	20	20	30 4	20 8	14 8	182 4	125 0	88 8
3/ Packing materials	18 3	12 5	8 9	–	20	–	–	–	–	18 3	12 5	8 9
4/ Others	58 1	39 8	28 2	–	20	–	–	–	–	58 1	39 8	28 2
2 Operating expenses	131 1	90 4	64 5							131 4	90 4	64 5
1/ Fuel, water and power	59 1	40 5	28 7	–	20	–	–	–	–	59 1	40 5	28 7
2/ Labour	21 0	14 6	10 5	–	20	–	–	–	–	21 0	14 6	10 5
3/ Maintenance	19 5	13 5	9 8	–	20	–	–	–	–	19 5	13 5	9 8
4/ Distribution and marketing	31 8	21 8	15 5	–	20	–	–	–	–	31 8	21 8	15 5
3 Overheads	39 9	27 8	20 0							39 9	27 8	20 0
1/ Production	10 2	7 1	5 1	–	20	–	–	–	–	10 2	7 1	5 1
2/ Administration	29 7	20 7	14 9	–	20	–	–	–	–	29 7	20 7	14 9

(c) Increase in capital costs The base case assumes that the final capital costs of the project will be 10 per cent above the estimates in the PCI [22] Case 6 assumes an increase of 20 per cent and case 7 one of 5 per cent,

(d) World price of outputs As mentioned above, the world market for synthetic fibres has been depressed in recent years The base case simply projects the mid-1977 world prices for PSF and filament yarn over the operating life of the project The sensitivity of the appraisal to a fall in the world price of these outputs in relation to all other prices affecting the project is tested Case 8 assumes a 5 per cent relative fall in the price of project outputs and case 9 a 10 per cent fall

Table 28 shows that the project is most sensitive to changes in the world price of PSF and filament yarn In both case 8 and case 9, the IRR of the project is below 10 per cent The appraisal is not very sensitive to the shadow price of foreign exchange within the range of values used In case 4, at the lowest premium on foreign exchange of 15 per cent, the IRR is 11 per cent An increase in capital costs, case 6, and a reduction in the capacity utilization rate achieved over the life of the project, case 2, both reduce the IRR to 10 per cent Only in case 3, at full capacity working over most of the project's operating life, does the IRR rise above 12 per cent

TABLE 28. SENSITIVITY ANALYSIS OF STAGE-TWO APPRAISAL

	Assumptions				*NPV (millions of rupees)*		
Case	*(1) Utilization rate years 7-15[a] (%)*	*(2) Premium on foreign exchange[b] (%)*	*(3) Extra capital cost[c] (%)*	*(4) Change in world price of outputs[d] (%)*	*10%*	*15%*	*Internal rate of return (%)*
1	90	20	10	0	41	−55	12
2	80	20	10	0	9	−75	10
3	100	20	10	0	72	−35	13
4	90	15	10	0	25	−63	11
5	90	25	10	0	56	−47	12
6	90	20	20	0	16	−77	10
7	90	20	5	0	53	−44	12
8	90	20	10	−5	18	−96	< 10
9	90	20	10	−10	−77	−136	< 10

[a] The same utilization rates are assumed for the build-up of production in years 4-6

[b] Three alternative premiums of 15 per cent, 20 per cent and 25 per cent are used Details of the foreign-exchange adjustment to the cash flow are given in table 26 for a 20 per cent premium only

[c] Refers to the assumption used regarding the additional real cost of the project above that given in the PCI document

[d] Refers to the assumption used regarding the future relative prices of PSF and filament yarn, zero change implies that their prices will move in line with inflation

[22] This increase reflects the use of additional resources, and not simply inflation, see the appendix to the chapter

CONCLUSIONS

The stage-two appraisal follows the simple procedure of substituting world prices for domestic prices for the main inputs and outputs of the project and expressing the foreign-exchange value of these items in domestic prices at a shadow exchange rate above the official rate Case 1, taken as representing the most likely set of outcomes for the project, has been appraised at both market and shadow prices The returns to the project at market prices are considerably higher than the returns calculated in the stage-two appraisal The IRR of the project is approximately 32 per cent at stage one, as opposed to 12 per cent at stage two A comparison of the NPVs is given below (millions of rupees)

	NPV at		
	10%	*15%*	*20%*
Stage one	730	417	227
Stage two (preliminary adjusted)	−22	−88	−124
Stage two	41	−55	−109

The major explanation for this divergence of private from economic profitability is the import tariffs imposed on the outputs and key inputs of the project As we have seen, import duties are 60 per cent of the c i f value of the outputs PSF and filament yarn and 35 per cent of the c i f value of the inputs TPA and EG These duties combine with indirect taxes and domestic mark-ups to raise the domestic selling prices of these items above their import prices These domestic selling prices are the prices relevant to the private or commercial appraisal of the project undertaken at stage one of the analysis The high rate of effective protection enjoyed by the project is a major factor in its high private profitability However, at stage two, traded goods are valued at their opportunity costs, that is, their import prices, and import duties and indirect taxes are subtracted from the prices at which these goods sell domestically Since the rate of import duty is higher on the project outputs than on its inputs, the deduction of these duties decreases the revenue, or benefit, side of the cash flow proportionately more than the cost side

This reduction in the profitability of the project is partially offset by the premium given to foreign exchange As we have seen, the official price of foreign exchange in Pakistan has been estimated to be below the contribution of additional units of foreign exchange to the economy In other words, additional units of foreign exchange have a value greater than the official exchange rate This means that all the foreign-exchange effects of a project, both positive through earning or saving foreign exchange and negative through the use of foreign exchange, must be adjusted to allow for this premium

The project has a significant number of foreign-exchange effects, since its outputs are traded goods, whose domestic production is assumed to save the economy the import cost of equivalent items, and its main inputs are imported and therefore involve a direct foreign-exchange expenditure It has also some indirect foreign-exchange effects, since the production of certain domestically produced goods, which themselves have no direct foreign-exchange value, will require some foreign exchange It is not possible to allow for these indirect foreign-exchange effects, however Because all the outputs of the project involve foreign-exchange benefits, while not all the costs are foreign-exchange costs, the inclusion of a 20 per cent premium on the value of foreign exchange raises the net worth of the project The unadjusted preliminary stage-two NPVs for the project can be contrasted with

the final NPVs when the adjustment for foreign exchange has been incorporated into the appraisal

To determine the acceptability of the project, its IRR can be compared with the estimated returns on marginal public-sector projects in Pakistan In chapter II, a range of 10-12 per cent was put forward as a crude measure of the opportunity cost of additional investment, although the uncertainty regarding the value of this parameter was stressed

In comparison with a range of test rates of discount of 10-12 per cent, the base case (case 1) appears marginal, since it has an IRR of 12 per cent The conditions required for an IRR above the test range are full capacity operation for most of the life of the project and no reduction in the relative price of the project's outputs (case 3) The results of the appraisal are highly sensitive to the world prices used for the project outputs Decreases in the relative price of PSF and filament yarn reduce the IRR considerably below 10 per cent (cases 8 and 9) It requires only a 3 5 per cent reduction in the world prices of both of these commodities to lower the IRR in case 1 from 12 to 10 per cent Similarly, if the price of PSF alone changes, it requires only a 6 per cent relative reduction to lower the IRR of case 1 to 10 per cent

Future world prices of project outputs and the utilization rate achieved over the life of the project appear to be the key variables in the appraisal Forecasts of future prices of PSF and filament yarn and the most important inputs TPA and EG were not available for the appraisal However, the over-capacity of synthetic fibre producers in Western Europe suggests that if synthetic fibre prices are to move relative to other prices, this movement will be downwards rather than upwards Regarding the future utilization rate of the project, it is difficult to do more than list the factors that may affect it significantly They include

Technical problems in running the plant

Growth of domestic demand, particularly for PSF, since the project should have little difficulty in disposing of its output of filament yarn

Share of the market taken by the competing private-sector producer

Prospects for exporting any surplus PSF to the world market

On the basis of what seem to be the most reasonable set of assumptions, the project appears no more than marginal, in other words, its IRR is no greater than that estimated for alternative government investments However, relatively small changes in the world prices of project outputs have a major impact on its IRR, and more pessimistic assumptions regarding the world price of PSF and filament yarn make the project clearly unacceptable Within the limitations of the data used, the results of the appraisal suggest that the project is marginal, with high risks, and probably should not have been undertaken

Appendix

DATA ON THE POLYESTER PROJECT

Data on the project are taken from the two documents prepared for the Planning Division by the project authorities, one written in 1974 and the other in July 1977 The latter version contains revised costs and output figures for the project and has been drawn upon frequently The data contained in this document have been modified as follows

(a) The PCI analysis is at current and not constant prices Here the prices for all items relevant for mid-1977 are projected over the working life of the project,

(b) The original PCI document assumes that commercial production will begin in 1978 Discussions with managers of the company revealed that 1979 was a more realistic starting date, which implied a four-year construction period In the cash flow of the project, year 4 is taken to be the first year of operation,

(c) The PCI document assumes that the plant will work at 100 per cent of rated capacity immediately after production begins In the financial year 1978/79, production is taken to be 55 per cent of total capacity because it is assumed to start half-way through the financial year Here a gradual build-up to 90 per cent capacity working is assumed

Financial year	*Year of project*	*Capacity utilization (%)*
1979/80	4	60
1980/81	5	70
1981/82	6	80
1982/83	7	90

Several cost items are taken to be variable costs in that they vary in direct proportion with the level of capacity The costs for materials, that is, TPA, EG and packing materials, the costs for fuel, power and water and distribution and marketing costs are assumed to be variable costs The values taken from the PCI document for 100 per cent capacity operation have been adjusted to reflect the changed assumptions regarding utilization rates

The PCI document does not specify a working life for the project On the basis of discussions with the company and government planners, a working life of 12 years is used here, which means that year 15 is the final year of the cash flow A terminal value has been given to the project equipment and buildings in year 15, it is assumed arbitrarily to be 15 per cent of the original cost of these items

The PCI document of July 1977 contains revised capital costs 14 9 per cent greater than the original estimates These increases reflect both under-coverage of the items involved and inflation during the period between the two estimates In discussions, the company recognized that the final capital costs of the project would be higher than the revised figures This increase in the revised figures was kept below 15 per cent of the original estimates, since an increase greater than 15 per cent would have required formal government approval again Therefore, the final value of the capital costs at mid-1977 prices could not be ascertained from the PCI document Here it is assumed arbitrarily that there will be an additional 10 per cent increase in real terms above that given in the revised PCI document which will be attributed to the project buildings Since the assumed 10 per cent increase is arbitrary, the sensitivity of the appraisal to increases of 5 per cent and 20 per cent in total capital costs is tested

In the financial cash flow of the project, it is assumed that the extra capital cost of Rs 33 million will be financed by a short-term loan at a 13 per cent rate of interest, to be repaid over a three-year period It is also assumed that the loans shown in the PCI document as falling due in 1978/79 can be rescheduled for 1979/80, at zero cost This was necessary because commercial production is taken as starting at the beginning of the financial year 1979/80

IV. THE TEXTILE PROJECT

THE COTTON TEXTILE INDUSTRY IN PAKISTAN

The cotton textile industry has been one of the major economic activities in Pakistan since the formation of the State in 1947 It embraces four processes

The growing of raw cotton and its ginning into cotton lint and cotton seed

The spinning of cotton lint and various man-made fibres into yarn

The weaving of yarn into cloth

The bleaching, dyeing, printing and finishing of cloth

Table 29 shows production and exports of the various sections of the industry in recent years Production has been closely geared to the world market, and exports have accounted for a high proportion of total sales, particularly of cloth Pakistan accounted for 30 per cent of world exports of cotton yarn and 9 per cent of world exports of cotton cloth in 1974 [1]

The industry has been a major source of foreign exchange through its export earnings Table 30 shows the share of raw cotton, cotton yarn and cloth in the total value of exports In 1971/72, cotton products accounted for nearly 60 per cent of total visible export earnings, with the recession in the world textile industry in the mid-1970s this proportion fell, but was still around 35 per cent in 1975/76

In 1977, the industry was experiencing major difficulties Cotton crops had been poor in two successive years, largely because of heavy rains and floods Total cotton production had fallen from 0 62 million tons in 1974/75 to 0 5 million tons in 1975/76 and to 0 42 million tons in 1976/77 [2] The effect of these poor crops was to reduce the availability of raw cotton for export and for spinning and weaving domestically Export earnings from raw cotton during the first nine months of 1976/77 were estimated provisionally to be less than 20 per cent of the value of raw cotton exports during 1975/76 [3] Many textile mills, faced with shortages of cotton for spinning, particularly of fine-grade, long-staple varieties, imported man-made fibres as substitutes for cotton The cotton-supply situation was further complicated by the nationalization of the cotton-ginning sector in 1976 It has been alleged that nationalization led to a deterioration of the quality of ginned cotton and that the prices fixed by the Government and paid to farmers for different grades of cotton gave insufficient incentive to produce high-quality grades, which were in particularly short supply [4]

[1] These percentages relate to tonnage, see *Annual Report, 1976* (All-Pakistan Textile Mills Association, 1976)

[2] *Pakistan Economic Survey 1976/77* (Government of Pakistan, Finance Division), pp 21-22

[3] *Ibid*, pp 113-134

[4] See, for example, *Pakistan Textiles* (All-Pakistan Textile Mills Association), September 1977, pp 6 and 23, where these arguments are used

TABLE 29 PRODUCTION AND EXPORTS OF THE COTTON TEXTILE INDUSTRY, 1970/71-1975/76

Year	Raw cotton (million tons)		Exports as a share of production (%)	Cotton yarn (million lb)		Exports as a share of production (%)	Cotton cloth (million yards)		Exports as a share of production (%)
	Production	Exports		Production[a]	Exports		Production[a]	Exports	
1970/71	0 53	0 10	18 5	669 7	227 4	33 9	787 3	462 2	58 7
1971/72	0 69	0 19	27 5	740 0	287 3	28 8	751 3	448 1	59 6
1972/73	0 69	0 21	30 4	829 2	406 5	49 0	704 9	618 4	87 7
1973/74	0 64	0 03	4 8	836 5	221 7	26.5	708 2	415 7	58 7
1974/75	0 62	0 19	30 6	774 2	172 7	22 3	664 8	468 1	70 4
1975/76	0 50	0 11	22 0	794 8	247 3	31 1	644 3	546 4	84 8

Sources. *Pakistan Economic Survey, 1976/77* (Government of Pakistan, Finance Division), *Annual Report, 1976* (All-Pakistan Textile Mills Association, 1976)

[a] Figures for yarn and cloth production refer to production from textile mills and exclude output from the unorganized non-mill sector

TABLE 30 COTTON EXPORTS, 1970/71-1975/76

Year	Raw cotton			Cotton yarn			Cotton cloth[a]		
	Total value (Rs millions)	*Average unit value (Rs per lb)*	*Share in total exports (%)*	*Total value (Rs millions)*	*Average unit value (Rs per lb)*	*Share in total exports (%)*	*Total value (Rs millions)*	*Average unit value (Rs per sq yard)*	*Share in total exports (%)*
1970/71	284 8	1 1	14 2	357 0	1 6	17 9	311 3	0 88	15 6
1971/72	982 2	2 0	29 1	605 7	2 1	18 0	387 1	0 84	11 5
1972/73	1 198 4	2 3	14 0	1 974 3	4 8	23 0	1 247 1	2 0	14 6
1973/74	411 1	3 8	4 0	1 863 1	8 4	18 3	1 416 8	3 4	13 9
1974/75	1 562 5	3 4	15 1	908 8	5 2	8 8	1 312 5	2 8	12 7
1975/76	990 4	3 9	8 8	1 461 8	5 9	13 0	1 359 4	2 4	12 1

Source *Pakistan Economic Survey, 1976/77* (Government of Pakistan, Finance Division)

[a]Defined as cotton fabrics, this item excludes exports of garments and hosiery

Most weaving is undertaken in small-scale units and not in integrated textile mills It has been estimated that, in 1976, while approximately 29,000 power looms were in the mill sector, 55,000 were in the small-scale non-mill sector [5] Total cloth production from the mill sector was estimated to be 665 million yards in 1974/75, as opposed to 1,237 million yards from the non-mill sector [6] Most of the cloth produced in the small-scale units is of a coarse variety and is sold on the domestic market Standards of production and efficiency are allegedly low in the non-mill weaving sector, and it has been recommended that weaving units of less than 20 power looms not be established in the future [7]

Within the large-scale mill sector there are also problems, much of the installed equipment is old and partially obsolete [8] The cloth produced is still predominantly of an unfinished grey variety—in other words, neither bleached, printed nor dyed Sales of finished fine varieties of cloth are one of the most dynamic sections of the world textile market, but in 1975/76 only approximately 15 per cent of total cloth production by mills in Pakistan was of a fine variety [9] The need to modernize mills to meet demand for this type of cloth is now recognized [10]

Because of its dependence on export markets, the industry has been severely affected by the world recession in textiles The dollar value of cloth exports fell from $144 million in 1973/74 to $117 million in 1976/77 This shortfall in demand, combined with shortages of raw cotton, forced around 30 mills to close in 1976 [11] The capacity utilization rate in the mills in June 1976 was 74 per cent in the spinning sections and 82 per cent in the weaving sections [12] Table 31 shows how these rates compare with those of previous years In mid-1977 it was estimated that 0 8 million spindles out of an installed total of 3 6 million were not in operation [13]

Despite this underutilization of capacity, an expert working group recommended an ambitious expansion and modernization programme for the industry Total spindles were to increase from 3 6 million in 1977 to 4 7 million in 1983, and total power looms in the mill sector from 30,000 to 55,000 [14]

[5] Government of Pakistan, Industrial Sub-Sector for the Fifth Plan 1977-83, *Report of the Expert Working Group on Textiles* (Karachi, Printing Corporation of Pakistan Press, 1977), p 18 The "non-mill" sector appears to be defined as units with less than 20 power looms.

[6] *Ibid*, p 13

[7] *Ibid*, p 6

[8] As we have seen in chapter III, most of the installed spindles were not designed to deal with yarn produced from a blend of cotton and man-made fibres.

[9] *Report of the Expert Working Group on Textiles, op cit*, pp 20 and 24

[10] The All-Pakistan Textile Mills Association argued "Concerted action on modernization, balancing and replacement could alone help our textile industry re-establish its position in the world markets and respond to the challenge of the changed situation. There is a need to diversify not only to produce goods according to the changed pattern of demand in the world but also to increase the unit value of our textile goods by further sophistication in quality and style" *Annual Report, 1976, op cit*, p 22.

[11] *Annual Report, 1976, op. cit*, p. 1 There are 171 registered mills in the whole country

[12] Capacity utilization was calculated on the basis of spindle hours worked as a percentage of a maximum capacity of 8,000 spindle hours per year, for weaving, maximum capacity was taken to be 7,200 loom hours per year

[13] Speech by Secretary-General-in-Chief, Government of Pakistan, on new economic policies. Reported in *Pakistan Times*, 5 September 1977

[14] *Report of the Expert Working Group on Textiles, op cit* The output targets are based obviously on the assumption of a revival in demand for textiles on the world market, and improvements in domestic cotton crops. The final targets in the fifth plan were not available to the author at the time of writing.

TABLE 31 CAPACITY UTILIZATION RATES IN TEXTILE MILLS IN PAKISTAN

(Percentage)

Year	*Spindles*	*Looms*
1970/71	88	93
1971/72	86	87
1972/73	87	91
1973/74	89	92
1974/75	75	86
To June 1976	74	82

Sources Calculated from data supplied by the Government of Pakistan, Planning Division and *Monthly Bulletin of Statistics* (Central Statistical Office, Karachi), various issues

Several new public-sector textile mills are at present under construction These are large integrated mills, which can carry on spinning, weaving and finishing They can also produce cotton cloth of good quality and blended fabrics of cotton and polyester One of these mills is the project analysed here

THE PROJECT

In May 1973, the Governments of Iran and Pakistan set up a joint commission to identify areas of economic co-operation Subsequently, in November 1973, they signed a protocol that envisaged the establishment of several integrated textile mills in Pakistan These plants were to be financed as a joint venture of the two Governments, with the Government of Iran holding a minority share in the equity of the companies The Government of Iran agreed to purchase a portion of the textile products of the plants

The arrangements appeared advantageous to both parties It meant that the Government of Pakistan could obtain foreign exchange from the Iranian Government for financing the modernization of part of its textile industry Since labour costs in Pakistan are considerably lower than in Iran, it appeared that the Government of Iran could receive textile products from Pakistan that would cost less than they would if they were produced in Iran

By the end of 1977, two projects had been approved under this agreement, both located in Baluchistan, the province of Pakistan that borders on Iran The mill that is examined here is located at Quetta, the provincial capital, and the other mill is sited at Uthal, in the south of the province 80 miles (130 kilometres) by road from the port of Karachi

Baluchistan is the least developed region of Pakistan It is thinly populated,[15] part of the population is nomadic Only 3 5 per cent of the total land area is under

[15] Population density for the whole province is 18 persons per square mile The Quetta district is the most densely populated, with 93 persons per square mile For statistics on Baluchistan, see *Development Statistics of Baluchistan Province* (Quetta, Government of Baluchistan, P & D Department)

cultivation Agriculture is hampered by a shortage of water, although fruit growing is an important activity There is some mining and fishing, but very little large-scale industry

Since no cotton is grown in Baluchistan, the cotton used by the projects will have to come from the provinces of the Punjab and Sind, probably via Karachi However, the Government considers cotton textile manufacture to be an activity that can be located away from both sources of raw materials and potential markets and thus could be located in a backward region to introduce an element of industrialization and to increase employment and local incomes

The town of Quetta has a population of roughly 160,000 and is the trading and administrative centre of Baluchistan A few industries have been established in and around Quetta, including a ghee factory, a pharmaceuticals plant and a distillery There was a small cotton textile mill near Quetta, but it closed several years before construction began on the new project Quetta is relatively accessible to Iran Finished textile goods can be moved by rail to Zahedan in Iran near the Iran-Pakistan border (734 km) or by road to Karachi (858 km) for shipment to Iranian ports [16]

Baluchistan lacks skilled textile workers Only very few were previously employed in the textile mill near Quetta, but they probably left the area after the mill closed The project will employ about 975 skilled, 750 semi-skilled and 1,375 unskilled workers [17]

The project is to establish an integrated textile mill having 50,000 spindles, 1,100 looms and its own bleaching, dyeing and printing facilities The mill will produce

(a) Cotton fabrics These are 100 per cent cotton and consist of grey cloth, bleached cloth and dyed/printed cloth,

(b) Blended fabrics These are a blend of cotton and polyester in the proportion 65 per cent polyester and 35 per cent cotton,

(c) Surplus cotton yarn This is yarn that is surplus to the requirements of the mill and can be sold to other mills for weaving

A significant proportion of the output is to be exported The *Feasibility Report* assumes that 50 per cent of the production of both cotton and blended fabrics will be sold abroad, with approximately 80 per cent of these exports going to Iran It assumes that all the surplus yarn will go to domestic mills [18]

Most of the textile machinery will be imported Finance for the foreign-exchange items of capital costs will come from the equity and loan contributions of Iran Machinery has been purchased on the basis of competitive tender, since untied foreign exchange was available for these imports The three major items in operating costs are

[16] A highway between Pakistan and Iran is under construction, but its completion date is still unknown.

[17] *Feasibility Report on the Textile Mill Project* (Karachi, West Pakistan Industrial Development Corporation, 1974), henceforth this will be referred to as the *Feasibility Report*

[18] The justification for this division of sales between domestic and foreign markets is not given in the *Feasibility Report* The Government of Iran has not entered into a contractual agreement that a certain percentage of the project's output would be sent to Iran. However, the management of the project appears confident that at least 40 per cent of the cotton and the blended fabrics will be sold to Iran. The Middle East is identified as another major potential export market.

(a) Raw cotton Both long-medium-staple and long-staple varieties of raw cotton are required by the mill In a normal crop year a sufficient quantity of medium-grade, long-medium-staple cotton should be produced in Pakistan to meet the requirements of all domestic mills However, production of blended fabrics requires the higher-grade long-staple cotton Sufficient quantities of this type of cotton are unavailable locally [19] The *Feasibility Report* assumes that 60 per cent by weight of the long-staple cotton, fine-quality cotton that can be combined with less fine locally available grades, will be imported Although no source of supply has been identified for this imported cotton, it will certainly be considerably more expensive than locally produced varieties,[20]

(b) PSF, the synthetic fibre blended with fine-quality cotton At present, there is no polyester plant in Pakistan, and imports are the sole source of supply However, the polyester plant discussed in chapter III is currently under construction at Karachi, and it is likely to meet the requirements of the new textile mill,

(c) Chemicals and dyes used in the finishing stage of textile production The *Feasibility Report* assumes that just under 50 per cent of the amount paid, at market prices, for these items will be in foreign exchange

The main source of data on the project is the *Feasibility Report* compiled in March 1974 and a PCI document based on this report that was submitted to the Planning Division, Government of Pakistan in September 1974 In the cost-benefit analysis conducted here the data from the *Feasibility Report* has been adjusted on the basis of additional information collected in Pakistan during 1977 Appendix A to this chapter describes the changes made to the original data

APPRAISAL OF THE PROJECT

The project has been appraised using stages one, two and four of the approach described in the *Guide* At stage one, the net worth of the project is expressed at constant market prices, at stage two, the outputs and inputs of the project are valued at shadow prices based on the opportunity costs of the items concerned, finally, at stage four, the income-distribution impact of the project is examined Income changes in Baluchistan, as a result of the project, are estimated and a possible weighting system is illustrated for revaluing these income changes to take account of government policy of giving special emphasis to the development of backward regions [21] The stage-four NPV therefore measures the project's contribution to overall efficiency in resource allocation and its contribution to removing the disparity in the level of development and income between regions However, the question of the impact of the project on savings is not considered in this analysis [22]

[19] Only 0 3 per cent of total cotton production in Pakistan is of the long-staple variety "North-West Frontier Province Textile Mills, PCI Proforma Scheme" (Karachi, Pakistan Industrial Development Corporation)

[20] The cotton required will be equivalent to Egyptian cotton, even though Egypt will not necessarily be the source of supply In the evaluation of the project, the world price of Egyptian cotton has been used to value these imported long-staple varieties

[21] This policy is referred to in *Pakistan Economic Survey, 1976/77, op cit*, chap 18, p 248

[22] This issue is considered in the case-study in chapter V An analysis of the savings effect was omitted to avoid introducing too many complications into the appraisal

Stage one

The real cash flow of the project is given in table 32, supplementary information on various items in the cash flow are given in tables 33-36 Details of the project data on which the cash flow is based are given in the notes to these tables and in appendix A to this chapter

At stage one, all outputs and inputs in the real cash flow are valued at constant market prices inclusive of any indirect taxes The only indirect taxes involved are import duties on chemicals and dyes used in the finishing stage of the project and the excise duty on local sales of finished cloth and yarn [23] Raw cotton is now imported duty-free, and a project located in a backward area does not have to pay duty on imported equipment Table 37 gives data on the market prices of fabric, yarn, PSF and grades of raw cotton

The financial cash flow of the project is not given here, partly because the exact financing arrangements of the project are not known The final costs of the project will exceed those given in the *Feasibility Report,* and additional sources of finance will be required to cover them However, more important, the financial flows associated with the project have no bearing on the results of the appraisal for two main reasons First, the income-distribution appraisal of the project distinguishes only between gains to residents of Baluchistan and the rest of the economy There is no need, therefore, to consider the income-distribution effects created by the various financial flows resulting from the project Secondly, although the project is a foreign-investment project with 51 per cent of the equity held by the Government of Pakistan and 49 per cent by Iranian financial institutions, it is almost certain that the Iranian funds would have been made available to Pakistan in the absence of the project The financing arrangements were part of a general agreement between the two Governments to set up several projects in Pakistan and were not tied specifically to this one Therefore, the inflows of funds from Iran are not treated as a benefit to the economy created by the project, and similarly the outflows in the form of dividends and loan repayments are not treated as costs resulting from the project [24] It is assumed that identical inflows and outflows would have arisen in the absence of the project

The total funds committed to the project are treated as part of a general pool of funds available for investment in Pakistan The net worth of the project is taken to be the return on the total resources of the project, and no distinction is made between returns to Pakistan and Iranian equity The results of the stage-one appraisal at market prices are given in table 38 At 10 per cent and 20 per cent discount rates the project has a negative NPV, the IRR for the total resources committed to the project is approximately 7 per cent This rate is higher than market rates of interest,

[23] A 35 per cent import duty is assumed for chemicals and dyes on the basis of information supplied by the producers responsible for the polyester project analysed in chapter III The average rate of import duty on chemical products in 1975/76 is calculated to be 38 per cent, *Monthly Statistical Bulletin,* vol 24, Nos. 3-6 (March-June 1976) The rates of excise duty given in the *Feasibility Report* are used here These are 60 paisa per lb of yarn and 10 paisa per square yard of cloth These rates may have been out of date in 1977, but more recent data could not be obtained

[24] The *Guide,* p 41, footnote 65, discusses the treatment of funds tied specifically to a project, in these circumstances it is necessary to consider the financial cash flow of the project, since foreign equity and loans will be treated as benefits and dividend, interest and amortization payments as costs

TABLE 32. STAGE-ONE CASH FLOW – REAL

	Year															
	0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
1 Net cash flow – real (1 1 –1 2.)	–108 8	–132 1	–42 8	–51.5	–5 1	20 0	43.5	43.5	43.5	43 5	43.5	43.5	43.5	43.5	43.5	144.5
1 Sources				–6 7	18.4	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43 5	144.5
1/ Operating profit BIT[a]				–6 7	18 4	43 5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5	43.5
2/ Terminal value[a]																101.0
2 Uses	108 8	132 1	42 8	44 8	23 5	23 5										
1/ Current assets[a]																
/1 Inventories				23.5	23.5	23.5										
2/ Fixed assets[a]																
/1 Buildings	22.0	26 7	13 5	21 3												
/2 Equipment	85 0	103 1	28 7													
/3. Others	1 8	2 3	0 6													

[a]Supporting documentation in tables 33, 34, 35 and 36

TABLE 33 OPERATING PROFIT BIT

(Millions of rupees)

Item	Year			Present value at	
	3	*4*	*5-15*	*10%*	*20%*
1 1 1/ Operating profit	−6.7	18.4	43.5	200.8	96.0
/1 Sales	*85 3*	*170 9*	*256 3*	*1 317 9*	*666 6*
1 Fabric (cotton)					
1/ Local sales	9 8	19 6	29 4	151 2	76 5
2/ Exports	14 4	28 9	43 3	222 6	112 6
2 Fabric (blended)					
1/ Local sales	29 9	59 9	89 8	461 8	233 6
2/ Exports	25 9	51 8	77 7	399 6	202 1
3 Yarn	5 3	10 7	16 1	82 7	41 8
/2 Costs (1 + 2 + 3 + 4 + 5 + 6 + 7)	*92.0*	*152.5*	*212 8*	*1 117 1*	*570.6*
1 Material inputs	41 0	82 1	123 1	632 9	320 1
1/ Raw cotton					
/1 Local					
1 Medium	15 3	30 6	45 8	235 6	119 2
2 Fine	1 0	2 0	3 0	15 4	7 8
/2 Imported	4 4	8 9	13 4	68 8	34 8
/3 Road transport cost of cotton	0 5	0 9	1 4	7 2	3 6
2/ PSF					
/1 Local	8 4	16 8	25 2	129 6	65 5
/2 Road transport cost of PSF	0 1	0 2	0 3	1 5	0 8
3/ Chemicals					
/1 Local	4 1	8 2	12 3	63 2	32 0
/2 Imported	5 3	10 7	16 0	82 3	41 6
/3 Import duty	1 9	3 8	5 7	29 3	14 8
2 Utilities	6 9	13 9	20 9	107 3	54 3
1/ Fuel					
/1 Furnace oil	1 4	2 8	4 3	22 0	11 1
/2 Rail transport cost of furnace oil	0 5	1 0	1.5	7 7	3 9
2/ Electricity	5 0	10 1	15 1	77 6	39 3
3 Spare parts	1 1	2 2	3 3	17 0	8 5
1/ Imported	1 08	2 15	3 2	16 5	8 3
2/ Road transport cost of spare parts	0 02	0 05	0 1	0 5	0 2
4 Wages	21 5	21 5	21 5	126 2	67 7
1/ Unskilled	7 4	7 4	7 4	43 4	23 3
2/ Semi-skilled	4 8	4 8	4 8	28 2	15 1
3/ Skilled	9 3	9 3	9 3	54 6	29 3
5 Administration	10 3	10 3	10 3	60 5	32 4
6 Selling and distribution	6 9	13 8	20 7	106 4	53 8
1/ Local trade	3 45	6 9	10 35	53 2	26 9
2/ Road transport	3 45	6 9	10 35	53 2	26 9
7 Excise duty	4 3	8 7	13 0	66 8	33 8

TABLE 34 TERMINAL VALUE
(Millions of rupees)

Item	Year 15	Present value at 10%	Present value at 20%
1 1 2/ Terminal value	30 5	7 3	2 0
/1 Buildings and equipment[a]			
/2 Working capital[b]			
1 Inventories	70 5	16 9	4 6
	101 0	24 2	6 6

[a]Terminal value of buildings and equipment has been estimated at 10 per cent of the original total capital cost of Rs 305 million at 1977 prices The choice of the terminal value was arbitrary

[b]Only the inventory element of working capital is shown as a benefit in year 15, the financial items of working capital are not shown as costs in years 3, 4 and 5 and therefore their recovery in year 15 is not treated as a benefit

TABLE 35 CURRENT ASSETS
(Millions of rupees)

Item	Year 3	Year 4	Year 5	Present value at 10%	Present value at 20%
1 2 1/ Current assets					
/1 Inventories					
1 Finished output[a]					
1/ Cotton fabric					
/1 Local sales	0 8	0 8	0 8		
/2 Exports	1 2	1 2	1 2		
2/ Blended fabric					
/1 Local sales	2 5	2 5	2 5		
/2 Exports	2 1	2 1	2 1		
3/ Yarn	0 4	0 4	0 4		
2 Raw cotton[b]					
1/ Local					
/1 Medium	7 6	7 6	7 6		
/2 Fine	0 5	0 5	0 5		
2/ Imported	2 2	2 2	2 2		
3 PSF[c]	4 2	4 2	4 2		
4 Chemicals[d]					
1/ Local	0 3	0 3	0 3		
2/ Imported	1 3	1 3	1 3		
5 Spare parts[e]	0 4	0 4	0 4		
	23 5	23 5	23 5	48 3	34 4

[a]On the basis of one month's production The *Feasibility Report* gives no item for stocks of finished output, a figure of one month's production has been assumed

[b]Calculated as the requirements for six months' production The *Feasibility Report* gives inventories as three months' requirements for domestic cotton, and six months' requirements for imported cotton Discussions with the project management suggested that six months' stocks would be held for both imported and domestic cotton

[c]On the basis of six months' requirements, the figure given in the *Feasibility Report*

[d]Local chemicals inventories covers one month's requirements and imported covers three months' requirements These figures are given in the *Feasibility Report*

[e]Spare parts inventories are the monetary value given in the *Feasibility Report* escalated to 1977 prices The costs of transporting stocks of inventories to the project, a very small proportion of the total cost of inventories, have been ignored

TABLE 36 FIXED ASSETS

(Millions of rupees)

Item	*Year*				*Present value at*	
	0	*1*	*2*	*3*	*10%*	*20%*
1 2 2/ Fixed assets						
/1 Buildings	22 0	26 7	13 5	21 3	73 4	65 9
/2 Equipment						
1 Local	4 5	5 4	1 5		10 6	10 0
2 Imported	78 4	95 2	26 5		186 8	176 1
3 Transport costs of equipment	2 1	2 5	0 7		4 9	4 7
/3 Other	1 8	2 3	0 6		4 4	4 1
Total	108 8	132 1	42 8	21 3	280 1	260 8

TABLE 37 MARKET PRICES OF ITEMS AT STAGE ONE

Item	*Price*[a]
Fabric – local sales[b]	*(Rs per yd) (ex-mill)*
100% cotton	
46 in./44 in wide	
Grey, 46 in	3 25
Bleached, 44 in	3 50
Dyed and printed, 44 in	4 00
72 in./66 in wide sheeting	
Bleached, 66 in	6 75
Grey, 72 in	5 80
105 in /97 in wide sheeting	
Bleached, 97 in.	10 00
Grey, 105 in	9 00
Polyester-cotton blended fabric	
46 in /44 in wide	13 29
Fabric – export sales	*(f o.b. price)*
100% cotton	
46 in /44 in wide	
Grey, 46 in	4 00
Bleached, 44 in	4 10
Dyed and printed, 44 in	4 25
72 in /66 in wide sheeting	
Grey	7 38
Bleached	7 70
105 in./97 in wide sheeting	
Grey	11 30
Bleached	11.40
Polyester-cotton blended fabric	
46 in /44 in. wide	11 50

Item		*Price*[a]
		(Rs per lb) (ex-mill)
Surplus yarn[c]		8 8
Raw cotton[d]		
Local		
Medium	Ex-ginnery price	4 5
	Road transport costs	0 12
		4 62
Fine	Ex-ginnery price	5 3
	Road transport costs	0 12
		5 42
Imported	C i.f import price	15 8
	Road transport costs	0 12
		15 92
PSF[e]	Ex-factory price	10 0
	Road transport costs	0 12
		10 12
		(Rs per ton)
Furnace oil[f]	Ex-refinery price	600
	Rail transport costs	200
		800

[a] All inputs used by the project are assumed to be purchased direct from the suppliers, therefore, the price paid by the project does not include a wholesale or retail margin

[b] Cloth prices are taken from the *Feasibility Report*

[c] Yarn prices are based on wholesale prices in Karachi, 1977, they are approximately equal to the mid 1977 average unit value for yarn exports See *Annual Report, 1976* (All-Pakistan Textile Mills Association) and *Pakistan Textiles, op cit*

[d] Raw cotton prices are derived from the maximum selling prices for ginned cotton fixed for the year 1977/78, plus an allowance for the cost of moving raw cotton by truck from Karachi to Quetta Medium-grade cotton is taken to be type AC134, and fine cotton is taken to be Sarmast, the maximum selling prices for these have been fixed at Rs 4 5 per lb and Rs 5 3 per lb, respectively Data supplied by Pakistan Industrial Development Corporation, Karachi The cost of moving this cotton by truck to Quetta is estimated to be Rs 0 12 per lb, data supplied by management of the textile mill, Quetta The imported price for Egyptian long-staple cotton was Rs 15 8 per lb, see *Monthly Bulletin of Statistics,* vol XXXI, No 12 (United Nations publication, ST/ESA/STAT/SER Q/60) This value has been used as an estimate of the long-run c i f cost to Pakistan, a transport cost element of Rs 0 12 per lb has been added to this c i f cost to give a value for the cost to the project

[e] PSF is assumed to be purchased from the new polyester plant at Karachi (analysed in chapter III), where the selling price of PSF is Rs 10 per lb It is assumed that transport cost per lb will be the same for PSF as for raw cotton The cost of PSF to the project is therefore taken to be Rs 10 12 per lb

[f] Furnace oil prices are based on an ex-refinery price of Rs 600 plus Rs 200 costs for transporting petroleum products by rail from Karachi to Quetta It is assumed that furnace oil will come from a refinery at Karachi Fuel oil prices ex-refinery are taken from *Pakistan Economic Survey, 1976/77* (Government of Pakistan, Finance Division) Rail costs are taken from *Pakistan Railways Goods Tariff,* part II (Lahore, Pakistan Railways, 1976)

TABLE 38 STAGE-ONE APPRAISAL

Item	*NPV at*			*IRR*
	0%	*10%*	*20%*	*(%)*
1 Net cash flow – real[a] (1 1 –1 2.)	215 7	–103 4	–192 7	7
1 Sources	591 2	225 0	102 5	
1/ Operating profit	490 2	200 8	96 0	
2/ Terminal value	101 0	24 2	6 5	
2 Uses	375 5	328 4	295 2	
1/ Current assets				
/1 Inventories	70 5	48 3	34 4	
2/ Fixed assets				
/1 Land and buildings	83 5	73 4	65 9	
/2 Equipment	216 8	202 3	190 8	
/3 Other capital costs	4 7	4 4	4 1	

[a]There are some slight roundings in the calculation of the NPV of the real cash flow

in real rather than nominal terms, however, it is considerably lower than the pre-tax rate of return at market prices normally expected from industrial projects in Pakistan [25]

The commercial profitability of the project is considerably lower in the present analysis than in that of the original *Feasibility Report* mainly because of the price assumptions used here, which take into account relative price changes between 1974, the date of the *Feasibility Report,* and 1977 In particular, the price of raw cotton is assumed to rise considerably in relation to the price of cotton fabrics [26]

Stage two

The appraisal of the textile-mill project at stage two differs from that of the polyester project in two ways. First, in the polyester case-study it is assumed that the domestic market prices of all non-traded items can be used as their shadow prices This is clearly the crudest way of dealing with non-traded goods In this case-study an attempt is made to estimate the costs of production at shadow prices of the more important non-traded items, whose production is assumed to increase as a result of the demands of the project [27] A second difference is in the treatment of unskilled labour In the polyester case-study unskilled labour is valued at its market wage Here sensitivity analysis is carried out at three shadow wage rates, which are used to value both the unskilled labour employed directly by the project and the labour inputs into the main non-traded goods used by the project As we shall see, the difference assumed between the market wage and the shadow wage plays an important role in the income-distribution analysis of stage four Therefore, it is particularly important

[25] See chapter II The Pakistan Industrial Credit and Investment Corporation looks for an IRR after tax of 15 per cent from projects.

[26] See appendix A to this chapter for more details of the price assumptions used

[27] The major reason for this differing treatment of non-traded goods is that the case-studies examined here are intended to illustrate exercises in cost-benefit analysis using the approach of the *Guide* but carried out to different degrees of complexity

to test the sensitivity of the appraisal to different values for labour As in the first case-study, sensitivity analysis using a range of values for the shadow price of foreign exchange is employed

The stage-two appraisal begins by classifying the commodities associated with the project into traded and non-traded goods as shown below.

Traded goods	*Non-traded goods*
Cotton fabrics (exports and domestic sales)	Electricity
Blended fabrics (exports and domestic sales)	Selling and distribution
Yarn	Administration
Raw cotton	Labour
Local	Road transport
Medium	Rail transport
Fine	Land and buildings
Imported	Other capital costs
PSF	
Chemicals and dyes	
Fuel	
Equipment	
Spare parts	

Secondly, shadow prices are estimated for each item, a set of AFs, derived from the ratio of these shadow prices to the market prices of items concerned, is used to convert the data in tables 32 and 33 from market to shadow prices The adjusted real cash flow is termed a preliminary adjusted cash flow, since the premium on foreign exchange has not yet been introduced The final part of the stage-two appraisal is to revalue all foreign-exchange items associated with the project, by the appropriate AF to allow for the extra value of foreign exchange

The treatment of each of the main items involved with the project is discussed briefly below

Traded goods

Cotton and blended fabrics

The *Feasibility Report* assumes that the output of cotton fabrics and blended fabrics will be divided equally between the export and the domestic markets Exports and local sales given in the *Report* have the same quality and dimensions No justification is given for this particular division of the market between foreign and local sales.[28]

Exported fabrics are clearly traded goods, whose benefit to the economy will be their foreign-exchange earnings. In this study the fabrics sold in Pakistan are also treated as traded goods, since their availability will free for the export market other fabrics that would otherwise have met the existing domestic demand This approach assumes that the level of domestic consumption of fabrics in Pakistan is independent of the project under examination, so that domestic sales by the project will substitute for sales from another domestic producer It also assumes that there is an export market for fabrics from Pakistan, so that other domestic producers will have

[28] On average, textile mills in Pakistan have exported over 50 per cent of their cloth output (see the data on cloth production and exports in table 29).

no problem in switching to exports [29] Neither of these assumptions is likely to hold completely, so that the effect of local sales of fabrics by the project will be both to free other fabrics for export and to increase the availability of cotton and blended fabrics for domestic consumers [30] However, in the absence of further information on the balance between these two effects, the fabrics sold locally are treated as traded goods The shadow prices of all cotton and blended fabrics are therefore taken to be their f o b export prices, regardless of whether the items are exported or sold domestically [31] (For the export prices of the various fabrics, see table 37) The export prices of the fabrics exported by the project are used to value the fabrics in the stage-one appraisal, since they represent the financial gain to the project from the production of these items The fabrics sold locally are valued in stage one at their domestic market prices Domestic sales are taken to be of identical quality and dimensions to those exported, so that the export prices given in table 37 are used to value the equivalent items sold locally Since the output of all cotton fabrics and blended fabrics is divided equally between domestic and export sales at stage one, there is no need to adjust each category of fabric sold domestically to a value at export prices A single AF is applied to the market price of all fabrics sold domestically, it is derived from the ratio of the value of total export sales of fabrics to the value of total domestic sales of fabrics

As can be seen from table 33, the present value of export sales of cotton fabrics is 47 2 per cent greater than the present value of domestic sales, in other words, in the *Feasibility Report* average export prices are assumed to be 47 2 per cent higher than domestic prices The AF for cotton fabrics sold domestically is 47 2 per cent A similar approach is used for the blended fabrics sold domestically The *Feasibility Report* assumes export prices lower than prices for domestic sales The present value of export sales of blended fabrics given in table 33 is 86 5 per cent of the value of domestic sales The AF for blended fabrics is therefore −13 5 per cent

The basis for the different prices between the domestic and the export market is not discussed explicitly in the *Feasibility Report* The prices given are before deduction of excise duties for domestic sales and export duties for export sales After the deduction of these taxes, the prices of the same items in the domestic and the export market appear to be roughly comparable, although some small differential seems to have been assumed In the absence of further information, the world prices given in the *Feasibility Report* are used to value the different fabrics [32] Sensitivity analysis is applied to see how the results of the appraisal are affected by a plus or minus 10 per cent change in the relative export prices of the fabrics produced by the project

[29] If the demand facing Pakistan fabric exports is less than perfectly elastic, additional export sales will be possible only at lower export prices The relevant shadow prices in this case will be the marginal export revenues from the various items

[30] For the fabrics that represent additional domestic consumption, the relevant shadow price will be a measure of what consumers are willing to pay for them rather than their export price on the world market

[31] The cost of transporting these exports to Karachi or to the border with Iran for export is not subtracted from their unit shadow prices These transport costs are covered by the separate cost item, selling and distribution costs, in operating profit, table 33 It is assumed that the cost of moving the fabric output sold domestically by the project equals the cost of moving the fabrics of other producers freed for the export market The former costs are included in table 33, and under this assumption they equal the transport costs incurred by other producers, there is no need, therefore, for an additional deduction from the shadow price of the fabrics

[32] Appendix A contains some discussion of the problem of using these prices as forecast values over the life of the project

Yarn

The *Feasibility Report* assumes that yarn remaining after the requirements of the project have been met will be sold domestically As is the case with fabrics sold domestically, yarn is classed as a traded good on the grounds that demand for yarn in Pakistan is determined by the level of weaving capacity and its utilization, yarn surplus to these requirements is exported It can be argued, therefore, that extra yarn supplies produced by the new project will free other locally produced yarn for export The shadow price of yarn is therefore its export price [33] The domestic market price of yarn given in table 37 is in fact equal to the average export price in 1977 No AF is therefore required to convert the stage-one value of yarn output to a value at shadow prices

Cotton

The project uses several varieties of raw cotton The *Feasibility Report* assumes that the fine-quality, long-staple cotton will be imported, while the long-medium-staple grades will be obtained in Pakistan [34]

The imported cotton is clearly a traded good, and its shadow price is its import price plus the local costs involved in transporting the cotton from Karachi to Quetta The local cotton is also treated as a traded good on the grounds that if the cotton is not used on the new project it can be exported, since raw cotton is a major export of Pakistan The shadow price of the local cotton is the assumed export price of raw cotton, plus the costs of shipping to Quetta [35] Since transport costs are entered as separate cost items, the AF for the raw cotton used by the project is the ratio of its world price, c i f for imported cotton and f o b for locally grown cotton, to the market price used in the stage-one appraisal

Polyester staple fibre

The *Feasibility Report* does not identify a source of supply for PSF, however, it is likely to be purchased from one of the two new domestic polyester plants (see chapter III)

The rate of growth of domestic demand for PSF is uncertain, since it will depend upon the extent and speed at which the textile mills in Pakistan are modernized If the two polyester plants work at full capacity to meet domestic demand, meeting the project's demand for PSF will force other users to import their requirements Alternatively, if a shortfall in domestic demand results in surplus capacity in the

[33] The yarn produced by the project will be moved to Karachi for sale to domestic users, the costs involved are included in the item selling and distribution expenses in table 33 As is the case with the fabric output, it is assumed that the costs of moving the yarn of other producers freed for export as a result of the domestic sale of yarn by the project equal the costs included in table 33

[34] The data given in table 33 distinguish between medium-, and fine-long-medium-staple varieties of local cotton.

[35] The costs of transporting the imported cotton form Karachi to Quetta are also shown as separate cost items in table 33. It is assumed that the locally grown cotton will be purchased at the Karachi cotton market, the costs of transporting this locally purchased cotton are also shown separately

plants, PSF can be exported, in that case use of PSF by the new project will divert output from the export market In the appraisal it is assumed that the use of PSF by the project will affect imports The shadow price of PSF is therefore the c i f import price, and the relevant AF is given by the ratio of the import price to the domestic selling price of PSF [36]

Chemicals and dyes

Although only 50 per cent by value of chemicals and dyes is imported, the whole category is classed as traded goods, on the assumption that the use by the project of locally available chemicals and dyes will force other users to import their requirements [37] The shadow prices of the imported items are their c i f prices, for the locally produced items an equivalent import price is estimated using the crude assumption that the domestic selling price exceeds the c i f import price by the average rate of import duty on chemical imports as a whole [38]

Fuel

The fuel used by the project is furnace oil Pakistan imports crude oil, which is refined domestically into petroleum products, refined products are also imported in small quantities [39] The *Feasibility Report* does not identify a source for the furnace oil Although it is almost certain to be purchased from a domestic refinery, it is classed as a traded good The shadow price of furnace oil is taken to be its c i f price at Karachi The AF for furnace oil is given by the ratio of its c i f price to its domestic refinery selling price The cost of transporting furnace oil to Quetta is treated separately [40]

Equipment and spare parts

Most of the equipment used on the project is imported, and its shadow price is its c i f price plus the local costs involved in transporting it to Quetta Some small items of equipment are produced in Pakistan These are also classed as traded goods

The transport cost element is estimated in the *Feasibility Report* to be 2 5 per cent of the total cost of equipment and spare parts, these costs are treated separately

[36] It was assumed that the PSF will be purchased from the public-sector plant at Karachi, the costs involved in transporting the PSF to Quetta are entered separately in table 33 The assumption that purchases of PSF by the project will ultimately affect imports need not be inconsistent with the operation of the domestic polyester plants at less than full capacity if this underutilization of capacity is caused by problems of supply rather than of demand The appraisal of the polyester project in chapter III questions the likelihood of full capacity over the life of the project

[37] It is assumed that imported and domestically produced chemicals are of comparable type and quality, the *Feasibility Report* gives no information on this subject

[38] The transport cost component in the shadow price of these items is judged to be very small and is ignored

[39] In 1975/76, imports of residual furnace oil totalled 4,000 tons *Monthly Statistical Bulletin, op cit*

[40] It is assumed that the furnace oil will come from a refinery at Karachi In 1977, there were three refineries in operation, two at Karachi and one at Rawalpindi It is also assumed that the furnace oil will be transported by rail

The shadow price of the imported equipment is its c.i.f price, for the locally produced items, an equivalent value at world prices was estimated using the crude assumption that their domestic price exceeds their world price by the average rate of import duty on all machinery and equipment imports The AF for equipment and spare parts is given by the ratio of their value at c.i.f prices to their value at domestic prices

Table 39 gives the AFs for all the main traded goods associated with the project

Non-traded goods

Non-traded goods can be defined as those whose use or production by a project has its main direct effect on the domestic economy rather than on the trade balance There will clearly be some indirect foreign-exchange effects in the use or production of non-traded goods, and these should be considered In analysing the non-traded items used by the project three categories may be identified

Labour

Construction, electricity, road and rail transport and local trading costs

Other capital costs and terminal values

TABLE 39 ADJUSTMENT FACTORS FOR TRADED GOODS

Item	*Stage-one market price*	*Stage-two shadow price*	$AF = \left(\frac{\text{shadow price}}{\text{market price}} - 1\right)\%$
Sales			
Fabric (cotton)[a]			
Local sales	Ex-mill prices (see table 37)	F o b export prices (see table 37)	47 2
Export sales	F o b export prices (see table 37)	F o b export prices (see table 37)	0
Fabric (blended)[b]			
Local sales	Ex-mill prices (see table 37)	F o b export prices (see table 37)	−13 5
Export sales	F o b export prices (see table 37)	F o b export prices (see table 37)	0
Yarn[c]	Ex-mill price Rs 0 88 per lb	F o b export price Rs 0 88 per lb	0
Material inputs			
Raw cotton[d]			
Local			
Medium	Ex-ginnery price Rs 4 5 per lb	F o b export price Rs 6 1 per lb	35 5
Fine	Ex-ginnery price Rs 5 3 per lb	F o b export price Rs 6 1 per lb	15 1
Imported (long-staple)	C.i.f import price Rs 15 8 per lb	C i f import price Rs 15 8 per lb	0
PSF[e]	Ex-factory price Rs 10 per lb	C i.f import price Rs 5 0 per lb	−50
Chemicals and dyes[f]			
Local	Domestic prices assumed to exceed world prices by 38%	C i f import price	−27 5
Imported	C i f import price	C i f import price	0
Import duty	35% of c.i.f value	Zero	−100

TABLE 39 *(continued)*

Item	*Stage-one market price*	*Stage-two shadow price*	$AF = \left(\frac{\text{shadow price}}{\text{market price}} - 1\right)\%$
Material inputs *(cont.)*			
Fuel[g]			
Furnace oil	Ex-refinery price Rs 600 per ton	C i f import price Rs 1 000 per ton	66 7
Equipment and spare parts[h]			
Local	Domestic prices assumed to exceed world prices by 20%	C i f import price	−16 7
Imported	C i f import price	C i f import price	0

[a]The AF for cotton fabrics is obtained from the ratio of the present value of total export sales of cotton fabrics to the present value of domestic sales At a 10 per cent discount rate, export sales are Rs 222 6 and domestic sales are Rs 151 2, which implies that on average export prices are 47 2 per cent higher than domestic prices

[b]The AF for blended fabrics is obtained from the ratio of the present value of total export sales of blended fabrics to the present value of domestic sales At a 10 per cent discount rate export sales are Rs 399 6 million and domestic sales Rs 461 8 million Export prices are therefore 13 5 per cent below domestic prices

[c]The ex mill yarn price is based on the domestic wholesale price at Karachi in mid-1977 It is assumed that the price will be paid to the mill with no deduction for trading margin The f o b export price is based on the average export price for Pakistan yarn in the first half of 1977 *Annual Report, 1976* (All-Pakistan Textile Mills Association), *Pakistan Textiles* (All-Pakistan Textile Mills Association)

[d]The prices for local grades of cotton are those of types AC134 and Sarmast, *Economic Survey of Pakistan*, 1976/77 (Government of Pakistan, Finance Division) The prices paid by the mill are taken to be prices paid to the ginning factory The f o b export price is based on an estimate of the long run world price of raw cotton, of medium grades, adjusted to 1977 prices The import price of high-grade, long-staple cotton refers to the mid-1977 price of Egyptian cotton *Monthly Bulletin of Statistics*, vol XXXI, No 12 (1977)

[e]Import and domestic ex factory prices of PSF are taken from the PCI document on the polyester project appraised in chapter III

[f]Chemicals produced domestically are assumed to be sold at a domestic price exceeding their equivalent import price by the average rate of duty on chemical imports In 1975/76, this average rate of duty was calculated to be 38 per cent, *Monthly Statistical Bulletin*, vol 24 The AF for domestically produced chemicals is therefore $\frac{100}{138} - 1 = 0\ 275$ Chemicals imported by the project are valued in stage one at their c i f prices plus import duty Import duties are a transfer payment, since they are not included as a cost at stage two, they have an AF of −100 per cent

[g]The ex-refinery price of furnace oil is taken from *Pakistan Economic Survey, 1976/77* (Government of Pakistan, Finance Division) The assumed c i f price is based on data on f o b export prices for 1977 in *Monthly Bulletin of Statistics*, vol XXXI, No 12 (1977) plus an allowance of 10 per cent for the cost of transport to Pakistan

[h]Imported equipment used by the project is valued at stage one at its c i f import prices It requires no adjustment in the stage-two appraisal Equipment produced domestically is only 5 per cent of the value of total equipment It is assumed that the domestic prices of these items exceed their equivalent world prices by the average rate of import duty of 20 per cent paid on machinery imports in 1975/76, calculated from *Monthly Statistical Bulletin*, vol 24 This means that domestic prices are 17 per cent higher than world prices for this equipment, since by assumption the ratio of world to domestic prices is $\frac{100}{120} = 0\ 833$ Because locally produced equipment is only a small proportion of the total equipment of the project and imported equipment requires no adjustment, the weighted average AF for all equipment, both imported and local, is only −0 8 per cent (rounded to zero for ease of calculation) Therefore, neither the equipment item in fixed assets (see table 36) nor the spare parts item in operating costs is adjusted at stage two

Labour

The *Feasibility Report* classifies the labour used by the project as skilled, semi-skilled and unskilled The item "administration" in operating costs (table 33) is comprised chiefly of the salaries of management and clerical staff Labour is also a significant element in the costs of production of some of the non-traded inputs used by the project The relevant shadow price of labour in the stage-two appraisal is its opportunity cost, that is, the output it would have produced in its alternative employment valued at shadow prices Most of the skilled labour and the management staff required for the project will have to be obtained from the textile industry outside Baluchistan It is assumed that wages and salaries they receive on the project are equal to the value of the output they would have contributed to the economy, measured in shadow prices, if they had remained in their previous employment In other words, for skilled workers and salaried staff, the shadow price of labour is taken to equal the market wages and salaries paid by the project

Unskilled and semi-skilled labour both employed directly on the project and employed in non-traded activities used by the project, such as construction, electricity, road transport and distribution are treated differently These workers are assumed to come from Baluchistan, in particular from the district of Quetta As was mentioned earlier, little industry exists in the province, Quetta itself is chiefly a trading and an administrative centre Firm evidence on which to base an estimate of the shadow price of labour in Quetta is limited, and much will depend on the activities from which workers are assumed to be drawn Because of this uncertainty, sensitivity analysis is carried out using three alternative values for the shadow price of unskilled and semi-skilled labour These shadow prices are used to adjust both the inputs into the project by these categories of workers and also the labour costs of the main non-traded items produced in Baluchistan and used by the project

A more detailed discussion of the treatment of labour is given in appendix B to this chapter Semi-skilled workers are treated as unskilled workers who received on-the-job training by the project The absolute value of their opportunity cost is therefore taken to be the same as that of unskilled workers Semi-skilled workers receive higher market wages, however, so that the AFs required to reduce their wages to the shadow price of labour are lower than for unskilled workers Three alternative cases are analysed

Case 1 A shadow price of labour of zero is used It represents a situation where unskilled workers have been drawn to work on the project from a previous activity where their contribution to output was zero, an example would be workers who had been underemployed on a family farm in the Quetta district

Case 2. A shadow price of labour 33 per cent of the market wage for unskilled labour is used Here workers have been drawn from part-time employment in the rural sector, either as employees earning a wage or workers on a family farm

Case 3 A shadow price of labour 66 per cent of market wage for unskilled labour is used Here workers have been taken from semi-permanent employment in other activities in the town of Quetta, such as construction, or employment in commerce

The resulting shadow prices are assumed to have a zero foreign-exchange content, so that the output the workers would have produced is assumed not to include any traded goods [41]

Construction, electricity, road transport, rail transport and local trading costs

It is assumed that the use of these non-traded items by the project has led to an increase in their production within Baluchistan,[42] in this case their shadow prices are the value of the resources used in their production The costs of producing these items should be disaggregated into traded-good inputs, non-traded goods, labour and capital resources, and taxes These inputs should be shadow priced at their opportunity cost Finally, the foreign-exchange content of these costs should be adjusted by the premium on foreign exchange In practice this type of analysis cannot always be carried out very accurately The AFs used here for these non-traded items are derived from the analysis in the appendix to chapter II

Three main adjustments are involved First, the unskilled labour costs of producing these items are reduced to allow for a shadow wage below the market wage Because of the uncertainty regarding this shadow wage, the three alternative values discussed above are used Thus for each non-traded item there are three AFs varying with the value adopted for labour Secondly, the opportunity cost of the capital stock involved in the production of each commodity is estimated Surplus profits above this figure are not treated as costs, on the grounds that they are transfer payments.[43] Thirdly, all traded goods are valued at their estimated world prices The foreign-exchange content of the total costs at shadow prices is identified to allow an adjustment for the premium placed on foreign exchange

The AF calculated for construction is used to revalue the buildings item in fixed assets[44] (table 36) The other AFs are used to revalue various items in operating costs (table 33) The AF for electricity is used to adjust the electricity item in operating costs The road transport AF is used to adjust the transport costs of raw cotton, PSF and spare parts, and the transport cost component of selling and distribution expenses[45] The AF for local trade is applied to the distribution component of selling and distribution expenses Finally, the rail transport AF is used to revalue the rail costs of furnace oil

[41] This assumption is clearly an oversimplification for workers taken from the rural sector The main agricultural products are fruit and wheat. At present, Pakistan neither exports nor imports fruit in any significant quantities, and it can be argued that the effect of additional production will not be felt on the balance of trade. However, wheat is clearly a traded good. The use of this simplifying assumption reduces the value of the shadow wage, since it means that the shadow wage is not adjusted to allow for a premium on foreign exchange.

[42] The electricity for the project will probably not come from the Quetta grid system, but from another power station in Sind province. It is assumed that the labour used in electricity can be treated in the same way as that in the other non-traded activities.

[43] Since this is a stage-two appraisal, transfers of income between different groups are costless.

[44] A small item for the cost of land is included in this category Since it is less than 5 per cent of the total cost of buildings, it does not appear worth while to treat it separately

[45] The *Feasibility Report* states that selling and distribution cover both transport and distribution costs involved in marketing the output of the project. It is assumed arbitrarily that these two items are of equal value.

Other capital costs and terminal value of buildings and equipment

Other capital costs are miscellaneous items shown as part of fixed assets in table 36. The terminal value refers to the resale value of buildings and equipment when the project ends Detailed information on these items is not available, and they are treated in the same way as all non-traded inputs into the polyester plant appraised in chapter III are treated The crude assumptions are used that the market and shadow prices of these items are more or less equal and that these items have no foreign-exchange content, the results of the appraisal are not sensitive to their valuation, however

Tables 40 and 41 give the AFs for all the non-traded items used by the project Table 42 gives the AF for current assets

The AFs for traded and non-traded goods are applied to the real cash flow of the project to convert the stage-one appraisal into an analysis at shadow prices The first part of the stage-two appraisal shown in tables 43 and 44 is a preliminary adjustment before a premium on foreign exchange is introduced Although the project is analysed at three alternative shadow prices of labour, details of the adjustments are given in the tables only for case 2, where the shadow wage of unskilled labour in Baluchistan is taken to be 33 per cent of the market wage

The second part of the stage-two appraisal involves the adjustment of the real cash flow at shadow prices to allow for the extra value placed on foreign exchange All the items that can be identified as foreign-exchange costs or benefits are adjusted by the AF for foreign exchange The foreign-exchange content of the traded goods used by the project is 100 per cent, since the non-traded costs or benefits also incurred as a result of the use or production of traded goods are included in the real cash flow as separate items The foreign-exchange content of the non-traded goods

TABLE 40 ADJUSTMENT FACTORS FOR LABOUR

Category	*Stage-one market wage*[a] *(Rs per day)*		*Stage-two shadow wage (Rs per day)*	$AF = \left(\frac{\text{shadow wage}}{\text{market wage}} - 1\right)$ *(%)*	*Foreign-exchange content of shadow wage*[b]
Unskilled	15	Case 1	0% of market wage = 0	−100	0
		Case 2	33% of market wage = 5	−66 7	0
		Case 3	66% of market wage = 10	−33 3	0
Semi-skilled	18	Case 1	0	−100	0
		Case 2	5	−72 2	0
		Case 3	10	−44 4	0
Skilled	26		26	0	0

[a]The wage rates for unskilled workers are based on data collected in Quetta Wages for skilled and semi-skilled workers are based on the same percentage differentials between grades as assumed in the *Feasibility Report* The shadow wages for unskilled labour are also used for semi-skilled labour

[b]To simplify, it is assumed that the opportunity cost of workers has no foreign-exchange content In other words, the output they would otherwise have produced is assumed to have no foreign-exchange value, and therefore no foreign-exchange loss is involved as a result of their new employment

TABLE 41 ADJUSTMENT FACTORS FOR OTHER NON-TRADED GOODS

Item	*Case*	*Shadow wage (Rs per day)*	*AF (%)*	*Foreign-exchange content of shadow price (%)*
Construction[a]	1	0	−46 1	65
	2	5	−39 5	58
	3	10	−32 8	52
Road transport[a]	1	0	−54 6	61
	2	5	−48 9	54
	3	10	−43 3	49
Rail transport[a]	1	0	−30 9	96
	2	5	−29 9	94
	3	10	−28 9	93
Local trade[a]	1	0	−84 6	45
	2	5	−70 6	24
	3	10	−56 6	16
Electricity[a]	1	0	−19 7	51
	2	5	−9 7	45
	3	10	0	41
Other capital costs, terminal value of plant and buildings[b]		Shadow wages are assumed to equal market wages	0	0

[a] AFs for construction, electricity, road transport, rail transport and local trade are derived from the analysis in the appendix to chapter II Three AFs are given for each item depending on the value assumed for the shadow wage All the labour costs of producing these items are assumed to be for unskilled workers Case 1 uses a shadow wage of zero, case 2 a shadow wage 33 per cent of the market wage, and case 3 a shadow wage 66 per cent of the market wage These ratios are taken to apply to Baluchistan, where these items are likely to be produced

[b] A foreign-exchange content of zero is assumed for these relatively minor items

associated with the project is the value at world prices of the traded-goods inputs used in their production.[46]

Each item of the preliminary adjusted real cash flow is revalued by multiplying the assumed foreign-exchange content of that item by the premium on foreign exchange This gives a weighted foreign-exchange adjustment factor As in the previous case-study, three alternative values of the shadow price of foreign exchange of 1 15, 1 2 and 1 25 are used These shadow prices imply alternative premiums on foreign exchange of 15 per cent, 20 per cent and 25 per cent Cases 1, 2 and 3 are appraised at these alternative premiums

The sensitivity of the project to changes in the world prices of the outputs is also examined Cases 1, 2 and 3 are evaluated at a single premium on foreign exchange of 20 per cent and at export prices for cotton and blended fabrics and yarn 10 per cent above and below those given in the *Feasibility Report* and reproduced in table 37

Tables 45 and 46 show the foreign-exchange adjustments to the real cash flow and operating profits, respectively Only the adjustments for case 2 at a 20 per cent premium are shown in detail The results of all the alternatives are given in tables 47, 48 and 49

[46] The estimates of the foreign-exchange content of the main non-traded goods associated with the project are explained in more detail in the appendix to chapter II There are in this chapter three estimates of foreign-exchange content for each non-traded item, because three shadow prices, each based on a different value for labour, are calculated for each item

TABLE 42 ADJUSTMENT FACTOR FOR CURRENT ASSETS

Item	*Share in total value (%)*	*AF (%)*	*Weighted average AF (%)*
1 2 1/ Current assets			
/1 Inventories[a]	100		−0 55[b]
1 Finished output			
1/ Cotton fabric			
/1 Local sales	3	47 2	1 41
/2 Exports	5	0	
2/ Blended fabrics			
/1 Local sales	10	−13 5	−1 35
/2 Exports	9	0	
3/ Yarn	2	0	
2 Raw cotton			
1/ Local			
/1 Medium	32	35 5	11 36
/2 Fine	2	15 1	0 3
2/ Imported	9	0	
3 PSF	18	−50 0	−9 0
4 Chemicals			
1/ Local	1	−27 5	−0 27
2/ Imported	4	0	
3/ Import duty	3	−100 0	−3 0
5 Spare parts	2	0	

[a] All inventories are traded goods, so that current assets have a 100 per cent foreign-exchange content

[b] The weighted average of −0.55 per cent is so low that it is rounded to zero Because the AF for current assets is zero, no adjustment is made to this item in table 43

TABLE 43 PRELIMINARY ADJUSTMENT TO NET CASH FLOW – REAL, CASE 2

Item	*Stage-one market price present value at*		*AF*	*Adjustment at*		*Stage-two preliminary adjusted economic present value at*	
	10%	*20%*	*(%)*	*10%*	*20%*	*10%*	*20%*
1 Net cash flow – real (1 1 – 1 2.)	–103 4	–192 7				141 9	–54 7
1 Sources	*225 0*	*102 5*				*438 9*	*212 2*
1/ Operating profit	200 8	96 0	[a]	213 9	109 7	414 7	205 7
2/ Terminal value[b]	24 2	6 5	0	0	0	24 2	6 5
2 Uses	*328 4*	*295 2*				*297 0*	*266.9*
1/ Current assets							
/1 Inventories[c]	48 3	34 4	0	0	0	48 3	34 4
2/ Fixed assets	280 1	260 8				248 7	232 5
/1 Building[d]	73 4	65 9	–39 5	–29 0	–26 0	44 4	39 9
/2 Equipment[e]	202 3	190.8				199 9	188.5
1 Equipment	197 4	186 1	0	0	0	197 4	186 1
2 Road transport costs of equipment[f]	4 9	4 7	–48 9	–2 4	–2 3	2 5	2 4
/3 Other capital costs[g]	4 4	4 4	0			4 4	4.4

[a] Details of the adjustments to operating profit are given in table 44

[b] Terminal value covers both the scrap value of plant and buildings and inventories The scrap value of plant and equipment at market prices is taken to equal its value at shadow prices so that no AF is required for either item of terminal value

[c] No AF is used for inventories, details of the calculation of an AF for inventories, derived from a weighted average of the AFs for the different items of inventories, are given in table 42

[d] Buildings are revalued by the AF for construction (case 2) given in table 41

[e] No AF is used for equipment, details of the calculation of an AF for equipment are given in table 39

[f] Road transport costs are adjusted by the road transport AF (case 2) given in table 41

[g] Other capital costs are assumed to refer to non-traded items for which domestic market prices equal shadow prices.

TABLE 44 PRELIMINARY ADJUSTMENT TO OPERATING PROFIT, CASE 2

Item	*Stage-one market price present value at*		*AF*[a]	*Adjustment at*		*Preliminary adjusted economic present values*	
	10%	*20%*	*(%)*	*10%*	*20%*	*10%*	*20%*
1 1 1/ Operating profit (/1 −/2)	200.8	96.0				414 7	205.7
/1 Sales	*1 317 9*	*666 6*				*1 327 1*	*671 2*
1 Fabric (cotton)							
1/ Local sales	151 2	76 5	47 2	71 4	36 1	222 6	112 6
2/ Exports	222 6	112 6	–	–	–	222 6	112 6
2 Fabric (blended)							
1/ Local sales	461 8	233 6	−13 5	−62 2	−31 5	399 6	202 1
2/ Exports	399 6	202 1	–	–	–	399 6	202 1
3 Yarn	82 7	41 8	–	–	–	82 7	41 8
/2 Costs (1 + 2 + 3 + 4 + 5 + 6 + 7)	*1 117 1*	*570 6*				*912 4*	*465 5*
1 Material inputs	632 9	320 1				603 1	305 0
1/ Raw cotton							
/1 Local							
1 Medium	235 6	119 2	35 5	83 6	42 3	319 2	161 5
2 Fine	15 4	7 8	15 1	2 3	1 2	17 7	9 0
/2 Imported	68 8	34 8	–	–	–	68 8	34 8
/3 Road transport cost of cotton	7 2	3 6	−48 9	−3 5	−1 8	3 7	1 8
2/ PSF							
/1 Local	129 6	65 5	−50 0	64 8	−32 8	64 8	32 7
/2 Road transport cost of PSF	1 5	0 8	−48 9	−0 7	−0 4	0 8	0 4
3/ Chemicals							
/1 Local	63 2	32 0	−27 5	−17 4	−8 8	45 8	23 2
/2 Imported	82 3	41 6	–	–	–	82 3	41 6
/3 Import duty[b]	29 3	14 8	−100 0	−29 3	−14 8	–	–
2 Utilities	107 3	54 3				112 2	56 7
1/ Fuel							
/1 Furnace oil	22 0	11 1	66 7	14 7	7 4	36 7	18 5
/2 Rail transport cost of furnace oil	7 7	3 9	−29 9	−2 3	−1 2	5 4	2 7
2/ Electricity	77 6	39 3	−9 7	−7 5	−3 8	70 1	35 5
3 Spare parts	17 0	8 5				16 8	8 4
1/ Imported	16 5	8 3	–	–	–	16 5	8 3
2/ Road transport cost of spare parts	0 5	0 2	−48 9	−0 2	−0 1	0 3	0 1
4 Wages	126 2	67 7				76 9	41 3
1/ Unskilled	43 4	23 3	−66 7	−28 9	−15 5	14 5	7 8
2/ Semi-skilled	28 2	15 1	−72 2	−20 4	−10 9	7 8	4 2
3/ Skilled	54 6	29 3	–	–	–	54 6	29 3
5 Administration	60 5	32 4	–	–	–	60 5	32 4
6 Selling and distribution	106 4	53 8				42 9	21 7
1/ Local trade	53 2	26 9	−70 6	−37 5	−19 0	15 7	7 9
2/ Road transport	53 2	26 9	−48 9	−26 0	−13 1	27 2	13 8
7 Excise duty[b]	66 8	33 8	−100 0	−66 8	−33 8	–	–

[a] The AFs for the various items are given in tables 39-42

[b] Transfer payments are deducted from costs, so that the AF is −100 per cent

TABLE 45 FOREIGN-EXCHANGE ADJUSTMENT TO CASH FLOW – REAL, CASE 2

Item	Preliminary adjusted economic present values at		Foreign-exchange					Stage-two economic present value at	
			Content	Premium	AF	Adjustment at			
	10%	20%	(%)	(%)	(%)	10%	20%	10%	20%
1 Net cash flow – real (1 1 – 1 2)	141 9	–54 7						214 2	–40 2
1 Sources	438 9	212 2						565 8	275 6
1/Operating profit[a]	414 7	205 7				123 5	62.5	238 2	268 2
2/Terminal value	24 2	6 5	70[b]	20	14	3 4	0 9	27 6	7 4
2. Uses	297 0	266 9							
1/Current assets								351 6	315 8
/1 Inventories[c]	48 3	34 4	100	20	20	9 7	6 9	58 0	41 3
2/Fixed assets									
/1 Buildings	44 4	39 9	58[d]	20	11 6	5 1	4 6	49 5	44 5
/2. Equipment[e]									
1 Equipment	197 4	186 1	100	20	20	39 5	37 2	236 9	223 3
2. Road transport costs of equipment	2.5	2.4	54[f]	20	10 8	0 3	0 2	2 8	2.6
/3 Other capital costs[g]	4 4	4 1	0	20	0	0	0	4 4	4 1

[a] Details of the adjustments to operating profits are given in table 46

[b] The foreign-exchange content of the terminal value is the value of inventories recovered in year 15 (see table 34) The scrap value of plant and buildings is assumed to have a zero foreign-exchange content

[c] Inventories are traded goods and have a 100 per cent foreign-exchange content (see table 42)

[d] The foreign-exchange content of buildings is that given for construction (case 2) in table 41

[e] Equipment, both that provided locally and imported, is classed as a traded good, therefore it has a 100 per cent foreign-exchange content

[f] The foreign-exchange content of road transport costs is that given in table 41 for case 2

[g] Other capital costs are assumed to be non-traded items with a zero foreign-exchange content

TABLE 46 FOREIGN-EXCHANGE ADJUSTMENT TO OPERATING PROFIT, CASE 2

Item	Preliminary adjusted economic present values at		Foreign-exchange					Stage-two economic present value at	
			Content (%)[a]	Premium (%)[b]	AF (%)[c]	Adjustment at			
	10%	20%				10%	20%	10%	20%
1 1 1/Operating profit (/1 –/2.)	**414.7**	**205.7**				**124.5**	**62.5**	**538.2**	**268.2**
/1 Sales	*1 327 1*	*671 2*				*265 3*	*134 2*	*1 592 4*	*805 4*
1 Fabric (cotton)									
1/Local sales	222 6	112.6	100	20	20	44 5	22 5	267 1	135 1
2/Exports	222 6	112 6	100	20	20	44 5	22 5	267 1	135 1
2. Fabric (blended)									
1/Local sales	399 6	202.1	100	20	20	79 9	40 4	479 5	242 5
2/Exports	399 6	202.1	100	20	20	79 9	40 4	479 5	242 5
3 Yarn	82.7	41 8	100	20	20	16 5	8 4	99 2	50 2
/2. Costs									
(1 + 2 + 3 + 4 + 5 + 6)	*912.4*	*465 5*				*141 8*	*71 7*	*1 054 2*	*537 2*
1 Material inputs	603 1	305 0						723 4	365 7
1/Raw cotton									
/1 Local									
1 Medium	319 2	161 5	100	20	20	63 8	32 3	383 0	193 8
2 Fine	17 7	9 0	100	20	20	3 5	1 8	21 2	10 8
/2. Imported	68.8	34 8	100	20	20	13 8	7 0	82 6	41 8
/3 Road transport cost of cotton	3 7	1 8	54	20	10 8	0 4	0 2	4 1	2.0
2/PSF									
/1 Local	64 8	32.7	100	20	20	13 0	6 5	77 8	39 2
/2. Road transport cost of PSF	0 8	0 4	54	20	10 8	0 1	0 04	0 9	0 4
3/Chemicals									
/1 Local	45 8	23 2	100	20	20	9 2	4 6	55 0	27 8
/2. Imported	82.3	41 6	100	20	20	16 5	8 3	98 8	49 9

TABLE 46 *(continued)*

Item	*Preliminary adjusted economic present values at*		*Foreign-exchange*					*Stage-two economic present value at*	
			Content	*Premium*	*AF*	*Adjustment at*			
	10%	*20%*	*(%)*[a]	*(%)*[b]	*(%)*[c]	*10%*	*20%*	*10%*	*20%*
/2 Costs *(continued)*									
2. Utilities	112.2	56 7						126 8	64 1
1/Fuel									
/1 Furnace oil	36 7	18.5	100	20	20	7 3	3 7	44 0	22 2
/2. Rail transport cost of furnace oil	5 4	2.7	94	20	18 8	1 0	0 5	6.4	3 2
2/Electricity	70.1	35 5	45	20	9 0	6 3	3 2	76 4	38 7
3 Spare parts	16 8	8.4						20 1	10 1
1/Imported	16.5	8.3	100	20	20	3 3	1 7	19 8	10 0
2/Road transport cost of spare parts	0.3	0.1	54	20	10.8	0 03	0 01	0 3	0 1
4. Wages	76 9	41 3						76 9	41 3
1/Unskilled	14 5	7 8	–	–	–	–	–	14.5	7 8
2/Semi-skilled	7 8	4 2	–	–	–	–	–	7 8	4 2
3/Skilled	54.6	29 3	–	–	–	–	–	54 6	29 3
5 Administration	60.5	32.4	–	–	–	–	–	60 5	32 4
6. Selling and distribution	42.9	21 7						46 5	23 6
1/Local trade	15 7	7 9	24	20	4 8	0 7	0.4	16 4	8 3
2/Road transport	27 2	13 8	54	20	10 8	2 9	1 5	30 1	15 3

[a]The foreign-exchange content of the non-traded items road transport, electricity and local trade is that given in table 41 for case 2 All traded goods have a 100 per cent foreign-exchange content

[b]The adjustments above refer to case 2, at a foreign-exchange premium of 20 per cent

[c]The weighted AF for foreign exchange is derived from the product of the foreign-exchange content of each item and the premium on foreign exchange

TABLE 47 STAGE-TWO APPRAISAL CASES 1, 2 AND 3 AT FOREIGN-EXCHANGE PREMIUM OF 20 PER CENT AND AT DISCOUNT RATES OF 10 PER CENT AND 20 PER CENT

Stage	Case	NPV[a] (millions of rupees) 10%	NPV[a] (millions of rupees) 20%	IRR (%)
One		−103	−193	7
Two	1	260	−15	19
	2	214	−40	18
	3	168	−67	17

[a] Rounded to the nearest million rupees

TABLE 48 STAGE-TWO APPRAISAL AT DIFFERENT VALUES FOR THE PREMIUM ON FOREIGN EXCHANGE

A. NPV at discount rates of 10 per cent and 20 per cent

(Millions of rupees)

Case \ Premium on foreign exchange / Discount rate	15% 10%	15% 20%	20% 10%	20% 20%	25% 10%	25% 20%
1	242	−19	260	−15	278	−12
2	196	−44	214	−40	232	−37
3	150	−71	168	−67	186	−64

B. IRR

(%)

Case \ Premium on foreign exchange	15%	20%	25%
1	19	19	19
2	18	18	18
3	16	17	17

TABLE 49 STAGE-TWO APPRAISAL AT ±10 PER CENT CHANGE IN THE PRICE OF FABRIC AND YARN OUTPUT CASES 1, 2 AND 3 AT A PREMIUM OF 20 PER CENT ON FOREIGN EXCHANGE

A. NPV at discount rates of 10 per cent and 20 per cent

(Millions of rupees)

Case	Discount rate / Price of output	10%			20%		
		−10%	Base case[a]	+10%	−10%	Base case[a]	+10%
1		101	260	419	−96	−15	65
2		55	214	373	−121	−40	40
3		9	168	327	−147	−67	13

B. IRR

(%)

Case	Price of output	−10%	Base case[a]	+10%
1		15	19	>20
2		13	18	>20
3		10	17	>20

[a] Base case refers to the prices of outputs given in table 37 The other prices are 10 per cent above or below the values in the base case

Summary

The main procedures followed in the stage-two appraisal of the project are as follows

(a) All traded goods are valued at their world prices,

(b) Non-traded goods are valued either at their estimated costs of production at shadow prices or in the case of relatively minor items at their domestic market prices,

(c) The unskilled and semi-skilled labour from Baluchistan is assumed to have an opportunity cost below the market wage, sensitivity analysis is used at three shadow wage rates Cases 1, 2 and 3 refer to the appraisal of the project at these shadow wage rates

(d) The shadow prices obtained from these adjustments are termed preliminary adjusted economic values, the foreign-exchange content of these values is revalued to allow for the premium on foreign exchange Again, three values of the premium are used

Results

It can be seen from table 47 that the NPVs and IRR of the project are considerably lower in the stage-one analysis at market prices than when shadow prices are introduced into the appraisal This is because

(a) Excise duties on finished output and import duties on imported PSF and chemicals, which are included as costs in the stage-one appraisal, are deducted from costs at stage two;

(b) In the stage-two appraisal, the costs of the main non-traded goods used by the project are reduced to allow for the difference between the value at shadow prices of the inputs used in their production and the value of these goods at market prices,

(c) The unskilled labour employed both by the project and in the production of non-traded goods is valued at three alternative shadow prices, all below the market wage rate,

(d) The application of the premium on foreign exchange affects benefits more than costs

The IRRs of the project alter with the values used for the shadow wage Table 47 shows that the IRRs of the project range from 19 per cent in case 1, when a zero shadow wage is used, to 17 per cent in case 3, when a shadow wage of 66 per cent of the market wage is used The intermediate case, case 2, has an IRR of 18 per cent These rates of return are considerably above the estimated range of values for the opportunity cost of public investment of 10-12 per cent Even if the project is appraised assuming a shadow wage equal to the market wage for the workers both employed on the project and in the production of the main non-traded inputs, the IRR, at 15 per cent, is still above the opportunity cost estimates for public investment

The results in table 48 show that the net worth of the project is not sensitive to changes in the premium placed on foreign exchange within the range of values for the shadow price of foreign exchange of 1 15-1 25 identified in chapter II

The sensitivity of the appraisal to changes in the world prices of the fabrics and yarn outputs is also examined Table 49 shows that a 10 per cent rise in the prices of outputs above the prices given in table 37 produces an IRR in all three cases of more than 20 per cent However, a 10 per cent fall in output prices reduces the IRR significantly, in case 3, the IRR is approximately 10 per cent, which is at the bottom of the range of opportunity cost rates of return of 10-12 per cent At this price level, therefore, the project becomes marginal As is discussed in appendix A, it is difficult to establish the accuracy of the export prices given in the *Feasibility Report* A 10 per cent price fall in this appraisal implies a relative reduction in prices, since all values are in terms of constant prices Such a relative price fall could result from weak demand for textile fabrics on the world market In the absence of detailed world market studies, it is not possible to do more here than to comment on the sensitivity of the appraisal to changes in the future relative world prices of fabric and yarn outputs

Stage four

At stage four, attention is focused on the impact of the project on the incomes of residents of Baluchistan One of the Government's stated objectives is to raise

income levels in the two backward provinces of Pakistan, Baluchistan and the North-West Frontier Province (NWFP)

The appraisal here can be seen as a modification of the *Guide* stage-four analysis In the *Guide* all income or consumption changes arising from a project are revalued in terms of the *numéraire*, whereas here a simple distinction is drawn between income going to residents of Baluchistan and that going to the rest of Pakistan

Despite being located in Baluchistan, the textile project is judged to have only a small direct impact on the province Machinery for the textile mills and the material inputs–chemicals and dyes, PSF and raw cotton–will either be imported from abroad or purchased from other parts of Pakistan The skilled workers and the management staff of the project will be recruited nationally Although these employees will become residents of Baluchistan after the establishment of the project, they are not treated as residents for the purpose of the income-distribution analysis on the grounds that they are not part of the original population towards which the government policy of regional development is directed Also, taxes and dividends paid to the central Government, interest and loan repayments to domestic banks, and interest, loan and dividend payments to Iran will all leave Baluchistan, although some of these funds may be respent ultimately in the province in the form of additional government investment

Extra income can be created for the original residents of the province in three main ways

(a) Through the employment of unskilled and semi-skilled workers on the project It is assumed that these workers will come from the Quetta area,

(b) Through the extra income created in supplying the project with items produced in Baluchistan The main activities carried out within the province to meet the demands of the project are construction work, local packing and distribution of the finished items, and road transport in moving the raw materials and finished goods to and from the project Road transport requirements will be met by firms in Quetta employing local workers However, it is assumed that extra incomes generated in the railway sector will not accrue to residents of Baluchistan because there is no particular reason why extra employment in the sector as a result of the demands of the project should be filled by workers from Baluchistan If the railway system has to be expanded between Karachi and Quetta, resources can be shifted from elsewhere in the network and recruitment increased in other parts of the country In the case of the supply of electricity, the *Feasibility Report* indicates that electricity will not come from the Quetta grid system, but from a power station outside Baluchistan,

(c) Through a regional-multiplier effect Additional incomes generated within Baluchistan will be partially respent within the province to create further income [47] The extent to which such a multiplier effect will occur depends on several factors the percentage of extra income saved, the percentage respent within Baluchistan and the amount of unemployed resources available within the province that can be brought into use in response to an increase in demand A regional multiplier is not used in the income-distribution analysis partly because realistic data for its

[47] The regional multiplier is defined as $\frac{1}{(1 - C_r)}$ where C_r is the marginal propensity to spend income within the region The concept of a regional multiplier is discussed in the *Guidelines*, pp 80-82 J P Gittinger analyses the conditions where the use of a multiplier in relation to the national economy is illegitimate *Economic Analysis of Agricultural Projects* (Baltimore, Johns Hopkins University Press, 1972), pp 27-28

estimation are lacking,[48] but also because it implies a level of unemployment of resources within Baluchistan inconsistent with the assumption used in the stage-two appraisal Use of a regional multiplier implies unemployment of both labour and capital Although in case 1 labour is given a zero opportunity cost, capital used in the production of non-traded goods is always assumed to have a positive opportunity cost Therefore, only the first two regional income effects are considered

For unskilled or semi-skilled workers employed on the project, the net income gain will be the difference between the wages paid by the project and the income the workers would have received in its absence In the stage-two appraisal, it is assumed that the wages of workers in their previous employment can be used as a measure of their productivity or opportunity cost in that employment, therefore, the difference between the market wage and the shadow wage is the net income gain received by workers Where workers produce nothing or very little, and thus have a zero or low opportunity cost, the income they would have received in the absence of the project will be part of a shared family income In these cases the difference between the wage paid by the project and the shadow wage will be a net gain to the family as a whole rather than to the individual worker Since three alternative values are used for the shadow wage, there are three alternative estimates of the extra income going to unskilled or semi-skilled workers and their families as a result of the project The extra income received by workers employed on the project is shown in table 50 for all three cases, details of the calculations are shown in table 51 for case 2 alone

The extra income generated by the activities undertaken in Baluchistan to meet the demands created by the project will take the form of extra income to workers employed in these activities and surplus profits accruing to owners of capital in the province As with the workers employed directly on the project, the gain received by those employed in activities supplying the project will be the difference between

TABLE 50 ADDITIONAL INCOME TO RESIDENTS OF BALUCHISTAN ARISING FROM THE TEXTILE-MILL PROJECT AT DISCOUNT RATES OF 10 PER CENT AND 20 PER CENT

(Millions of rupees)

	Case 1		*Case 2*		*Case 3*	
Category	*10%*	*20%*	*10%*	*20%*	*10%*	*20%*
Workers employed on the project						
Unskilled	43 4	23 3	28 9	15 5	14 5	7 7
Semi-skilled	28 2	15 1	20 4	10 9	12 5	6 7
Workers employed in						
Construction	14 7	13 2	9 8	8 8	4 9	4 4
Local trade	22 3	11 3	14 9	7 5	7 4	3 8
Road transport	10 6	5 4	7 1	3 6	3 5	1 8
Owners						
Construction	11 7	10 5	11 7	10 5	11 7	10 5
Local trade	19 7	9 9	19 7	9 9	19 7	9 9
Total	150 6	88 7	112 5	66 7	74 2	44 8

[48] On the basis of crude estimates of savings propensities and the proportion of consumer goods available in Baluchistan, a regional multiplier of 2 0 is indicated, but this estimate cannot be used with any confidence

TABLE 51 ADDITIONAL INCOME TO RESIDENTS OF BALUCHISTAN ARISING FROM THE TEXTILE-MILL PROJECT, CASE 2

	Stage-one market wage			*Stage-two shadow wage*		*Net gain*	
	10%	*20%*	*AF (%)*	*10%*	*20%*	*10%*	*20%*
Workers employed on the project							
Unskilled	43 4	23 3	−66 7	14 5	7 8	28 9	15 5
Semi-skilled	28 2	15 1	−72 2	7 8	4 2	20 4	10 9

	Stage-one total costs at market prices		*Share of labour in total costs (%)*	*Stage-one market wage*			*Stage-two shadow wage*		*Net gain*	
	10%	*20%*		*10%*	*20%*	*AF (%)*	*10%*	*20%*	*10%*	*20%*
Workers employed in										
Construction	73 4	65 9	20	14 7	13 2	−66 7	4 9	4 4	9 8	8 8
Local trade	53 2	26 9	42	22 3	11 3	−66 7	7 4	3 8	14 9	7 5
Road transport	62 4	31 5	17	10 6	5 4	−66 7	3 5	1 8	7 1	3 6

	Stage-one total costs at market prices		*Share of surplus profits in total costs (%)*	*Net gain*	
	10%	*20%*		*10%*	*20%*
Owners					
Construction	73 4	65 9	16	11 7	10 5
Local trade	53 2	26 9	37	19 7	9 9
Road transport	62 3	31 6	0	0	0

Note Workers are assumed to gain the difference between their market wage and their shadow wage In case 2 the shadow wage of unskilled labour is assumed to be 33 per cent of the market wage This implies an AF of −66 7 per cent for unskilled workers and −72 2 per cent for semi-skilled workers (see table 40) The share of labour costs and surplus profits in the total value of sectoral output is taken from tables 9, 11 and 12 in the appendix to chapter II Total costs at market prices for construction, local trade and road transport are taken from tables 43 and 44 All estimated labour costs in construction, local trade and road transport are assumed to refer to unskilled workers

their wage in their new employment and their alternative wage Surplus profits to owners of capital are defined as profits above those that can be earned from alternative investments The activities undertaken in Baluchistan to supply the project that are examined are construction,[49] local trade and road transport [50]

[49] The construction costs of the project are given in table 43, under buildings

[50] The local trade costs are shown in table 44 as part of selling and distribution costs These costs refer to the costs of distributing the finished products of the project Road transport costs appear both as part of selling and distribution costs, where they refer to the costs of moving finished outputs, and as part of the costs of the inputs to the project–raw cotton, PSF, equipment and spare parts The cost of transporting equipment to the project is assumed to be borne by the suppliers, who are not located in Baluchistan

Total wages paid to workers in construction, local trade and road transport in Baluchistan as a result of the new project are found by multiplying the percentage of labour in the total costs of each sector, given in the appendix to chapter II, by the costs to the project at market prices of each of the three activities To simplify, it is assumed that all labour costs refer to unskilled workers, the difference between the valuation of labour at the market wage and at the shadow wage is the net income gain per worker Since there are three alternative estimates of the ratio of the shadow wage to the market wage, there are three separate values for the additional income received by workers The assumption that unskilled workers account for all labour costs will produce an overestimate of the income gain, since skilled workers are assumed to have a shadow wage equal to their market wage

The extra income received by owners of capital in Baluchistan is the difference between profits made in construction, local trade and road transport and the normal profits that can be expected on investments, normal profits can be viewed as returns at the private opportunity cost of capital In the analysis in the appendix to chapter II, surplus profits are defined as the amount of profits in a particular sector above a rate of return on capital at the estimated opportunity cost rate In theory this latter measure must reflect the rate of return on investment valued from the point of view of the economy as a whole at shadow prices [51]

In this appraisal it is assumed that the private and the opportunity cost rate of return both equal 12 per cent, so that surplus profits from the private point of view are the same percentage of the total value of output in construction, local trade and road transport as are surplus profits from the viewpoint of the whole economy

In the analysis in the appendix to chapter II no surplus profits could be identified in road transport activities,[52] this means that surplus profits are estimated only for the owners of capital in the construction and local trade sectors The total value of surplus profits is found by multiplying the percentage of surplus profits in the value of sectoral output in construction and road transport by the costs of these items to the project measured at market prices The extra income in Baluchistan resulting from the expansion of activities supplying the project is shown in table 50 for cases 1, 2 and 3, table 51 gives details of the estimation of these income changes for case 2 alone

Tables 50 and 51 show that under the assumptions used, income will rise significantly in Baluchistan over the life of the project The present value of these estimated income gains is small in comparison with the total expenditure of the project over its lifetime, but is high in relation to the stage-two NPV The stage-two NPV expresses the present value of the additional income created in the economy as a whole, so that under the assumptions used a significant proportion of the gains created by the project will go to residents of Baluchistan The income gains are also significant in relation to total federal government expenditure in Baluchistan– Rs 296 million in 1976/77 [53] Even for case 3, the most pessimistic regarding income effects, at a 10 per cent discount rate the present value of the income gains to

[51] A 12 per cent opportunity cost rate of return on capital per year is used to estimate surplus profits, surplus profits are profits in a sector minus a 12 per cent annual return on the capital stock in the sector

[52] This is due to the way in which data on the sector are presented, however, the project itself may purchase a number of trucks If so, surplus profits will accrue to the project and not to local truck owners Profits for the owners of the project are not treated as income to residents of Baluchistan

[53] *Pakistan Economic Survey, 1976/77, op cit*, p 252

residents of Baluchistan over the lifetime of the project is Rs 74 2 million, which is 25 per cent of the 1976/77 budgetary allocation [54]

It must be stressed, however, that the whole of the distributional analysis applied here depends upon the value assumed for the shadow wage of unskilled labour, since it determines the income gains to unskilled workers in Baluchistan Furthermore, it contains an obvious overestimate of the income effects, since not all of the wage costs in the construction, local trade and road transport sectors will be for unskilled labour Because of the uncertainty regarding the treatment of unskilled labour, the analysis must be considered illustrative of a particular approach rather than producing conclusive results

The *Guide* does not discuss in detail the question of giving different weights to incomes going to residents of different regions However, the stage-four weighting procedures can be readily adapted to a regional analysis In this appraisal, a simple distinction between residents of Baluchistan and the rest of the country is used, no distinction is drawn between saved and consumed income, nor between government and non-government income, nor between rich and poor within Baluchistan All incomes received by those in the rest of Pakistan are given a weight of 1 0, while all incomes going to residents of Baluchistan are given a weight greater than 1 0, reflecting the Government's policy of developing backward regions [55]

The choice of weight to be used to value incomes of those who live in Baluchistan is a political decision In the absence of explicit guidance from decision takers on the value, the project analyst can adopt one of two approaches

The first approach is to infer a weight from government policies on regional development In the recent past, Baluchistan has received a considerably higher allocation of federal government funds than its size of population alone warrants Table 52 gives the federal allocations to the provincial governments in 1976/77 Punjab and Sind provinces are classed as the non-backward regions and the NWFP and Baluchistan as the backward regions The allocation per person in Baluchistan of Rs 122 was 244 per cent greater than that in the Punjab and Sind If past budgetary allocations between provinces were used to infer a weight for income gains to a particular province, a weight of 2 44 for gains to residents of Baluchistan would be inferred However, use of this weight could be misleading for several reasons

TABLE 52 FEDERAL GOVERNMENT ALLOCATIONS FOR THE PROVINCES, 1976/77

Province	*Allocation on basis of population (millions of rupees)*	*Special allocation (millions of rupees)*	*Allocation per person (rupees)*
Punjab	1 897 9		50
Sind	708 7		50
North-West Frontier Province	421 8	175 0	71
Baluchistan	121 6	175 0	122

Source *Pakistan Economic Survey, 1976/77* (Government of Pakistan, Finance Division)

[54] The project itself is large in relation to federal government allocations to Baluchistan The total capital costs of the project, at 1977 prices, given in table 34 are Rs 305 million

[55] The problem of the weights to be given to residents of the other backward province, NWFP, is not considered, however, in the appraisal no income effects on this area could be identified

(a) In addition to a direct transfer of funds to the provincial government, federal assistance to Baluchistan takes other forms Subsidizing occurs through preferential tax policies, for example, firms in backward regions do not pay import duties on imported plant and machinery If the value of subsidies per person could also be included in the analysis it might alter the total transfer per person in Baluchistan,

(b) A weight derived from this approach would be applicable over the life of the project only if the level of income in the province did not rise significantly in relation to the national average If the region developed economically, one would expect the pattern of budgetary allocations to change over time,

(c) Perhaps the most important point is that this approach implies a political consensus on regional development Whenever there is a change in government, as occurred in Pakistan in 1977, or a change of emphasis within the same government, there appears to be little justification for inferring income weights from an examination of past policies towards regional development

The second approach to choosing weights to value regional income is to treat them as unknowns and to carry out sensitivity analysis using a range of values A project can be appraised using different weights and the switching value of the regional income weight can be estimated, it is the weight required to make the project acceptable The results of the appraisal can be presented to those responsible for taking a decision on the project, and they can be advised that acceptance implies a weight on incomes going to a particular region equal to or greater than the switching-value weight If this procedure is carried out for several projects and decision taking is consistent, the weight on regional income gains should be narrowed down to a range of values [56]

In this appraisal the project always appears acceptable unless one assumes a relative fall in the price of the fabric and yarn outputs Table 49 shows that the project only has an IRR within the estimated opportunity cost range of 10-12 per cent when one uses the highest shadow price of labour (case 3) and assumes a 10 per cent fall in the price of outputs below the prices given in the *Feasibility Report* Since this is the only one of the possible outcomes examined at which the project appears marginal, it is used to illustrate the application of regional income weights For all the other possible situations the project is clearly acceptable, and the use of a weight of $>1\,0$ for income gains to residents of Baluchistan will simply make the project appear more attractive [57]

Table 53 shows the sensitivity of the appraisal to different regional income weights for Baluchistan If one considers an IRR of 13 per cent to be clearly acceptable, then an income weight of approximately 1 6 is required to justify the project under the particular set of pessimistic assumptions used In other words, to make the project acceptable, the Government would have to value income in the hands of residents of Baluchistan 60 per cent more highly than income going to either the Government itself or residents of other more developed regions

[56] The approach of calculating the switching value of regional income weights is discussed in the *Guidelines* case-studies in chapters 19 and 22

[57] As we have seen in theory, the test discount can vary between different stages of an appraisal In this analysis, however, it is assumed that the marginal public-sector project will have no impact on the province of Baluchistan, so that there is no need to apply a different opportunity cost discount rate at stage four from that used at stage two

TABLE 53 ADJUSTMENT FOR INCOME GAINS TO RESIDENTS OF BALUCHISTAN

(Case 3, premium on foreign exchange of 20 per cent, prices of outputs −10 per cent of prices given in *Feasibility Report*)

Stage-two NPV[a] *(millions of rupees)*	*Income gain to residents of Baluchistan*[b]	*Income weight to residents of Baluchistan*	*AF (%)*	*Extra value of income to residents of Baluchistan (millions of rupees)*	*Stage-four*	
					NPV[c] *(millions of rupees)*	*IRR (%)*
		A	*10% discount rate*			
9	74 2	1 1	10	7 4	16 4	11
		1 2	20	14 8	23 8	11
		1 4	40	29 7	38 7	12
		1 6	60	44 5	53 5	13
		1 65	65	48 2	57 2	13
		B	*20% discount rate*			
−147	44 8	1 1	10	4 5	−142 5	
		1 2	20	9 0	−138 0	
		1 4	40	17 9	−129 1	
		1 6	60	26 9	−120 1	
		1 65	65	29 1	−117 9	

[a] The stage-two NPV is taken from table 49, case 3

[b] The income gain to residents of Baluchistan is taken from table 50, case 3

[c] The stage-four NPV is given by the stage-two NPV plus the extra value placed on income going to residents of Baluchistan

CONCLUSIONS

This case-study has illustrated particularly the application of stage two of the approach described in the *Guide*, but an analysis of the regional effect of the project has been included in a modified form of stage-four appraisal The stage-two appraisal is somewhat more complex than that used in the case-study in chapter III, there the domestic market prices of all non-traded goods are used as their shadow prices In this case-study, crude estimates of the shadow prices of the main non-traded items are derived from data on the cost of their production, these data are also used in the regional analysis to identify the income changes in the province of Baluchistan created by the project

It is difficult to comment conclusively on the project under examination because of the limitations of much of the data used in the appraisal When the data in the *Feasibility Report* are evaluated at shadow prices the project appears acceptable, and the rate of return is considerably higher at shadow prices than at market prices The appraisal of the project is sensitive to changes in the world price of its outputs, it is also certain to be sensitive to the capacity utilization rate achieved by the project, although this subject is not examined here Therefore, changes in the world market demand for cotton textile fabrics can have a major effect upon the results of the project However, without more detailed information, forecasts of changes in export demand and prices cannot be included in this appraisal

Appendix A

PROJECT DATA

The main source of data on the project is the *Feasibility Report* prepared in March 1974 and the PCI document submitted to the Planning Division in September 1974 The data in these documents have been revised in several ways for purposes of appraisal

In the appraisal, constant prices at mid-1977 are used Capital costs are valued on the basis of the revised estimates of the project management, in 1977 prices these are estimated to be approximately 15 per cent above the original figures in the *Feasibility Report* Most of the major items in operating costs—PSF, raw cotton, fuel, electricity, labour and transport—are valued at domestic prices prevailing in mid-1977 At the stage-two appraisal, world prices are substituted for the domestic prices of traded goods. For PSF and fuel, prevailing *mid-1977 world prices are* projected over the life of the project This implies that these prices will move in line with domestic inflation affecting the project For medium-grade raw cotton, there is evidence that long-run export prices will rise slightly in relation to inflation and therefore a forecast long-run export price is used over the life of the project Certain items in operating cost have no single unit price, it is assumed that the costs in the original *Feasibility Report* are based on prices in March 1974, the date of publication of the *Report* The mid-1977 value of these items is obtained by escalating their value in the original report by the percentage change in the wholesale price index in Pakistan between March 1974 and July 1977 The items of operating costs treated in this way are chemicals and dyes, administrative costs, selling and distribution expenses and spare parts

It is not clear from the *Feasibility Report* whether the unit prices used for the cloth fabrics produced by the project are long-run forecasts or prices current in 1974 Since price forecasts for the fabric output produced by the project could not be obtained in the appraisal, the prices given in the original report are applied to the cloth output over the life of the project, in other words, the prices are used as forecasts Average export prices for Pakistan cloth were roughly constant over the period 1974-1977, the average unit value of cloth exports was Rs 3 5 per lb in 1973/74 and Rs 3 2 per lb in 1976/77 In the intervening years, average export prices fell significantly below the 1973/74 level [a] Therefore, for the export market at least, if the prices given in the original report were current early in 1974, and if they moved in line with average cloth prices, they would still be valid for an analysis in 1977 prices Yarn export prices current in 1977 are obtainable and are used in the evaluation of the yarn output

The original report assumes that commercial production will commence in the final quarter of 1977 Discussions with the project management revealed that production is now expected to start approximately one year late The construction period of the project has been lengthened in the appraisal to allow for this delay Year 0 of the project's life is taken to be 1975/76, since the final agreement between the Government of Iran and the company was signed in February 1975 A

[a] Data on average export prices were obtained from the following publications *Pakistan Textiles Annual Report, 1976* (All-Pakistan Textile Mills Association), *Monthly Statistical Bulletin*, vol 24, Nos 3-6 (March-June 1976)

three-and-a-half year construction period is assumed, so that production is taken to commence in the latter half of year 3 of the project's life Capital costs are distributed between years 0 to 3 on the basis of the release of funds in each year for the project

The PCI document submitted to the Planning Division assumes 100 per cent capacity utilization from the first year of operations Given the technical problems of establishing a new plant and the problems affecting the Pakistan textile industry as a whole, this assumption appears unrealistic, in the appraisal a phased build-up of production is assumed. In year 3, the first year of operations, a 30 per cent capacity utilization rate is assumed, in year 4 it is assumed to rise to 60 per cent and in year 5 to 90 per cent It is also assumed that a 90 per cent utilization rate will be maintained over the rest of the life of the project The operating cost data of the project are adjusted to allow for less than full capacity working The cost of those items identified as variable costs are assumed to vary in direct proportion with changes in the utilization rate

The 90 per cent utilization rate can be seen as a normal level of capacity working in years in which there is no slackening in international demand for textiles (see the figures for capacity utilization in the early 1970s, in table 31 of chapter IV) A new recession on the world market would be likely to reduce capacity working below 90 per cent

The project's life of 12 years and its terminal value are assumed, since the *Feasibility Report* contains no reference to either Since partial production commences in year 3, the 12 years of the project's life cover years 4-15 In year 15, the project is given a terminal value equal to the stock of inventories, plus 10 per cent of the original total capital cost to cover the value of buildings and any scrap value of equipment The choice of the project's life and terminal value is arbitrary, a more detailed analysis of the project would have examined alternative assumptions regarding its life, since the appraisal is more sensitive to the assumption regarding the life of this project than to the terminal value

When the *Feasibility Report* was prepared, cloth exports were subject to duty, which was removed during 1974 Therefore, the export duties shown as costs in the original report are not included in this appraisal Excise duties on domestic sales have not been removed, however In the absence of more detailed information, it is assumed that the rates given in the original report are still relevant for 1977

Appendix B

THE SHADOW PRICE OF LABOUR

The shadow price of labour, or shadow wage, is defined here as the opportunity cost of a worker, the value of the output he would have produced elsewhere had he not been employed on the project Three categories of workers employed by the textile mill can be distinguished

(a) The unskilled workers employed during the construction stage who are not permanent employees and who after completion of the mill will go to work on another project,

(b) The factory operatives who are employed as semi-skilled and unskilled workers and trained by the mill,

(c) The factory operatives who are employed as skilled textile workers, these workers will be taken from textile mills in other parts of the country

The position of unskilled labour alone will be discussed, since it is assumed that the wages of skilled workers adequately reflect their shadow prices.

Quetta, the main urban settlement in Baluchistan and its capital, has a population of 160,000 Apart from the textile mill, the main industrial unit is a ghee factory, employing roughly 75 workers [a] There are a number of small-scale industrial units, including a woollen mill, a flour mill, a distillery and a soap factory Total factory employment in these small-scale units is estimated to be below 600 persons [b]

The four main sources of employment for unskilled labour in the city and the surrounding area are

(a) The construction industry Quetta has experienced a minor building boom in the last few years The prevailing wage rate for unskilled construction workers was Rs 15 per day in 1977 Because of the severity of the winter in Quetta, building activity ceases between mid-November and mid-March During the cold season construction workers customarily return to their villages in other parts of Baluchistan,

(b) The service sector Since Quetta is a trading centre for Baluchistan, opportunities for employment in shops, warehouses, restaurants and hotels exist The Government of Baluchistan is also a major employer The minimum wage paid by the Government is fixed at Rs 140 per month, however, with additional allowances and bonuses, the government minimum rate in 1977 was approximately Rs 310 per month [c] Legally all workers in establishments employing 10 or more persons are covered by minimum-wage regulations

(c) The fruit industry Baluchistan is the chief supplier of fruit for the rest of Pakistan Fruit, the major agricultural crop of the Quetta valley, is picked in the valley from June to October and sent to Quetta for packing and transportation to Karachi and other centres of consumption This trade is carried on all the year round, since fruit continues to arrive at Quetta from other parts of Baluchistan during the period when none is available in the Quetta area itself Semi-permanent workers employed in packing fruit earned approximately Rs 300 per month plus two meals a day in 1977, or the equivalent of a monthly money wage of Rs 600-Rs 700;[d]

(d) Agriculture Casual employment exists in agriculture during the fruit-picking and wheat-harvesting seasons, the former runs from June to October and the latter from May to July In these months many farmers hire casual workers, who are likely to come from share-cropping farming families Fruit pickers and casual labour employed for the wheat harvest probably earn around Rs 15 per day [d]

To estimate the shadow wage, some assumptions must be made regarding the source of the labour employed on the project Once the previous employment of the workers has been identified, their productivity in that employment must be

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[a] *Cheltan Ghee Mills Project Report in PCI Form* (Baluchistan Development Authority, September 1974)

[b] Data supplied by the Labour Directorate, Government of Baluchistan, Quetta.

[c] Data supplied by the Government of Pakistan, Planning Division

[d] Estimate of Labour Directorate, Government of Baluchistan

estimated Three sources of employment appear possible for workers in the textile mill the construction sector and the service sector in Quetta itself and the agricultural sector in the surrounding district It is assumed that workers will not be drawn from full-time employment in the fruit trade in Quetta because the annual income they would earn on the project would not exceed that in their existing activity A daily wage rate of Rs 15 per day, in 1977 prices, is assumed for unskilled textile factory workers The wage that workers would have received in their previous employment is taken as a measure of their productivity in that employment at shadow prices However, because of the considerable uncertainty regarding the true value of the opportunity cost of unskilled labour in the appraisal of the project, three alternative assumptions are used In each of these three cases, the shadow wage is assumed to be a different proportion of the market wage of Rs 15 per day paid by the project

Case 1. Here the shadow wage is taken to be zero, an extreme assumption that implies that workers have been drawn from either open unemployment in Quetta or from family farms in the Quetta district where their contribution to total output was zero Workers are unlikely to go directly from agriculture to employment on the new project However, a chain effect could operate so that if the workers for the textile mill were taken from the construction or service sector in Quetta, the jobs they vacated could be filled by migrants from agriculture In this event the final loss of output as a result of the employment effect of the mill would be felt in the agricultural sector [e]

Case 2 Here the shadow wage is taken to be 33 per cent of the market wage, with a daily wage rate of Rs 15 per day, the shadow wage will be Rs 5 per day It can be thought of as the highest shadow wage for workers drawn directly or indirectly from agriculture Estimates from the Punjab suggest that landless workers there are employed for 80 days per year in agriculture plus 54 days in non-agricultural work [f] Here 134 man-days are used as a measure of annual employment for both family workers and employees earning an agricultural wage If Rs 15 is used as a measure of the value of their daily output at shadow prices, the value of their annual output is Rs 15 x 134 = Rs 2,010 In the project appraisal, the annual wages of unskilled permanent employees of the project are assumed to be Rs 5,400, or Rs 450 per month Therefore, the assumed output lost in agriculture per worker is 37 per cent of the annual wage bill, this is rounded down to 33 per cent This estimate can be seen as a maximum shadow wage for agricultural workers, since the agricultural sector is considerably more developed in the Punjab than in Baluchistan, and one might expect annual employment to be higher there than in Baluchistan

Case 3 Here the shadow wage is taken to be 66 per cent of the market wage, or Rs 10 per day, and the final effect of employing workers on the project is felt in the construction and service sectors in Quetta Building activity ceases for four months of the year, during the winter season It is assumed that construction workers are fully employed for eight months of the year and unproductive for the remaining four months, and that their daily wage of Rs 15 can be used as a measure of their opportunity cost at shadow prices If construction workers move to work as

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[e] Firm information on the importance of migration within the Quetta district is not available

[f] J B Eckert, *Rural Labour in the Punjab A Survey Report* (Government of Punjab, Lahore P and D Department, 1972)

permanent employees on the new project, their shadow price will be roughly two-thirds of their market wage on the project For workers drawn from the service sector, it is assumed that they were previously employed full-time at the government minimum wage of Rs 310 per month, the minimum wage is a little more than two-thirds of the monthly wage assumed to be paid to unskilled employees of the project As with the other workers, their previous wage is taken as a measure of their opportunity cost

The effect of employing workers on the project may be to reduce the number of workers openly unproductive, to attract migrant workers from agriculture and to draw workers away from permanent and semi-permanent employment in Quetta In that event the real shadow wage would be the weighted average of the values in cases 1, 2 and 3 In the absence of further information, however, the project is evaluated at each shadow price It is assumed that the opportunity cost of labour has a zero foreign-exchange content, that is, the output workers would have produced elsewhere contains no traded goods This is an extreme assumption used to simplify the analysis, it is not likely to be misleading in the event of workers coming from Quetta, since construction and service activities are non-traded However, part of the forgone output from workers drawn from agriculture will be wheat, clearly a traded good It is more debatable whether fruit that is not yet exported in any sizeable quantity should be classed as a traded item Hence, for agricultural workers, the relevant opportunity cost will have some foreign-exchange content, and the assumption of a zero foreign-exchange content will be partly misleading Wheat is a secondary crop in the Quetta district in comparison with fruit, however

The analysis of unskilled labour has been conducted in terms of workers and employees of the textile-mill project itself However, many of the non-traded goods and services used by the project, such as transport facilities, construction work, packing and distribution of the finished products, and the supply of electricity will be produced or undertaken within Baluchistan Therefore, the same shadow prices of unskilled labour used in the evaluation of labour costs for the textile project are used to value the labour components in the costs of production of these non-traded items The treatment of these goods is discussed in the appendix to chapter II.

V. THE SUGAR PROJECT

THE SUGAR INDUSTRY IN PAKISTAN

Sugar production in Pakistan in the past has been a high-cost activity by world standards A study of the industry by the Food and Agriculture Organization of the United Nations (FAO) identified four features that give cause for concern

The lack of any sustained growth in acreage under sugar-cane since the mid-1960s

A low level of sugar-cane yields per acre

A low recovery rate of sugar per ton of sugar-cane processed

A high degree of cyclical variations in both acreage under sugar-cane and in the production of mill-processed white sugar[1]

Table 54 gives figures for acreage under sugar-cane and yields per acre for the period 1965/66-1976/77

A major characteristic of the industry is that most of the sugar-cane is used to manufacture coarse sugar, chiefly gur, by the open-pan process in the rural areas In 1974/75, of a total harvest of 21 million tons of cane, 14 million was used for village gur production, with only approximately 7 million going to sugar-mills [2] The

TABLE 54 SUGAR-CANE CULTIVATION AND WHITE-SUGAR PRODUCTION, 1965/66-1976/77

Year	*Acreage (thousand acres)*	*Yield (maunds per acre)*	*White-sugar production (thousand tons)*
1965/66	1 476	404 9	377
1966/67	1 605	366 9	322
1967/68	1 245	401 5	252
1968/69	1 336	440 6	408
1969/70	1 532	461 1	610
1970/71	1 572	394 9	519
1971/72	1 364	391 8	375
1972/73	1 318	405 4	429
1973/74	1 595	401 6	608
1974/75	1 663	342 2	502
1975/76[a]	1 729	395 8	623
1976/77[a]	1 828	412 6	n a

Source *Pakistan Economic Survey* (Government of Pakistan, Finance Division, 1977)
[a] Provisional

[1] *Commodity Policy Study on Sugar*, TA3257 (Rome, 1974), p 24
[2] Between 10 and 15 per cent of cane was used for seed and fodder

proportion used in gur production was even higher in earlier years, as can be seen from table 55 Total gur production was estimated to be 1 3 million tons in 1973/74, in contrast with total white-sugar production from the mills of 0.59 million tons [3]

The major cause of instability in mill white-sugar production appears to be the diversion of cane from the mills into gur production. Unlike cane prices, which are controlled, gur prices fluctuate freely, whenever prices for gur rise significantly in relation to cane prices paid by the mills, cane is diverted to gur production [4] The FAO study suggests that gur prices are sensitive to the supply of white sugar available in the rural areas When white sugar is scarce, for example following a poor cane crop, gur is used as a substitute, and the price of gur rises almost to the level of the controlled retail price of white sugar When supplies of white sugar are adequate, the price of gur falls, since consumers prefer white sugar

TABLE 55 CANE CRUSHED BY SUGAR-MILLS AS A PROPORTION OF TOTAL CANE CRUSHED, BY PROVINCE, 1965/66-1972/73

(Percentage)

	Province			
Year	*NWFP*	*Punjab*	*Sind*	*Total*
1965/66	42 9	9 0	31 6	17 2
1966/67	36 1	11 6	27 1	17 4
1967/68	28 8	8 9	25 9	14 3
1968/69	29 5	14 4	41 0	19 9
1969/70	41 7	19 3	57 9	27 0
1970/71	41 3	16 1	78 0	28 1
1971/72	29 9	11 6	41 5	18.9
1972/73	28 2	14 9	58 1	23 4

Source *Commodity Policy Study on Sugar* (Rome, FAO, 1974)

Sugar is a tropical crop, but Pakistan lies wholly within the temperate zone This climatic factor, combined with poor cultivation methods and lack of irrigation facilities, has produced yields of cane per acre that are among the lowest in the world The national average yield is at present less than 15 tons of cane per acre, which is not low in comparison with average yields in some of the sugar-growing parts of India but is low in relation to other sugar-growing areas of the world Average yields in India were also less than 15 tons per acre in the early 1970s, although tropical states like Maharashtra and Andhra Pradesh achieved yields of around 20 tons per acre [5] Average yields in the Caribbean are around 30 tons per

[3] *Pakistan Economic Survey, 1976/77* (Islamabad, Government of Pakistan, Finance Division, 1977)

[4] The econometric analysis of the FAO study suggests that a 10 per cent change in the ratio of the price for cane paid by the mills to the price of gur is associated with an 11 per cent change in the volume of cane crushed by the mills, with the sign of the change being positive *Commodity Policy* , *op cit* , pp 121-122

[5] *Indian Agriculture in Brief* (New Delhi, Government of India, 1973)

acre, and average yields as high as 75 tons per acre in Peru and 90 tons per acre in Hawaii have been reached [6]

The number of tons of sugar-cane required in Pakistan to produce a ton of white sugar is high by world standards—11 8 tons, the present extraction, or recovery, rate, that is, tons of sugar per ton of sugar-cane, is low—9 per cent The FAO report suggests that the poor quality of cane, rather than inefficiency in the extraction process, is the main explanation for this low recovery rate [7]

Despite the problems experienced by the industry, the Government has identified it as a priority area for expansion The projected total demand for mill white sugar by 1982/83 is 1 2 million metric tons This projection implies an average annual rate of growth of total domestic consumption of 10 per cent over the period 1975/76-1982/83, in contrast with an actual average annual rate of growth of 11 9 per cent during the 1960s The absolute amount of gur consumption is also expected to increase, although it is projected to decline in *per capita* terms On the basis of current recovery rates and working days per year, installed mill capacity in the industry was estimated at 0 76 million metric tons in 1976/77 To meet the forecast growth in demand, the Government has planned to expand capacity, rather than import the sugar that the existing industry could not supply Sixteen new mills are likely to be installed by 1982/83 On the basis of a conservative estimate of average recovery rates, this expansion should be sufficient to meet a demand of 1 2 million metric tons [8]

THE PROJECT

The project examined here is a public-sector enterprise with the Government of Pakistan holding all the equity It is one of several new mills sanctioned during the fourth plan period, 1970-1975, as part of the expansion programme for the industry Under a protocol signed in April 1970, the Government of China agreed to supply Pakistan with a plant for a sugar-mill The terms of the agreement were very generous, since repayment for the plant and technical assistance was to be over a period of 40 years, commencing after a grace period of 30 years from the date of utilization of the loan The terms for interest on the loan were to be discussed only at the end of the grace period The Chinese also agreed to supply designs and components for equipment for the mill, which was to be produced in Pakistan by a new public-sector engineering plant After the visit of a team of Chinese experts, a mill with a capacity to crush 1,500 tons of sugar-cane per day was finally agreed upon,[9] and a site in Larkana District, Sind Province, was selected

From the statements made by the central Government and the sponsoring authority, the project was expected to create three types of benefit First, it was to save foreign exchange that would otherwise have been spent on sugar imports [10]

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[6] Government of Pakistan, *Report of the Expert Working Group on Food, Beverages, and Tobacco Industries* (Karachi, Printing Corporation of Pakistan Press, 1977), p 17

[7] *Commodity Policy* , *op cit* , p 55

[8] *Report of the Expert Working Group on Food* , *op cit* , p 18 On the basis of an average recovery rate of 9 per cent, the 16 new mills would give a small surplus above domestic requirements that would be available for export

[9] The original suggestion by the Chinese was for a plant with a capacity of 1,000 tons per day

[10] *PCI Document on the Sugar Mill Project* (Karachi, Pakistan Industrial Development Corporation, 1974)

Secondly, it was to raise the income of farmers who shifted to the cultivation of sugar-cane, expected to be a more profitable crop, and thus raise the average standard of living in the area.[11] Thirdly, it was to be the first new sugar-mill to use much domestically manufactured equipment It was hoped that the experience gained by the new public-sector engineering plant in supplying the equipment would form the basis for a local equipment industry capable of supplying other sugar plants to be built later as part of the expansion programme of the industry [12]

Civil construction started on the project in September 1972, and installation of machinery was completed towards the end of 1974 Trial production began in 1974/75, when a small quantity of sugar, 1,893 tons, was produced In the first full year of operation, 1975/76, total production was around 10,000 tons, or just over 50 per cent of rated capacity

The main problem experienced by the mill since coming on-stream has been to obtain adequate supplies of cane, since Larkana District is a predominantly rice- and wheat-growing area Table 56 gives acreages for the main crops in the district over the period 1971/72-1976/77

Before the mill began production, sugar-cane was cultivated on only around 4,300 acres, but not all of even this land produced cane of a quality suitable for milling The amount of land under cane needed to supply a sugar-mill with a crushing capacity of 1,500 tons of sugar-cane per day varies with cane yields per acre On the basis of current yields of around 330 maunds of sugar-cane per acre (12 tons per acre) in Larkana District, 20,455 acres would be required to meet the needs of the mill In Larkana District in 1977/78, it was estimated that around 12,000 acres in the district were under sugar-cane, of which approximately 8,000 were supplying cane to the mill The remainder of the cane crushed by the mill came from the surrounding districts of Sukkur, Jacobabad and Dadu

This cane procurement pattern has had several unfortunate consequences First, as yet the mill has not been able to obtain sufficient cane to achieve full-capacity operations, it ran at 51 per cent capacity in 1975/76 and 62 per cent in 1976/77

TABLE 56 ACREAGES FOR THE MAIN CROPS IN LARKANA DISTRICT, 1971/72-1976/77

Crop	*1971/72*	*1972/73*	*1973/74*	*1974/75*	*1975/76*	*1976/77*
Paddy	346 520	347 392	347 878	344 443	364 793	347 840
Wheat	154 964	149 881	144 818	125 858	132 481	122 809
Sugar-cane	2 075	2 486	4 343	4 415	7 147	10 603
Cotton	970	795	1 221	450	1 485	351
Vegetables	6 399	5 134	5 877	4 893	5 417	2 961
Oil-seeds	11 295	13 238	7 932	13 528	26 221	26 849
Jowar	5 883	6 582	6 054	5 497	18 422	16 926
Fruit	7 139	7 932	7 086	7 694	7 516	8 827
Maize	139	296	177	147	129	120
Pulses	91 283	93 127	92 729	86 649	84 159	97 730
Fodder	n.a	78 994	n a	n a.	n.a	106 726

Source Office of the Extra Assistant Director for Agriculture, Larkana District

[11] *Pakistan Annual Plan, 1975/76* (Government of Pakistan, Planning Commission, 1975)

[12] *Fourth Five-Year Plan, 1970/75* (Government of Pakistan, Planning Commission, 1970)

Secondly, much of the cane used by the project has been supplied from other districts Recently, the construction of two new sugar-mills has led to competition over the sources of supply Thirdly, the distance over which cane has to be transported to the project is considerably longer than is normal in Pakistan or desirable The bulk of cane crushed in Pakistan is moved from areas up to 20 miles from the sugar-mills (see table 57) For this project, however, some cane has been transported over distances of 60 miles or more. It is undesirable to ship cane over long distances not only because transport costs rise, but also because the cane deteriorates rapidly after being cut At high temperatures sucrose in the cane changes to glucose, and the sucrose extraction rate, or the amount of sugar produced per ton of cane, is lowered, which is one of the main reasons why the extraction rate achieved by the project is low

TABLE 57 PROCUREMENT OF CANE ACCORDING TO DISTANCE FROM MILL SELECTED MILLS

(Percentage)

	Miles				
Province and mill	*0-5*	*5-10*	*10-20*	*20-50*	*over 50*
NWFP					
Premier	29 5	28.6	28.6	14 3	–
Charsadda	46 0	45 0	5 4	3 1	0.5
Punjab					
Crescent	35 0	55 0	6 0	4.0	–
Kohinoor	18.75	25 0	18.75	37 5	–
Sind					
Habib	17 44	29 31	45 04	8.21	–
Fanji	17 0	38 0	41 0	4 0	–
Koski	19 6	33 2	2.1	19 1	–

Source *Commodity Policy Study on Sugar* (Rome, FAO, 1974)

APPRAISAL OF THE PROJECT

Unlike the two previous case-studies, the project examined here had already commenced production at the time of the appraisal; thus, actual rather than estimated figures could be used for the early years of the project's life The main source of data on the project is the original PCI document prepared by the sponsoring authority for the Planning Division of the Government of Pakistan. Data in this report are supplemented by additional information collected in Pakistan during 1977, further details of the project data are given in appendix A to this chapter The project is appraised at stages one and two and in a modified form of stages three and four following the *Guide.* In other words, all the considerations relevant in a cost-benefit analysis using the *Guide,* with the exception of the production of merit wants, are incorporated in the analysis Constant mid-1977 prices are used in the appraisal

The availability of sugar-cane for the project is an important consideration, and sensitivity analysis is applied to examine the effect of different assumptions about the supply and cost of sugar-cane on the net worth of the project Three alternative cases are examined Full details of the assumption used in each case are given in appendix B to this chapter Case 1 can be described as the base case, since it represents the most likely outcome It assumes that sugar-cane yields will not improve above existing levels, that the growth of cane supplies will not permit full-capacity operations until year 10 of the project's life and that Larkana District will supply the main requirements of the project by year 12 Case 2, for which the most pessimistic outcome is projected, assumes an even slower build-up of acreage under cane in Larkana, with no improvement in yields The project must continue to rely on obtaining some cane from other districts over the whole of its working life, and full-capacity operations will not be achieved until year 19 Finally, case 3, for which the most optimistic outcome is projected, assumes a steady annual increase in yields and acreage under cane in Larkana, here full-capacity operations are reached by year 8 of the project's life

The assumptions used regarding the supply of sugar-cane determine several key items in the appraisal The first is the capacity utilization rate reached by the project, output obviously depends on the availability of cane The second is the cost at market prices of sugar-cane used by the mill, although the price per maund of sugar-cane paid to farmers is fixed, the transport costs paid by the mill vary depending on the area from which the cane comes The third is the cost to the economy as a whole imposed by a shift from other crops to cane cultivation, this cost varies with the alternative crops, their yields and the yields assumed for cane These factors vary between districts, so that the opportunity cost of sugar-cane varies with the assumed source of supply

Stage one

All outputs and inputs of the project are valued at constant mid-1977 domestic market prices Following the procedures of the *Guide,* two cash flows are given for the project The cash flow–real, table 58, relates to the physical transactions associated with the project. Supplementary documentation on operating profits, terminal value, current assets and fixed assets are given in tables 59-62 Although the appraisal has been conducted for each of the three sets of assumptions regarding the supply of sugar-cane to the project, data on the base case alone (case 1) are given in detail Table 63 refers to the financial flows resulting from the project Table 64 gives the summary results of the appraisal at stage one for each of the three cases.

Sugar from mills in Pakistan is purchased by the Government and sold to consumers in ration shops at fixed prices. Prices paid to the mills are controlled In 1977, they were Rs 160 per maund,[13] while the mills paid an excise duty of Rs 50 per maund on sugar sales Table 59 shows that sugar-cane costs are by far the single most important element in operating costs Prices paid to farmers for their cane are also fixed by the Government In 1977, they were Rs 5 9 per maund [14]

[13] In the first two years of operation, the mills received a slightly higher price for sugar of Rs 170 per maund

[14] These prices had a slight variation between provinces Rs 5 9 per maund was the price fixed for Sind province

TABLE 58 NET CASH FLOW–REAL, CASE 1

(Millions of rupees)

Item	*Year*														
	0	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13-21*	*22*
1 Net cash flow – real	−19 1	−74 1	−60 3	−3 6	1 1	−4 6	3 3	4 4	7 9	9 4	10 3	10 8	11 3	11 8	27 6
1 Sources															
1/ Operating profit (BIT)[a]				−3 6	1 1	−4 6	3 3	4 4	7 9	9 4	10 3	10 8	11 3	11 8	11 8
2/ Terminal value[a]															15 8
2 Uses															
1/ Current assets[a]															
/1 Inventories				0 04	0 16	0 04	0 05	0 02	0 04	0 04	0 01				
2/ Fixed assets[a]															
/1 Construction	4 2	21 8	8.6												
/2. Other capital costs	2 6	13 3	5 3												
/3 Equipment															
1 Domestic	4 9	25 4	10 1												
2. Imported	7 4	13 6	36 3												

[a]Supporting documentation in following tables

TABLE 59 OPERATING PROFIT BIT, CASE 1

(Millions of rupees)

Item	*Present value at* 0%	5%	10%
1 1 1/ Operating profit (/1 −/2.)	168.3	81 1	41 3
/1 Sales at market prices	1 703 1	902.8	522.8
1 Sugar	1 693 9	897 9	520 0
2. Molasses	9 2	4 9	2.8
/2. Operating costs	1 534 8	821 7	481 5
1 Sugar-cane	701 8	374 0	217 9
2. Sugar-cane cess[a]	14 0	7 5	4 4
3 Road transport cost of sugar-cane	79 3	44 9	27 7
4. Labour			
1/ Unskilled and semi-skilled	28.1	15 8	9 8
2/ Skilled	47 9	27 1	16 8
5 Packing materials	38.8	20 6	12.0
6. Chemicals	49 6	26 3	15 3
7 Import duty on chemicals[b]	18.8	10 0	5 8
8. Other	24 0	13 6	8 4
9 Excise duty on sugar	532.5	281 9	163 4

[a]Cess is a government tax on sugar-cane paid by sugar-mills.

[b]All chemicals are assumed to be imported Import duty is taken to be 38 per cent, the average rate of duty on all chemical imports for 1975/76

TABLE 60 TERMINAL VALUE IN YEAR 22

(Millions of rupees)

Item	*Present value at* 0%	5%	10%
1 1 2/ Terminal value			
/1 Plant and buildings[a]	15 4	5 3	1 9
/2 Working capital			
1 Inventories[b]	0 4	0 1	0 05
Total terminal value	15 8	5 4	1 95

[a]Scrap value of plant and buildings was assumed to be 10 per cent of the original total capital cost

[b]In the real cash flow, inventories are the only items of working capital recovered at the end of the project's life

Sugar-mills also meet approximately 50 per cent of the costs of transporting cane from the farms Molasses, the by-product of the mill, is sold to a public-sector exporting company In 1977, the average selling price was Rs 2 2 per maund, a price considerably below the average f.o b price for molasses exports, and molasses sales provided only a very small proportion of project revenue

The net worth of the project at stage one is very low At market prices in case 1, it has an IRR of only 1 per cent, and in case 3, based on the most optimistic

assumptions, the IRR is only 2 per cent In case 2 the IRR is negative These rates of return are lower than nominal commercial interest rates in Pakistan in 1977 Furthermore, on the assumptions used, the mill will be able to maintain its operations only if it receives loans from the Government to cover operating losses in its early years Two obvious factors can be identified to account for this poor performance in commercial terms First, the build-up of the supply of sugar-cane to the mill is likely to be very slow, these supply difficulties are assumed to result in underutilization in the mill and high transport costs of sugar-cane Secondly, the excise duty imposed on sugar-mills in 1977 is high in relation to the controlled ex-mill price of sugar While these excise duties are a transfer payment between a public-sector producer and other branches of the Government, they reduce substantially the commercial returns to the mills themselves

TABLE 61 CURRENT ASSETS

(Millions of rupees)

Item	*Present value at*		
	0%	*5%*	*10%*
1 2 1/ Current assets[a]			
/1 Inventories			
1 Chemicals and packing materials[b]	0 4	0 3	0 2

[a]Sugar-cane cannot be stored for long periods, and therefore the main item under working capital is not sugar-cane inventories, but cash to cover the purchase of one month's supply of cane This cash item is not shown under current assets in the cash flow – real, but under cash and receivables in the cash flow – financial.

[b]These items are shown in the PCI document as covering one month's supply at full-capacity operations Since there is a gradual build-up to full capacity at year 10, chemicals and packing materials inventories are shown as increasing gradually to a value of Rs 0 4 million at year 10

TABLE 62 FIXED ASSETS

(Millions of rupees)

Item	*Present value at*		
	0%	*5%*	*10%*
1 2 2/ Fixed assets			
/1 Construction[a]	34 6	32 8	31 1
/2 Other capital costs[b]	21 2	20 1	19 1
/3 Equipment[c]			
1 Domestic	40 4	38 3	36 4
2 Imported	52 3	48 4	45 0
3 Duty on imported equipment	5 0	4 9	4 8
Total cost	153 5	144 5	136 4

[a]Refers to the cost of the buildings and housing colony of the project

[b]Covers a range of miscellaneous items, including cost of land, furniture, vehicles, tubewells and transport

[c]Refers to the plant and machinery of the project

TABLE 63 NET CASH FLOW – FINANCIAL

(Millions of rupees)

Item	Year 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
2 Net cash flow – financial	19.1	74.1	60.3	3.6	–1 1	4.6	–3.3	–4.4	–7.9	–9.4	–10.3	–10.8	–11.3	–11.8	–11.8	–11.8	–11.8	–11.8	–11 8	–11 8	–11.8	–11.8	–27 6
1 Sources	*19 1*	*74 1*	*60 3*	*4 1*	*1 3*	*5 2*																	
1/ Borrowings[a]	5 0	59 8	40 3	4 1	1 3	5 2																	
2/ Equity[b]	14 1	14 3	20 0																				
2 Uses				*0 5*	*2 4*	*0 6*	*3 3*	*4 4*	*7 9*	*9 4*	*10 3*	*10 8*	*11 3*	*11 8*	*11 8*	*11 8*	*11 8*	*11 8*	*11 8*	*11 8*	*11 8*	*11 8*	*27 6*
1/ Working capital																							
/1 Cash and receivables				0 5	2 4	0 6	0 7	0.3	0 6	0 5	0 1												
2/ Debt service[c]									5 7	5 7	5 7	5 7	5 7	5 7	5 7	5 7	5 7	5 7	5 7	5 7			
3/ Taxes[d]														3 3	3 3	3 3	3 3	3 3	3 3	3 3	6 5	6 5	6 5
4/ Dividends and retained earnings[e]							2 6	4 1	1 6	3 2	4 5	5 1	5 6	2 8	2 8	2 8	2 8	2 8	2 8	2 8	5 3	5 3	21 1[f]

Note The financing of the project is hypothetical and does not correspond with the actual plan adopted because all items here are expressed in constant 1977 prices

[a] All the loans come from the Government of Pakistan The original value of the Chinese loan, Rs 34 6 million, was escalated to mid-1977 prices, that is, Rs 55 8 million The Government has re-lent these funds to the project Since no interest or repayments are to be made to China during a 30-year grace period, it is assumed that no interest is charged to the project for the use of this loan The other loan, Rs 59 9 million, at mid-1977 prices, is assumed to have an interest charge of 10 per cent per year As discussed in chapter II, interest rates in 1977 are 10-13 per cent for project loans, these interest charges are reduced to real costs by subtracting an estimate of the future domestic rate of inflation in Pakistan An inflation figure of 8 per cent per annum is used arbitrarily, this gives a real interest rate of 2 per cent per year The appraisal is not affected by this choice of inflation rate, however, since the interest payments are transfers between different branches of the public sector An inflation-adjusted figure is used here only for the sake of consistency

[b] All the equity of the project is held by the Government of Pakistan

[c] The project has operation losses in years 3 and 5, and in drawing up the financial cash flow it was assumed that these could be covered by short-term loans A loan of Rs 4 1 million was required in year 3 to cover an operating loss of Rs 3 6 million and to build up working capital that could not be financed from income from operations, and a further loan of Rs 5 6 million was required in year 5 for operating losses and working capital It is assumed that repayment of all loans could be postponed until year 8, with no interest charges on the unpaid balances, during the grace period

[d] Operating profit is calculated net of depreciation allowances Operating profit defined in this way is negative until year 13 and therefore not subject to profits tax From year 13 on the capital cost of the project is fully depreciated, and there is a positive operating profit, which is subject to profits tax Taxes are calculated at 55 per cent of operating profit

[e] The income left with the project after the deduction of debt charges and taxes is assumed to be either dividends or retained earnings Since the Government is the sole equity holder and source of loans, no distinction is drawn between these uses of funds The small item of deductions for workers' welfare and profit-sharing funds is shown as part of the item dividends and retained earnings

[f] In year 22, terminal value, composed of the scrap value of plant and buildings and stocks held as working capital, is shown as dividends and retained earnings Terminal value does not include the cash working capital recovered at the end of the life of the project, to permit consistency with the real cash flow, where the recovery of cash items is not treated as a source of funds at the end of the project's life

TABLE 64 STAGE-ONE APPRAISAL[a]

(Millions of rupees)

Item	*Present value at*		
	0%	*5%*	*IRR (%)*
Case 1			
1 Net cash flow – real	30	–58	1
1 Sources			
1/ Operating profit	168 3	81 1	
2/ Terminal value	15 8	5 4	
2 Uses			
1/ Current assets	0 4	0 3	
2/ Fixed assets	153 5	144 5	
Case 2			
1 Net cash flow – real	–20	–85	Negative
Case 3			
1 Net cash flow – real	56	–52	2

[a]Net cash flow figures have been rounded to the nearest million rupees

Stage two

The appraisal at stage two proceeds in the same way as in the other case-studies Shadow prices based on opportunity costs are substituted for market prices The foreign-exchange content of all items associated with the project is then adjusted to take account of the extra value placed on foreign exchange Each of the three cases is appraised at shadow prices

The main considerations in the appraisal at stage two are the treatment of the output sugar and the key input sugar-cane Although Pakistan has not imported any significant quantities of sugar since 1972/73,[15] sugar is an internationally traded commodity The chief benefit to the economy from the production of sugar by the project is the saving of the foreign exchange that would have been spent on importing an equivalent quantity of sugar[16] Sugar-cane is not an internationally traded commodity, here it is treated as a non-traded good and valued on the basis of the inputs used per maund of cane These inputs, which include land, are valued at shadow prices The treatment of these key items and other aspects of the appraisal at stage two are discussed below under separate headings

Transfer payments

The transfer payments associated with this project are import duties on equipment and chemicals, the sugar-cane cess and the excise duty on sales of sugar None of these are treated as costs at stage two Since the excise duty on sugar is high,

[15] *Report of the Expert Working Group on Food* , *op cit* , p 21

[16] Production of sugar by the project is also assumed to save the costs involved in transporting imported sugar from the port of Karachi inland to consumers, these cost savings are small in relation to the value of sugar at world prices.

its omission raises the net benefit of the project significantly. Transfer payments can be important in an appraisal at stages three and four, when income changes resulting from a project are considered However, here all the transfers are taxes paid to the Government by a public-sector producer, and the Government is the sole equity holder of the project Therefore, the transfers involved are solely within the public sector and have no significance for the distributional analysis at stages three and four

The Chinese loan

The foreign equipment used by the mill was purchased from China with a loan provided by the Chinese Government As discussed in the textile project case-study, an inflow of funds from abroad can be treated in two ways If the funds are tied specifically to a particular project, they cannot be used elsewhere in the economy, therefore, these funds cannot have an opportunity cost The cost of using such funds on a project will be outflows abroad in the form of interest or dividend payments Alternatively, where funds are not tied to a particular project but are available for a range of projects, their cost will be their opportunity cost elsewhere Outflows associated with the use of such funds can be ignored if equivalent flows would have resulted from the alternative use of the funds on other projects

For the sugar project, the loan was made available as part of a general agreement under which the Chinese Government undertook to help expand the Pakistan sugar industry Therefore, if the loan had not been used to cover the purchase of equipment for the project concerned, it could have been used to import equivalent equipment for another sugar-mill In these circumstances, the loan was treated as untied, and the cost of its use was the value at shadow prices of the equipment purchased with the loan In other words, use of the loan by the project deprives another sugar-mill of the equipment, and the opportunity cost of the loan is therefore the cost of importing identical equipment

Both the equipment imported from China and that produced domestically in Pakistan are taken to be traded goods, with shadow prices equal to their import prices [17] In the original PCI document, the cost of the imported equipment is given in Chinese yuans and converted into rupees at the 1974 exchange rate To obtain a value at market prices for the stage-one appraisal, this figure is raised to 1977 prices Similarly, the cost of domestically produced equipment given in the PCI is also expressed in 1977 prices The total cost of this equipment estimated in this way and used at stage one of the appraisal of the project is Rs 92 7 million, a figure considerably below the cost of purchasing a complete plant with a capacity of 1,500 tons per day on the world market Data supplied from the domestic public-sector equipment producer suggest approximately Rs 142 million as the import cost of such a plant at 1977 prices Although there may well be some differences in type of machinery between that used on the project and imported machinery, since the former was either imported from China or produced in Pakistan from Chinese designs, it is assumed that the quality is broadly comparable Since the

[17] The small local cost items of transport, insurance and port handling involved in moving the equipment from Karachi to the project are entered separately under other capital costs, see table 62

total cost of equipment at market prices is Rs 92.7 million and the estimated world price is Rs 142 million, an AF of 53 1 per cent is used to revalue equipment costs at stage two $\left(\frac{142}{93\ 7} - 1 = 0\ 531\right)$ Both domestically produced equipment and that imported from China are revalued by this AF

Sugar

The sugar output produced by the project is defined as an importable traded good, and its shadow price is taken to be its c.i f import price plus the non-traded costs saved by not having to move the sugar inland from Karachi to various consumption centres In this appraisal, instead of valuing sugar at one shadow price, that is, the c.i f import price plus the value at shadow prices of the non-traded items saved, the two elements of the shadow price are calculated separately The sugar output is valued at an estimated c.i f import price to Pakistan

The world market for sugar is divided broadly into a controlled market section, where purchases are based on long-term contracts at fixed prices, and a free market, or non-controlled section, where sales are based on short-term contracts at current world market prices, appendix C to this chapter provides further information on the world sugar market Purchasers such as Pakistan buy sugar from the non-controlled section of the world market, and therefore the c.i f price for sugar relevant for the appraisal is the price in this non-controlled section In the free section of the world market, prices have been highly volatile in recent years In 1974, sugar prices rose substantially—from 9 6 cents/lb in 1973 to 30 0 cents/lb in 1974 However, prices have fallen steadily from the 1974 peak, the average price in 1976 was 11 6 cents/lb, and in the first half of 1977 it was down to 8 8 cents/lb [18] In view of these price fluctuations, it is difficult to project a single 1977 price for sugar into the future and argue that it will reflect the value of sugar imports over the life of the project at 1977 prices To overcome this problem, several forecast prices for sugar are applied in the appraisal They are in constant prices and therefore show how the price of sugar will move in relation to the price movement of other internationally traded items The low sugar prices of 1976 and 1977 are not expected to persist long into the future, in relative terms the world price is projected to rise by 8 per cent between 1977/78 and 1978/79 and by 9 per cent between 1978/79 and 1979/80 A gradual rise of 17 per cent is projected between 1979/80 and 1984/85, however, even by 1984/85, sugar prices are not expected to approach the levels of 1974 and 1975 The original price projections are in 1975 constant prices, for the purpose of this appraisal they are converted to 1977 prices Table 65 gives the forecast values for sugar prices in the non-controlled section of the world market and compares them with ex-mill prices in Pakistan in 1977 The AFs required to convert domestic prices for mill sugar into shadow prices are given also It is clear that in all years except 1974/75 the world price of sugar is considerably below the price the mill receives The excise duty of Rs 50 per maund on mill sales of sugar should not be forgotten, however, so that the net price the mill receives is Rs 110 per maund After 1984/85, the forecast world price of Rs 125 per maund will exceed this net revenue figure

[18] *Monthly Bulletin of Statistics*, vol. XXXI, No 12 (1977) (United Nations publication, ST/ESA/STAT/SER.Q/60)

TABLE 65 WORLD MARKET AND DOMESTIC EX-MILL PRICES FOR SUGAR

Year	*Year of project's life*	*Forecast world sugar price*[a] *(cents/lb)*	*(Rs/maund)*[b]	*Domestic ex-mill price (Rs/maund)*[b]	*AF for sugar (%)*
1974/75[c]	3	26.4	215	170	+26 4
1975/76[c]	4	17 2	140	170	−17 6
1976/77	5	11 3	92	160	−42 5
1977/78	6	11 1	90	160	−43 7
1978/79	7	12.0	98	160	−38 7
1979/80	8	13 1	107	160	−33 1
1980/81	9	13 1	107	160	−33 1
1981/82	10	13 1	107	160	−33 1
1982/83	11	13 1	107	160	−33 1
1983/84	12	13 1	107	160	−33 1
1984/85	13[d]	15 3	125	160	−21 8
↓	↓	↓	↓	↓	↓
1993/94	22	15 3	125	160	−21 8

[a]Constant 1977 prices, exchange rate $1 = Rs 9 9 has been used

[b]26 79 maunds equals 1 metric ton

[c]World prices for years 1974/75 and 1975/76 are actual average prices for those years expressed in 1977 terms.

[d]The price forecast for year 13 has been projected over the period years 13-22

The other benefit resulting from the production of sugar by the project is the savings in non-traded goods that no longer have to be used to transport the imported sugar from Karachi to domestic consumers The main items involved are port handling and local transport costs Since port handling costs are a very small proportion of the import price of sugar, they have been ignored in the appraisal The value of savings in transport costs cannot be estimated precisely, since the location of the final consumers of the project's sugar is not known It is assumed, however, that they are located to the north of the project [19]

The costs in transporting sugar from the project to consumption centres to the north and the distribution costs at these centres are incurred whether the sugar is imported or produced domestically Therefore, they cannot be treated as cost savings resulting from the project It is assumed that the sugar will be moved from Karachi by rail, so that the savings involved are in rail transport costs. In 1977, the cost of moving sugar from Karachi to the project over a distance of 450 kilometres was Rs 3 5 per maund [20] These costs at market prices are converted into shadow prices to express the opportunity cost of the resources saved in the transport sector A rail transport AF similar to that used in the textile project in chapter IV is applied to convert the rail costs at market prices into shadow prices The AF is discussed in more detail below in the section on "Other traded goods" The only difference to the AF used in chapter IV is in the treatment of unskilled labour, since here a single value is used for the shadow price of unskilled labour

[19]The assumption implies that sugar from the project will be consumed in the northern part of Sind Province, the Punjab and Baluchistan The results of the appraisal are not sensitive to the treatment of these transport cost savings, however

[20]Approximately 30 per cent of the sugar produced by mills in Pakistan in 1975/76 was moved by rail, *Monthly Statistical Bulletin*, vol. 24, Nos. 3-4 (March-June 1976) Data on costs of movement by road are not available.

In summary, two separate benefits from the production of sugar are identified and valued at shadow prices at stage two of this appraisal One covers the value of foreign exchange saved from not having to import equivalent amounts of sugar and the other, a much smaller item, the value of resources saved in rail transport

Sugar-cane

To meet the requirements of the project for sugar-cane, additional resources will have to be diverted to the cultivation of cane Sugar-cane is therefore an example of a non-traded good whose use by a project imposes an opportunity cost on the economy measured by the value at shadow prices of the inputs used in cane cultivation The inputs involved can be divided into two broad categories direct inputs and land Direct inputs include fertilizers, seed, water, pesticides, labour, bullock power and transport These items have shadow prices based, for traded goods like fertilizers or pesticides on their world market values and for non-traded goods like water or bullock power on their value in alternative uses [21] For the land used for cane cultivation the opportunity cost will be the alternative crops that could be grown in the absence of cane cultivation minus the direct inputs used to produce these crops, both crops and direct inputs should be valued at shadow prices The shadow price per maund of sugar-cane therefore will be the value of direct inputs per maund of cane, at shadow prices, plus the opportunity cost of the land required per maund of cane, again at shadow prices Details of the calculations for sugar-cane are given in appendix B to this chapter

Estimates of the shadow price of sugar-cane differ for each of the three cases examined, for each assumes a different source of supply The main crops displaced by cane, namely wheat, rice, jowar (sorghum) and cotton, are the same in each case However, the relative significance of the crops and yields per acre differ between districts Furthermore, case 3 assumes that in Larkana District annual yields of sugar-cane will rise steadily by 20 maunds per acre to a maximum level of 500 maunds per acre Cases 1 and 2 assume that yields will continue at their current 1977 level of 330 maunds per acre Because the land input per maund of cane is considerably lower in case 3 than in cases 1 and 2, the estimate of the shadow price of sugar-cane is lower

Table 66 gives estimates of the shadow price of sugar-cane for the three cases Shadow prices after an adjustment for a 20 per cent premium on foreign exchange represent the estimated total cost to the economy from cane cultivation Except in case 3, the cost of sugar-cane at shadow prices, after the foreign-exchange adjustment, is always above the market price of Rs 5 9 per maund

Labour

The unskilled labour element in the operating costs of the project and the labour components in the costs of construction and road and rail transport are adjusted to allow for a shadow wage below the market wage Data are not available to permit a

[21] In some cases, the basis for estimating shadow prices for non-traded inputs may be different where use of a non-traded input leads to an expansion of its production, its shadow price will be based more accurately on its costs of production than its value in alternative uses.

TABLE 66 SHADOW PRICE AND MARKET PRICE OF SUGAR-CANE IN CASES 1, 2 AND 3

(Rupees per maund)

Year of project's life	Shadow price of sugar-cane						Market price of sugar-cane
	Case 1		Case 2		Case 3		
	Before adjustment for premium on foreign exchange	After adjustment for premium on foreign exchange	Before adjustment	After adjustment	Before adjustment	After adjustment	
3	9 51	10 91	9 51	10 91	9 51	10 91	5 9
4	6 53	7 61	6 53	7 61	6 53	7 61	↓
5	5 85	6 83	5 85	6 83	5 85	6 83	
6	6 00	7 08	5 86	6 85	5 71	6 71	
7	6 03	7 07	5 92	6 94	5 42	6 37	
8	6 10	7 18	5 95	6 96	5 20	6 13	
9	6 16	7 26	5 97	7 00	4 95	5 84	
10	6 17	7 28	6 03	7 07	4 72	5 57	
11	6 18	7 29	6 05	7 10	4 51	5 33	
12	6 19	7 31	6 06	7 13	4 31	5 10	
13	6 20	7 32	6 08	7 15	4 14	4 89	
14	↓	↓	6 10	7 18	4 07	4 08	
15			6 12	7 20	↓	↓	
16			6 13	7 22			
17			6 15	7 24			
18			6 16	7 26			
19			6 17	7 27			
20			↓	7 27			
21				7 27			
22				7 28			

thorough estimation of this shadow wage and the procedure followed is crude, however, unskilled labour costs are only a small proportion of total project costs at market prices [22] Appendix A to this chapter examines the way in which unskilled labour employed in the sugar-mill is distinguished from skilled labour Skilled workers are assumed to have a shadow wage equal to their market wage

The shadow wage of unskilled labour is defined as the net output the worker would have produced in his alternative employment, valued at shadow prices It is assumed that employment prior to moving to a new job either on the project or in an activity supplying the project was employment on a farm in Larkana District of 25 acres or less There are very few tenant farms in Larkana District above 25 acres, and on owner-cultivated farms of this size income per family member is relatively high It is further assumed that workers will be drawn from tenant and owner-cultivated farms of different size categories in proportion to the total number of farm households in each size category [23]

[22] Labour costs are considered in some detail because unskilled workers are one of the groups whose income changes are revalued at stage four The analysis at stage four is intended partly for illustrative purposes, so that the income changes for workers are estimated in greater detail than their importance for the first results of the appraisal might warrant

[23] *Pakistan Census of Agriculture, 1972,* vol II, pt 3 (Lahore, Agricultural Census Organization, 1975) contains data on household members on various farms in Larkana District

As part of the study of the opportunity cost of sugar-cane, estimates have been produced of the annual income *per capita* on farms in the district differentiated by size and by owner or tenant cultivation [24] Annual income *per capita* figures for different farms have been adjusted for the number of working members per household in each farm category given in the *Pakistan Census of Agriculture* In this way an estimate is obtained for income per working family member It is assumed that this income per family worker on a tenant-cultivated farm can be taken as a measure of the marginal product or opportunity cost of agricultural labour in the district, valued at market prices The income figures for owner cultivators have not been used, since they do not distinguish between returns to family labour and returns to land [25] A weighted average value of income per family worker has been obtained by weighting the income figures for farms of different size categories by the total number of households in each size category [26] The resulting figure for income per worker of Rs 1,453 is used as a measure of the annual opportunity cost of agricultural workers at market prices

The value of output forgone in agriculture as a result of the change in employment created by demands of the project is expressed in shadow prices using an AF for the agricultural goods produced in the Larkana district Appendix B to this chapter discusses the derivation of this AF, in summary, the weighted average ratio of the shadow price of these commodities to their domestic ex-farm price is estimated at 1 66, with the weights given by the share of the various commodities in total agricultural production in the district The shadow prices of the agricultural goods are calculated with an adjustment for the shadow price of foreign exchange, in other words, a 20 per cent premium is added to the foreign-exchange values of these goods when they are converted into rupees [27] The opportunity cost of unskilled labour at shadow prices is therefore

$$\text{Rs } 1{,}453 \times 1\ 66 = \text{Rs } 2{,}412$$

The wages of relatively unskilled factory operatives employed by the project are taken to be Rs 450 per month, or Rs 5,400 per year [28] The ratio of the shadow wage

[24] Appendix B to this chapter contains the data on income *per capita* for different farm categories in Larkana District. Income is given for size categories 0-5, 5-12.5, 12 5-25, 25-50, 50-150, and 150+ acres. A distinction is drawn between owner-cultivated and tenant farms, income *per capita* differs between these categories.

[25] The income figures for tenant farmers are net of the returns to landlords, either in the form of rent or a share of crops. The approach used here assumes that these returns to landlords can be taken as a crude measure of the productivity of land The gains in income accruing to landlords are likely to include some monopoly profits, however, and thus the original estimates for the opportunity cost of agricultural labour are rounded upwards.

[26] The figures for income per family worker in the farm categories 0.5 acres, 5-12 5 acres and 12.5-25 acres are weighted by the total number of farm households, both tenant and owner cultivators, in each farm-size category Workers for the project and related activities are assumed to be drawn from both tenant and owner-cultivating families.

[27] This treatment of the foreign-exchange element in the cost of labour differs from that used for the foreign-exchange costs of other items. The procedure normally adopted is first to calculate shadow prices, termed preliminary adjusted economic values, which do not include an adjustment for a premium on foreign exchange, the foreign-exchange adjustment is conducted separately Here for ease of calculation, a foreign-exchange-adjusted shadow price is applied initially to unskilled labour costs, this means that in the part of the stage-two analysis where the foreign-exchange adjustment is introduced, no foreign-exchange element is identified in unskilled labour costs, so that the foreign-exchange premium is not introduced twice

[28] This average wage estimate is based on data collected on other industrial projects.

to the market wage for workers employed by the project is 45 per cent $\left(\frac{2,412}{5,400} = 0\ 446\right)$, it is rounded upwards to 50 per cent Therefore, all unskilled labour operating costs of the project are revalued by an AF of −50 per cent [29]

The labour used in the construction, road and rail transport sectors is treated differently It is assumed that the new workers involved in these activities will come from Larkana District and therefore that their opportunity cost is the same as that of the factory workers The exact annual earnings of unskilled workers in these sectors is not known, however, it is likely to be less than earnings form full-time employment in an industrial project A ratio of the shadow wage to the market wage of 66 per cent is assumed arbitrarily for these sectors, using an annual shadow wage of 50 per cent of the annual factory wage of Rs 5,400 gives annual earnings of Rs 4,090 per worker $\left(\frac{2,700}{0\ 66} = 4,090\right)$ The AFs used for construction, rail and road transport are those given in the appendix to chapter II for a shadow wage 66 per cent of the market wage

Other traded goods

The goods falling in the category other traded goods are the equipment imported from China for the project, the imported chemicals, the equipment produced in Pakistan, and molasses, the by-product of the mill Both types of equipment have been discussed above, their shadow prices are their equivalent prices on the world market The domestic costs of transport and port handling involved in moving this equipment to the project are included under other capital costs As discussed above, the domestic price of the equipment is revalued by an AF of 53 1 per cent, derived from a comparison of the total cost of equipment at domestic prices and the estimated import price of a complete plant The shadow prices of imported chemicals are their import prices The costs of chemicals are not disaggregated into their c i f import costs and the non-traded costs of transporting the chemicals to the project The latter are assumed to be a very small proportion of the total costs of chemicals and are ignored, so that chemical costs are assumed to be a 100 per cent foreign-exchange cost

The final item under other traded goods is molasses, a by-product It is sold by the project to a public-sector exporting company The value to the economy of the molasses is therefore the export price minus the cost at shadow prices of transporting it to Karachi The average export price of molasses for Pakistan in 1976/77 was Rs 15 1 per maund, and the cost of transporting it by rail was equal to that of transporting sugar—Rs 3 5 per maund These rail costs are expressed in shadow prices by an AF for rail transport of −15.6 per cent Port handling costs at Karachi are ignored The shadow price of molasses before an adjustment for the

[29] An alternative approach to the estimation of the shadow wage in Larkana District gives a similar value Survey data published in M H Khan, *Economics of the Green Revolution in Pakistan* (New York, Praeger, 1975) gives data on the number of days employed per annum for landless labourers in various districts in Sind and the Punjab The figure for Larkana District is 240 days per year, of which 80 are in agricultural activities If an estimated average daily wage for casual labour in Larkana District of Rs 8 is used as a measure of the daily marginal product, the agricultural output produced is valued at the AF for agricultural goods of 1 66 and the output for the remaining activities is valued at an AF of 1 00, the annual opportunity cost is (Rs 8 x 160 x 1 00) + (Rs 8 x 80 x 1 66) = Rs 2,342

premium on foreign exchange is therefore Rs 15 1 – (Rs 3 5–15 6%) = Rs 12 1 per maund This shadow price is 550 per cent higher than the price paid to the project for molasses,[30] the AF for molasses is therefore 450 per cent

Other non-traded goods

Other non-traded goods include fixed assets, construction and other capital costs, operating costs, road and rail transport, packing materials, skilled labour and other operating costs These non-traded items are further disaggregated into two groups

For those items for which detailed information is lacking, domestic market prices are used as a measure of their shadow prices These items are assumed to have a zero foreign-exchange content This approach is also used for certain non-traded items in the other case-studies The items valued in this way are other capital costs (miscellaneous investment costs), packing materials (the bags used to pack milled sugar), skilled labour and other operating costs (miscellaneous costs) Although the treatment used is crude, the items involved represent only 11 per cent of total costs at market prices

The other non-traded items, construction and road and rail transport, are valued using the AFs discussed earlier in the appendix to chapter II and used in chapter IV in the appraisal of the textile project The only difference between the AFs applied here and those used in chapter IV is in the treatment of unskilled labour The AFs in chapter IV are calculated for three alternative values of the shadow wage In this appraisal a single value, 66 per cent of the market wage, is applied [31]

Externalities

One of the specific claims made for the project is that it will help generate local engineering capacity to produce equipment for future sugar-mills With the help of Chinese designs and assistance, 40 per cent (in terms of value) of the equipment used by the mill was produced domestically, it was the first sugar-mill equipment to be produced in Pakistan After gaining experience with the project, the public-sector equipment producer went on to supply equipment to several other mills and is now in a position to supply a complete plant [32] If the sugar project were solely responsible for the establishment of a local equipment industry, it would clearly have

[30] The average f o b price of molasses over the period July 1976 to April 1977 is calculated from the *Monthly Statistical Bulletin,* vol 25, Nos 3-4 (March-April 1977) The AF for rail transport is taken from table 13 for the case of a shadow price of labour 66 per cent of the market wage, the AF is after an allowance for a 20 per cent premium on the value of foreign exchange The very high margin between the export price and the price received by the project suggests either an error in one or both of the prices or that the exporting company is earning substantial profits

[31] As discussed above, considerable uncertainty exists regarding the real value of the ratio of the shadow to the market wage for workers in these sectors A ratio of 50 per cent can probably be taken as the bottom of the range of possible values, since the wages of permanent workers in the mill are likely to be above those of construction and transport workers The stage-two results of the project are not sensitive to values of the shadow wage in these sectors of between 50 and 100 per cent of the market wage

[32] Information supplied by the management of the engineering company concerned

generated an external benefit In the appraisal, however, no external benefit is included on the grounds that even though the local equipment producer benefited considerably from Chinese designs and expertise, these were not linked specifically to the sugar project under consideration In other words, in the absence of the project another mill could have been established with similar linkage effects the domestic equipment industry therefore does not depend on the demand of any particular project [33]

Results

The project is evaluated by substituting a set of shadow prices for market prices in the real cash flow Initially the shadow prices are preliminary adjusted economic values, since they contain no allowance for the extra value given to foreign exchange [34] Tables 67-70 give the results of the appraisal before the adjustment for foreign exchange As in the other appraisals, the foreign-exchange adjustment is carried out by revaluing all items in the cash flow by a foreign-exchange AF derived by multiplying the foreign-exchange content of each item by the premium placed on foreign exchange

In this appraisal the foreign-exchange component is 100 per cent of the preliminary adjusted shadow prices of all traded goods [35] The non-traded items associated with the project have some foreign-exchange content in the form of traded good inputs, but for some minor non-traded items the crude assumption of a zero foreign-exchange content is used

As in the other appraisals (chapters III and IV), three values for the shadow price of foreign exchange are applied The most likely value is taken to be 1 2, implying a premium for foreign exchange of 20 per cent However, the sensitivity of the appraisal to values of 15 per cent and 25 per cent is tested Details of the adjustment for foreign exchange in table 69 are shown only for case 1, the base case, using a shadow price of foreign exchange of 1 2 Summary details of the results of cases 1, 2 and 3 with alternative values for the shadow price of foreign exchange are given in table 71

Since the world price of sugar is an important parameter in the appraisal, the effect of a 10 per cent rise or fall in the price above or below the forecast values given in table 65 is examined The shadow price of foreign exchange is kept constant at 1 2 to identify the effect of a change in the world price of sugar alone The results are given in table 72

[33] It can be argued that this approach to externalities, which is common in project appraisals, will mean that external effects will not be captured by the appraisal of individual projects. In this case, if the value of the external benefit could be quantified, an alternative treatment would be to allocate this value among all the new sugar-mills sanctioned at the same time as the mill under appraisal, the basis for the allocation might be the value of equipment used or tons of sugar produced per mill The author is indebted to John MacArthur for this idea However, this alternative treatment must face the problem of valuing an externality

[34] The treatment of unskilled labour discussed above is the exception to this procedure, since the output of traded goods forgone, which form this shadow price, is valued at shadow prices, including an adjustment for foreign exchange This approach is followed for ease of calculation and does not imply any difference of substance in the treatment of the foreign-exchange elements in labour costs

[35] The non-traded elements in these shadow prices are either shown separately, as in the case of the transport cost savings associated with the production of sugar, or are assumed to be a negligible proportion of the shadow price of the traded goods

TABLE 67 STAGE-TWO PRELIMINARY ADJUSTMENT TO NET CASH FLOW–REAL, CASE 1

(Millions of rupees)

Item	*Stage-one market price present value at* 5%	10%	*AF* (%)	*Adjustment at* 5%	10%	*Preliminary adjusted economic present value at* 5%	10%
1 Net cash flow – real (1 1 –1 2)	–58 3	–93 4				–1 7	–75 2
1 Sources	*86 5*	*43 2*				*173 5*	*89 6*
1/ Operating profit[a]	81 1	41 3		87 0	46 4	168 1	87 7
2/ Terminal value[b]	5 4	1 9	0	0	0	5 4	1 9
/1 Inventories	0 1	0 05	0	0	0	0 1	0 05
/2 Plant and buildings	5 3	1 9	0	0	0	5 3	1 9
2 Uses	*144 8*	*136 6*				*175 2*	*164 8*
1/ Current assets[c]							
/1 Inventories	0 3	0 2	0	0	0	0 3	0 2
2/ Fixed assets	144 5	136 4				174 9	164 6
/1 Construction[d]	32 8	31 1	–32 8[d]	–10 7	–10 2	22 1	20 9
/2 Other capital costs[e]	20 1	19 1	0	0	0	20 1	19 1
/3 Equipment							
1 Domestic	38 3	36 4	53 1	20 3	19 3	58 6	55 7
2 Imported	48 4	45 0	53 1	25 7	23 9	74 1	68 9
3 Import duty on equipment	4 9	4 8	–100	–4 9	–4 8	0	0

[a] Details of the adjustments to operating profit are given in table 68

[b] It is assumed that the market prices of these items can be used to approximate their shadow prices, no AF is used therefore

[c] The physical stocks held by the project are imported chemicals and packing materials The shadow prices of the imported chemicals are their c i f import prices, the value shown for imported chemicals at market prices is their c i f value in domestic currency, at the official exchange rate No AF is required to convert this market price into a shadow price Packing materials are one of the non-traded items whose market prices are taken to equal their shadow prices

[d] Based on the data for construction given in table 9 at a shadow wage 66 per cent of the market wage

[e] Treated as non-traded costs whose market prices approximate their shadow prices

TABLE 68 PRELIMINARY ADJUSTMENT TO OPERATING PROFIT, CASE 1

(Millions of rupees)

Item	*Market price present value at* 5%	10%	*AF* (%)	*Adjustment to cash flow at* 5%	10%	*Preliminary adjusted economic present value at* 5%	10%
1 1 1/ Operating profit[a] (/1 −/2)	**101.0**	**52.9**		**67 1**	**34.8**	**168.1**	**87.7**
/1 Revenue	*922 7*	*534 4*		*−240.5*	*−144 1*	*682 2*	*390 3*
1 Sugar[b]	897 9	520 0		−256 8	−153 4	641 1	366 6
2 Molasses	4 9	2 8	450	22.0	12 6	26 9	15 4
3 Rail transport cost savings	19 9	11 6	−28.9[c]	−5 7	−3 3	14 2	8.3
/2. Operating costs	*821 7*	*481 5*		*−307 6*	*−178 9*	*514 1*	*302.6*
1 Sugar-cane	374 0	217 9	[d]	19 1	11 6	393 1	229 5
2. Sugar-cane cess	7 5	4 4	−100	−7 5	−4 4	0	0
3 Road transport cost of sugar-cane	44 9	27 7	−43 3[e]	−19 4	−12.0	25 5	15 7
4 Labour[f]							
1/ Unskilled and semi-skilled	15 8	9 8	−50	−7 9	−4 9	7 9	4 9
2/ Skilled	27 1	16 8	0	0	0	27 1	16 8
5 Packing materials[g]	20 6	12.0	0	0	0	20 6	12.0
6 Chemicals[h]	26 3	15 3	0	0	0	26 3	15 3
7 Import duty on chemicals	10 0	5 8	−100	−10 0	−5 8	0	0
8. Others[g]	13 6	8.4	0	0	0	13 6	8.4
9 Excise duty	281 9	163 4	−100	−281 9	−163 4	0	0

[a] Operating profit at market prices given here differs from that at stage one, since rail transport cost savings are included as a benefit at stage two, but not at stage one

[b] The ratio of the forecast world price of sugar to the ex-mill domestic price varies from year to year, because of these variations, a single AF cannot be applied to the present value of sugar output at market prices The calculations of the shadow price of sugar have to be done on an annual basis and discounted to the present Table 65 gives the AFs for sugar over the life of the project

[c] The AF is that given for rail transport in table 13 at a shadow wage 66 per cent of the market wage

[d] Based on the ratio of cost of production at shadow prices to the price of Rs 5 9 per maund paid to farmers, as with sugar, the ratio of shadow to the market price varies from year to year, and the shadow price calculation must be done on an annual basis and discounted to the present Table 66 gives the shadow and market prices of sugar-cane

[e] The AF is that given for road transport in table 12 at a shadow wage 66 per cent of the market wage

[f] Unskilled labour employed on the project is valued at a shadow wage 50 per cent of the market wage, it is assumed that the market wage paid to skilled and salaried employees of the project is equal to their shadow wage

[g] The market price of these items is used to approximate their shadow price

[h] All are imported The market price is their c i f import price expressed in rupees at the official exchange rate Their shadow price is taken to be their import price, so that no adjustment is required to convert their market price into their shadow price

TABLE 69 STAGE-TWO FOREIGN-EXCHANGE ADJUSTMENT TO NET CASH FLOW–REAL, CASE 1

(Millions of rupees)

Item	*Preliminary adjusted economic present values at*		*Foreign-exchange*			*Adjustment to cash flow at*		*Stage-two economic present value at*	
	5%	*10%*	*Content (%)*	*Premium (%)*	*AF (%)*	*5%*	*10%*	*5%*	*10%*
1 Net cash flow – real (1 1 –1 2)	–1 7	–75 2						30.9	–69 7
1 Sources	*173 5*	*89 6*						*234 9*	*122 2*
1/ Operating profit[a]	168.1	87 7				61 4	32.6	229 5	120 3
2/ Terminal value[b]	5 4	1 9						5 4	1 9
/1 Inventories	0.1	0.05	55	20	11 1	0 01	0 005	0 1	0 05
/2. Plant and buildings	5 3	1 9	0	–	–	0	0	5 3	1 9
2. Uses	*175 2*	*164 8*						*204 0*	*191 9*
1/ Current assets									
/1 Inventories	0 3	0 2	55	20	11 1	0 03	0 02	0 3	0 2
2/ Fixed assets	174 9	164 6						203 7	191 7
/1 Construction	22.1	20 9	52[c]	20	10 4	2 3	2.2	24 4	23 1
/2. Other capital costs[d]	20 1	19 1	0	20	–	0	0	20 1	19 1
/3 Equipment[e]									
1 Domestic	58 6	55 7	100	20	20	11 7	11 1	70 3	66 8
2. Imported	74 1	68 9	100	20	20	14 8	13 8	88 9	82 7

[a] See table 70 for details.

[b] Composed of both chemicals and packing materials Chemicals, a traded good, account for approximately 55 per cent by value of total inventories Packing materials, one of the non-traded items, are assumed to have a zero foreign-exchange content

[c] Derived from table 9 The foreign-exchange content of 52 per cent of the value of costs at shadow prices is the foreign-exchange component for the AF at a shadow wage 66 per cent of the market wage

[d] Non-traded goods having zero foreign-exchange content

[e] Traded goods The costs given represent the equivalent c i f import value of the equipment and are therefore treated as a 100 per cent foreign-exchange cost

TABLE 70 FOREIGN-EXCHANGE ADJUSTMENT TO OPERATING PROFIT, CASE 1

(Millions of rupees)

Item	*Preliminary adjusted economic present values at*		*Foreign-exchange*			*Adjustment to cash flow at*		*Stage-two economic present value at*	
	5%	*10%*	*Content (%)*	*Premium (%)*	*AF (%)*	*5%*	*10%*	*5%*	*10%*
1 1 1/ Operating profit (/1 −/2)	**168.1**	**87.7**				**61.4**	**32.6**	**229.5**	**120.3**
/1 Revenue	*682.2*	*390 3*				*136 2*	*77 9*	*818.4*	*468.2*
1 Sugar	641 1	366 6	100	20	20	128.2	73 3	769 3	439 9
2. Molasses	26 9	15 4	100	20	20	5 4	3 1	32.3	18.5
3 Rail transport cost savings	14 2	8 3	93[a]	20	18.6	2.6	1 5	16 8	9 8
/2. Costs	*514 1*	*302.6*				*74 8*	*45 3*	*588 9*	*347 9*
1 Sugar-cane[b]	393 1	229 5				67 0	40 7	460 1	270 2
2. Road transport cost of sugar-cane	25 5	15 7	49[c]	20	9 8	2.5	1.5	28.0	17 2
3 Labour[d]									
1/ Unskilled and semi-skilled	7 9	4.9	0	20	0	0	0	7 9	4 9
2/ Skilled	27 1	16 8	0	20	0	0	0	27 1	16 8
4 Packing materials[e]	20 6	12.0	0	20	0	0	0	20 6	12.0
5 Chemicals	26 3	15 3	100	20	20	5 3	3 1	31 6	18.4
6 Others	13 6	8 4	0	20	0	0	0	13 6	8 4

[a] Derived from table 13 for the AF at a shadow wage 66 per cent of the market wage

[b] The foreign-exchange component of cost of production of sugar-cane varies from year to year, the foreign-exchange adjustment must be carried out for each year and the resulting annual values discounted to the present Table 66 gives the data on the shadow price of sugar-cane after the adjustment for the premium on foreign exchange

[c] Derived from table 12 for the AF at a shadow wage 66 per cent of the market wage

[d] Both unskilled and skilled labour costs are treated as having a zero foreign-exchange content In the calculation of the shadow wage for unskilled labour, the foreign-exchange element in the opportunity cost of unskilled labour is adjusted directly to allow for the premium on foreign exchange

[e] Non-traded goods whose foreign-exchange content is taken to be zero

TABLE 71 STAGE-TWO APPRAISAL AFTER THE FOREIGN-EXCHANGE ADJUSTMENT, CASES 1, 2 AND 3

A. NPV at discount rates of 5 per cent and 10 per cent

(Millions of rupees)

Case \ Discount rate / Premium on foreign exchange	5%			10%		
	15%	*20%*	*25%*	*15%*	*20%*	*25%*
1	23	31	39	−71	−70	−68
2	−14	−8	−2	−91	−90	−90
3	127	138	149	16	13	9

B. IRR

(%)

Case \ Premium on foreign exchange	*15%*	*20%*	*25%*
1	6	6	6
2	< 5	< 5	< 5
3	9	9	9

TABLE 72 RESULTS OF THE STAGE-TWO APPRAISAL USING A WORLD PRICE OF SUGAR ±10 PER CENT OF THE FORECAST VALUE GIVEN IN TABLE 65 AND A PREMIUM FOR FOREIGN EXCHANGE OF 20 PER CENT

A NPV at discount rates of 5 per cent and 10 per cent

(Millions of rupees)

Case \ Discount rate / World price of sugar	5%			10%		
	−10%	*Base case*[a]	*+10%*	*−10%*	*Base case*[a]	*+10%*
1	−46	31	108	−114	−70	−26
2	−75	−8	60	−129	−90	−52
3	60	138	216	−57	−13	32

B. IRR

(%)

Case \ World price of sugar	*−10%*	*Base case*[a]	*+10%*
1	< 5	6	9
2	< 5	< 5	7
3	7	9	11

[a]The base world price of sugar refers to the forecast prices given in table 65

The net worth of the project is considerably higher at shadow prices than at market prices At stage one, the IRR of the project is only 1 per cent for case 1, the base case, and 2 per cent for case 3 A major explanation for the divergence of the results between stages one and two is the exclusion from the costs at stage two of the high excise duties paid by the project A second major factor is the extra value placed on the foreign exchange the project saves The outputs of the project, sugar and molasses, are both traded items, and although expenditures on traded goods account for a significant proportion of the costs of the project, the net effect is to save foreign exchange The application of an AF for foreign exchange raises the net worth of the project above what it would be at the official exchange rate The extra value given to the project at stage two as a result of these two factors is only partially offset by the fact that the shadow price of sugar-cane exceeds the market price for cane paid by the project to farmers

Using the forecast values for the world price of sugar given in table 65, the project appears unacceptable if it is compared with alternative rates of return of 10-12 per cent on other public-sector projects Even using optimistic assumptions regarding improvements in agricultural productivity and a rapid growth of cane supplies to the mill (as in case 3), the project has an IRR of only 9 per cent For case 1, which reflects the most likely set of assumptions regarding cane supplies, the IRR is 6 per cent

The net worth of the project is not sensitive to the choice of shadow price of foreign exchange within what are considered to be a reasonable range of values The premiums for foreign exchange used in evaluating the project are 15 per cent, 20 per cent and 25 per cent, even at the highest premium of 25 per cent, using the forecast prices for sugar, none of the three cases examined is acceptable

The appraisal is more sensitive to the assumed future world price of sugar Table 72 gives the NPV and IRR of the project using the forecast values for the world price of sugar given in table 65 and prices 10 per cent above and below these forecast values Although the IRRs for all three cases change significantly with the assumed sugar price, only for case 3 does a 10 per cent increase in world sugar prices give the project an IRR within the opportunity cost range of 10-12 per cent, for case 1, the IRR is still only 9 per cent at the higher world price of sugar It requires a 16 per cent increase in sugar prices above the forecast values before the base case (case 1) has an IRR of 10 per cent Similarly, it requires a 24 per cent increase in prices above the forecast values to give case 2, reflecting the most pessimistic assumptions, an IRR of 10 per cent

Care needs to be exercised in applying a particular set of future sugar prices Appendix C to this chapter discusses further some of the problems involved in forecasting sugar prices However, if one uses the forecasts set out in table 65, then at none of the probable values of the shadow price of foreign exchange is the project acceptable The most likely case, case 1, has an IRR of 6 per cent, which is significantly below the range of opportunity rates of return of 10-12 per cent suggested tentatively for the marginal public-sector project

Stage three/four

In this appraisal the sugar project is examined from three perspectives *(a)* its contribution to the efficient use of resources, which is reflected in its stage-two NPV, *(b)* its effect on savings and investment in the economy, and *(c)* its contribution to

improving the distribution of consumption among income groups, regardless of their location Here stages three and four are considered together (stage three/four) This means that the contribution of the project to the objectives of growth and equity will be expressed in a single NPV rather than in separate NPVs at stages three and four, as in the *Guide*

The first step in the stage-three/four appraisal is to identify the main groups affected by the project There are three the Government, unskilled workers and farmers

The approach used can be illustrated algebraically [36] The total net income change in the economy Y_2 equals the stage-two NPV of the project, since at stage two all items associated with the project are valued at shadow prices, which reflect their cost in terms of income lost or saved elsewhere in the economy The net income change in the economy can also be thought of as the stage-one NPV at market prices Y_1 plus the difference between the stage-two NPV and the stage-one NPV, which is the difference between the value of the project at shadow prices and its value at market prices That is, $Y_2 = Y_1 + (Y_2 - Y_1)$

The physical transactions of the project valued at market prices create a set of financial flows as set out in table 63 The income changes for each of the three groups resulting from these financial flows are identified We have $Y_1 = Y_{1G} + Y_{1L} + Y_{1F}$, where Y_{1G}, Y_{1L}, Y_{1F} are the income changes for the Government, unskilled labour and farmers resulting from the financial flows created by the project

Secondly, the income changes created by the divergence between the market and shadow prices of items associated with the project must be identified The market price of a commodity is a cost to whoever purchases it and a benefit to whoever sells it The shadow price of a commodity is its opportunity cost, or the loss of income elsewhere in the economy when a project uses the item as an input or the gain in income when it is produced as an output The difference between market and shadow prices creates an income effect in addition to the income flows at market prices identified at stage one [37] The income effects resulting from the divergence of shadow from market prices are attributed to the three groups, so that $Y_2 - Y_1 = Y_{2G} + Y_{2L} + Y_{2F}$, where Y_{2G}, Y_{2L}, Y_{2F} are the income effects for the Government, labour and farmers resulting from the divergence between shadow and market prices The full income-distribution effect of the project is therefore $Y_1 + (Y_2 - Y_1) = Y_{1G} + Y_{2G} + Y_{1L} + Y_{2L} + Y_{1F} + Y_{2F} = Y_G + Y_L + Y_F$, where Y_G is the total income change for the Government $Y_{1G} + Y_{2G}$ and similarly for Y_L and Y_F

As discussed earlier, in the stage-three/four appraisal all government income and private savings are treated as equal to the *numeraire* Only private consumption

[36] The treatment here differs from that set out in *Guide*, pp 52-63 In the *Guide* the project is identified as a separate group, and gains and losses by other groups are balanced by losses or gains for the project This approach is not followed here, since the project is wholly owned by the Government, and there appears to be no justification for treating it as a separate category of income recipient

[37] For example, for sugar-cane used by the project the market price paid to farmers is a cost to the project that enters into the stage-one calculations and helps to determine the financial flows resulting from the project However, in cases 1 and 2, the shadow price of producing cane represents the income lost elsewhere as a result of cane cultivation There will be an additional loss to the economy above that experienced by the project through paying farmers the market price of cane

changes are expressed as equivalent values in terms of the *numéraire* The final stage-three/four NPV, of the sugar project, Y_4, which incorporates the stage-three adjustment, can be written as

$$Y_4 = Y_G + s_L Y_L + s_F Y_F + [(1 - s_L)Y_L + AF_{dL}] + [(1 - s_F)Y_F + AF_{dF}]$$

where s_L and s_F are the portion extra income saved and $(1 - s_L)$ and $(1 - s_F)$ are the portion extra income consumed by unskilled workers and farmers, respectively, AF_{dL} and AF_{dF} are the distribution adjustment factors for workers and farmers, derived from the respective consumption weights

The income changes created for the three groups by the project are discussed in turn

The Government

The Government is involved with the project in several ways It is the sole equity holder, and in the appraisal it is assumed that it will provide the loan finance required by the project Therefore, the Government is the source and recipient of the financial flows generated by the project and set out in table 63 It receives debt repayments, dividends, taxes on profits, and as the sole equity holder it has the right to retained earnings Since all the costs and revenues of the project at market prices are either met by or accrue to the Government, the stage-one NPV of the project at market prices will be the net gain or loss experienced by the Government as a result of the project

Government income is also affected by most of the divergences between shadow and market prices of items associated with the project

In the analysis, the Government is treated as the residual income category so that when an income loss or gain to the economy cannot be specifically attributed to other groups it is allocated to the Government The income changes of the Government resulting from the divergence of stage-one and stage-two values of items arise in six main ways

(1) The excise and import duties paid by the project are shown as a cost in the stage-one appraisal, at market prices However, as transfer payments between different branches of the public sector, these taxes have a zero value at stage two of the appraisal. Their value at market prices therefore represents an income gain for the Government that is not included in the appraisal at stage one

(2) Through its control of the central banking system, the Government disposes of foreign exchange Since foreign exchange has an extra value above its official price, the Government always loses when it makes foreign exchange available to importers, the latter gain, since they receive foreign currency at a price in rupees below its opportunity cost Similarly, the Government gains at the expense of exporters when it purchases foreign exchange at the official exchange rate The project creates a demand for foreign exchange to pay for required imports, and the Government loses the shadow price premium on the value of the foreign exchange involved This loss, however, is more than offset by the foreign-exchange savings and earnings created by the project The Government gains the premium on the net foreign-exchange balance resulting from the project

(3) The difference between the price paid to the project for sugar and its c i f import price to Pakistan is treated as a loss to the Government Consumers in

Pakistan are unaffected by the project, since all sugar, whether produced domestically or imported, is sold at the same controlled ration price The alternative to production by this project is taken to be the import of an equivalent quantity of sugar The Government, through one of the public-sector trading corporations, would be responsible for purchasing these imports

In all the years of the project's life, the estimated c i f import price of sugar is below the ex-mill price received by the project The domestic ex-mill price, used to value sugar output at stage one, is thus used to calculate the gain to the Government at stage one Since the real gain to the Government from sugar production is the saving of the c.i f value of an equivalent quantity of sugar imports, the difference between the value of the sugar at market and shadow prices must be treated as a loss to the Government to be deducted from the gain at stage one

As discussed above, the foreign-exchange premium on the c i f value of an equivalent quantity of sugar imports is treated in the same way as the premium on all foreign-exchange savings created by the project It is an extra gain that partially offsets the loss created by the divergence between the c i f price and the market price of sugar

(4) The savings in rail transport costs for imported sugar are treated as a gain to the Government Rail cost savings are not included at stage one, since the project does not benefit from them, however, they represent an income gain to the economy Rail transport is within the public sector, and the total savings in resources are assumed to accrue to the Government [38]

(5) The price paid for sugar-cane by the project differs significantly from its estimated shadow price Farmers who shift to cane cultivation benefit from the production of cane The price paid to the farmers is the cost of cane at stage one However, the economy experiences an additional income loss not accounted for at stage one This loss is the difference between the cost of cane at shadow prices and at market prices Since farmers receive an income gain from cultivating cane, the additional loss to the rest of the economy equals the difference between the value of sugar-cane at shadow and market prices plus the income gain to farmers The losses to the rest of the economy are assumed to accrue to the Government, so that the net loss to the economy from sugar-cane cultivation not accounted for in the market price of cane is composed of a loss to the Government and a gain to farmers The above discussion relates to cases 1 and 2 In case 3, the income forgone elsewhere as a result of sugar-cane cultivation is less than the value of sugar-cane at market prices, so that the economy as a whole gains an additional income, not reflected in the market price of cane

In cases 1 and 2, the additional loss from cane cultivation arises because the shadow price of the traded crops forgone as a result of the shift to sugar-cane cultivation exceeds their domestic ex-farm price The Government is responsible for the procurement and international trade in these crops Therefore, as the potential exporter, it loses the f.o b value and the foreign-exchange premium on the

[38] No attempt is made to identify the income effect on unskilled labour as a result of the reduced rail transport. Labour costs are estimated to be only 3 per cent of the total value of sectoral output in rail transport, see appendix to chapter II.

exportable crops, rice and cotton Similarly, as the potential importer, it has to pay the c i f value and the foreign-exchange premium on imports of wheat [39]

(6) The value, at world prices of items of equipment comparable to those used by the sugar-mill is estimated to be considerably above the stage-one value of equipment, in other words, in committing these items to the project there is an additional income loss above their value at market prices This loss is the extra cost of importing equivalent items and would be felt by another sugar project forced to obtain similar equipment from the world market A significant number of sugar-mills in Pakistan are in the public sector, and, following the principle that where uncertainty exists regarding an income effect it should be allocated to the Government, this additional cost is treated as a loss to the Government not reflected in the appraisal at stage one

The differences between the market and the shadow prices of several small items also create income effects for the Government (see table 73)

Unskilled labour

The unskilled workers whose incomes are affected by the project are those employed in the operation and construction of the project and in the activities involved in transporting inputs and outputs to and from the project by road and rail As discussed above, these unskilled workers are assumed to be drawn from farms in Larkana District they are assumed to come from owner-cultivator and tenant farms of varying sizes below 25 acres, in proportion to the number of households in each farm-size category The income gains resulting from their new employment are the difference between their new market wage and the value of the output at market prices they would have produced if they had remained working on the family farm The income gains are treated as gains to the family as a whole to be divided equally among the members The income family workers would have produced if they had remained on the farm is estimated to be Rs 1,453 per year The size of the income gain will depend on the annual wage in the new employment, for workers employed in the sugar-mill it is taken to be Rs 5,400 per year Unskilled construction and transport workers are assumed to earn Rs 4,090 per year Therefore, the income gain for workers employed on the project is Rs 5,400 – Rs 1,453 = Rs 3,947, or 73 per cent of the annual market wage on the project Workers employed in construction and transport gain Rs 4,090 – Rs 1,453 = Rs 2,637, or 64 per cent of the annual market wage in these sectors [40]

The gain to unskilled labour estimated in this way exceeds the income effect for the economy as a whole resulting from a shadow wage below the market wage The shadow wage for unskilled labour employed by the project is estimated at 50 per cent of the market wage, so that for the economy as a whole there is an income gain not accounted for at stage one of 50 per cent of wage costs at market prices Since

[39] Trade in these commodities is carried out by public-sector corporations such as the Rice Export Corporation and the Cotton Export Corporation The full income effect on the Government is the difference between the value of these items at shadow prices, which is lost as a result of the shift to cane cultivation, and their value at ex-farm prices, the latter value is saved, since the Government no longer purchases these commodities from farmers

[40] The annual opportunity cost of unskilled labour at shadow prices is Rs 1,453 plus an AF of 66 per cent to allow for the fact that the shadow prices of agricultural commodities exceed their market prices

TABLE 73 EFFECTS OF THE PROJECT ON INCOME, CASE 1

(Millions of rupees)

Item	5%			10%			Group affected	Gain or loss at	
	Market price	*Pre-liminary adjusted shadow price*	*Foreign-exchange-adjusted shadow price*	*Market price*	*Pre-liminary adjusted shadow price*	*Foreign-exchange-adjusted shadow price*		*5%*	*10%*
1 Stage-one NPV	−58 3			93 4			Government	−58 3	−93 4
2 Difference between shadow and market prices in cash flow									
1 Sources									
1/ Operating profit									
/1 Revenue									
1 Sugar	897 9	641 1	769 3	520 0	366 6	439 9	Government	−128 6	−80 1
2 Molasses[a]	4 9	26 9	32 3	2 8	15 4	18 5	Government	27 4	15 7
3 Rail cost savings for sugar	0	14 2	16 8	0	8 3	9 8	Government	16 8	9 8
/2 Operating costs									
1 Sugar-cane[b]	374 0	393 1	460 1	217 9	229.5	270 2	Government Farmers	−134 5 48 4	−78 8 26 5
2 Sugar-cane cess[c]	7 5	0	0	4 4	0	0	Government	7 5	4 4
3 Road transport cost of sugar-cane[d]	44 9	25.5	28 0	27 7	15 7	17 2	Government Unskilled labour Government	−2.5 4 9 14 5	−1 5 3 0 9 0
4 Labour									
1/ Unskilled and semi-skilled	15 8	7 9	7 9	9 8	4 9	4 9	Unskilled labour Government	11 5 −3 6	7 1 −2 2
2/ Skilled	27 1	27 1	27 1	16 8	16 8	16 8	No change	0	0
5 Packing materials	20 6	20 6	20 6	12 0	12 0	12 0	No change	0	0
6 Chemicals	26 3	26 3	31 6	15 3	15 3	18 4	Government	−5 3	−3 1
7 Import duty on chemicals	10 0	0	0	5 8	0	0	Government	10 0	5 8
8 Others	13 6	13 6	13 6	8 4	8 4	8 4	No change	0	0
9 Excise duty on sugar	281 9	0	0	163 4	0	0	Government	218.9	163 4
2/ Terminal value	5 4	5 4	5 4	1 9	1 9	1 9	No change	0	0

2 Uses									
1/ Current assets									
/1 Inventories	0 3	0 3	0 3	0 2	0 2	0 2	No change	0	0
2/ Fixed assets							Government	−2 3	−2 2
/1 Construction[e]	32 8	22 1	24 4	31 1	20 9	23 1	Unskilled labour	4 1	3 9
							Government	6 6	6 3
/2 Other capital costs	20 1	20 1	20 1	19 1	19 1	19 1	No change		
/3 Equipment									
1 Domestic	38 3	58 6	70 3	36 4	55 7	66 8	Government	−32 0	−30 4
2 Imported	48 4	74 1	88 9	45 0	68 9	82 7	Government	−40.5	−37 7
3 Import duty on equipment	4 9	0	0	4 8	0	0	Government	4 9	4 8

[a]Sold by the project to a public-sector exporting company The Government therefore gains the difference between the market price paid to the project and the foreign-exchange-adjusted shadow price This latter price reflects the real value of molasses to the Government, it is based on the f o b export price of molasses minus the costs of transporting it to Karachi for export, plus an adjustment for the extra value of foreign exchange

[b]The gain to farmers who shifted to cane cultivation is calculated separately in appendix B to this chapter

[c]The Government gains this small item of indirect taxation, which is shown as a cost to the project at stage one.

[d]The cost data in table 12 are used to identify the distributional impact caused by the difference between the market and the shadow prices of inputs into the sector First, the Government is assumed to lose the foreign-exchange premium on the traded-good inputs used in road transport, chiefly vehicles and fuel. Secondly, unskilled workers or their families are assumed to gain an additional income of 64 per cent of their market wage in transport activities. Labour costs are taken to be 17 per cent of the total value of road transport costs Thirdly, the difference between the preliminary adjusted shadow prices of the traded goods used in the sector and their market price is assumed to be accounted for by taxation, either import or export duties When production in the road transport sector expands to meet the demands of the project, it is assumed that the Government will receive the taxes and duties paid on vehicles, fuel, oil and other traded inputs. Traded inputs are 71 per cent of the total value of sectoral output Therefore, the divergence between the value of costs in the sector at preliminary adjusted shadow prices and at market prices, not accounted for by labour costs, is treated as a gain to the Government arising from the receipt of taxes and duties on traded items

[e]Construction is treated in a similar way to road transport costs, the cost data from table 9 are used to identify the distribution impact caused by the divergence between the shadow price of construction and its cost at market prices First, the Government loses the premium on the foreign-exchange value of traded good inputs used in the sector Secondly, unskilled workers employed in construction gain 63 per cent of their market wage From the data in table 9 labour costs are taken to be 20 per cent of the value of sectoral output Thirdly, the divergence between the preliminary adjusted shadow prices of the traded-good inputs used in construction and their market prices is assumed to be accounted for by import duties and other taxes These are treated as gains to the Government that accrue as a result of expansion of the construction sector Traded items account for 35 per cent of the value of output in the sector Some of the gains identified as accruing to the Government are in fact surplus profits to the owners of capital in the sector These capitalists are not indicated as a separate income group, however

unskilled labour gains more than the economy as a whole, its income gains have to be offset by losses elsewhere The Government is treated as the residual income category, so that the losses required to balance the extra gains to labour are assumed to accrue to the Government

The average income per family member on farms in the district weighted by the number of farms in each size category is estimated to be Rs 731 per year, and the average family is estimated to consist of seven members The gains in income per family member as a result of the employment generated by the demands of the project are Rs 564 per year for the families of the newly employed factory workers and Rs 377 per year for the families of the workers who obtain employment in the construction and transport sectors Therefore, the *per capita* income of the families involved is increased substantially to Rs 1,295 and Rs 1,108, respectively [41]

An examination of the consumption and savings patterns recorded in the *Household Income and Expenditure Survey, 1971/72*[42] reveals negative average savings rates for the groups at these levels of income *per capita*. The same assumption adopted for the savings propensity of those at the base level, that is, a zero marginal savings rate, is used for these groups of workers, implying that all their income gains will be consumed These consumption gains for the workers and their families are very large in relation to their previous level of consumption Since the families involved borrow to finance additional consumption, the previous average level of consumption probably exceeds the figure for average income per family member of Rs 731 However, because the estimates of the average total consumption financed from borrowing are less than 5 per cent, the average income figure is used as a measure of the previous average level of consumption per family member It is only 56 per cent of the new consumption level per family member for the families of the workers who obtain employment on the project and 66 per cent of the new consumption level for the families of those who work in construction and transport activities

Whenever large or non-marginal changes in consumption occur, the formula for consumption weights given in chapter II will be inapplicable, since both the old and new levels of consumption must be compared with the base level [43]

When $n = 1$ the relevant formula is

$$d_i = b\frac{(\log_e c_2 - \log_e c_1)}{(c_2 - c_1)}$$

where d_i is the weight given to the consumption gains of group i

b is the base level of consumption

c_2 is the new level of consumption

and c_1 is the original level of consumption

[41] The increase in average family income is very large, which casts some doubt on the accuracy of the estimates of previous income level An alternative explanation is that some of the monetary gains may be reduced in real terms by higher prices in the urban areas. The overall results of the appraisal are not highly sensitive to the estimation and valuation of gains to workers.

[42] Ministry of Finance, Statistical Division

[43] The derivation of the formulae for non-marginal changes in consumption is given in Squire and van der Tak, *op. cit*, appendix, pp. 136-137 The only difference in approach is that in this study all consumption changes are related to consumption at the base level, while Squire and van der Tak express consumption changes in terms of the average level of consumption

Calculation of weights from the non-marginal formula gives a value of d_t = 1 06 for workers employed in the sugar-mill, and d_t = 1 17 for those employed in other activities supplying the mill Rupees of consumption accruing to those workers and their families have a value greater than rupees going to those at the base level because of the relatively low initial consumption level of the workers involved

However, after obtaining a new job either on the project or associated with it, the family *per capita* consumption of these workers is increased above the base level Therefore, the weights for the consumption changes are less than they would be if the formula for marginal changes were used The base level of Rs 1,080 is 48 per cent greater than the workers' initial consumption level of Rs 731, so that the weight derived from the marginal formula alone is

$$d_t = 1\ 48$$

At stage four, the income gains to unskilled labour are divided between those workers newly employed on the project and those newly employed in the construction, road and rail transport sectors as a result of the demands generated by the project These income changes are revalued by two AF_d derived from the relevant consumption weights

Farmers

As a group, farmers who shift from the cultivation of other crops, chiefly rice, cotton, wheat and jowar, to the cultivation of sugar-cane increase their income significantly The net income gain per farmer is the value of cane produced per acre minus the costs of cultivation, minus the net income per acre that the land switched to cane would have produced if it had remained under the previous crops These revenues and costs are all at market prices

Appendix B to this chapter gives details of the calculation of the income gains for farmers in various income groups Six groups of farmers and one category of landlords are distinguished Savings rates are estimated for these groups from the *Household Income and Expenditure Survey, 1971/72* For groups with *per capita* income below Rs 2,400, the estimated average savings rate is negative, and a marginal savings rate of zero is used for these groups For the higher-income groups of farmers, average savings rates are used to approximate marginal rates [44] Data on the income level of landlords are not available, their income levels and savings patterns are assumed to be similar to those of the wealthiest group of owner cultivators [45] The changes in savings resulting from the income gains of farmers are obtained by multiplying the estimated income change for each group by the relevant marginal propensity to save for that group All savings arising from the project are given a weight of 1 0, implying a value equal to that of units of the *numeraire*

Data collected in Larkana District suggest that most farmers who have shifted to sugar-cane cultivation have diverted only a small part of their land to cane, preferring

[44] The procedure of approximating marginal savings rates by average rates is crude, however, it is unlikely to be misleading, particularly since the income gain to any individual farmer is judged to be small in relation to previous income

[45] The richest group of farmers is estimated to have an average *per capita* income of Rs 15,500, which is over 800 per cent of the national average

to continue to keep most of it under the less profitable but more traditional crops Although this pattern may alter in the future, it does suggest that while farmers as a group receive substantial income and consumption gains, the gain to the individual farmer is not large in relation to existing levels of income or consumption [46] If farmers continue to grow cane on a small portion of their land, one can treat their consumption gains as marginal changes This approach is used here, so that the estimated consumption gains for the various groups are revalued by adjustment factors based on consumption weights, calculated from the formula $d_i = \left(\frac{b}{c_i}\right)^n$ Table 74 gives details of the consumption weights for the different groups

TABLE 74 WEIGHTS FOR THE INCOME CHANGES CREATED BY THE PROJECT

Group	*Savings weight*	*Consumption weight*	*AF_d for consumption*[a] *(%)*
Government	1 0	1 0	0
Unskilled labour[b]			
(a) Workers employed in factory operations in the sugar-mill	0 marginal propensity to save	1 06	6
(b) Workers employed in construction and transport	0 marginal propensity to save	1 17	17
Farmers, grouped by income level[c] (Rs *per capita*)[c]			
(a) 0-600 (436)	1 0	2 48	148
(b) 600-1 200 (998)	1 0	1 08	8
(c) 1 200-2 400 (1 735)	1 0	0 62	−38
(d) 2 400-4 800 (3 380)	1 0	0 32	−68
(e) 4 800-9 600 (4 226)	1 0	0 25	−75
(f) 9 600+ (11 470)	1 0	0 09	−91
(g) Landlords (11 470)	1 0	0 09	−91

[a] $AF_d = \left(\frac{d_i}{1\,0} - 1\,0\right)$ per cent

[b] The weights were calculated using the formula for non-marginal consumption changes, $d_i = b\frac{(\log_e c_2 - \log_e c_1)}{(c_2 - c_1)}$

For (a) c_2 = Rs 1,295, and c_1 = Rs 731
For (b) c_2 = Rs 1,108, and c_1 = Rs 731
The base level of consumption is Rs 1,080

[c] Figures in brackets are estimated average levels of consumption for the different groups The consumption weights for each group are derived by substituting these average consumption levels for c_i in the formula $d_i = \left(\frac{b}{c_i}\right)^n$ Therefore, for group a the weight $d_a = \left(\frac{1,080}{436}\right)^n$, a value of $n = 1$ is used in all cases, so that $d_a = 2\,48$

[46] This assumption means that any gains experienced by the Government as a result of extra income tax payments made by the wealthier farmers are likely to be small and can be ignored Income tax payments begin at an income of Rs 12,000 per year

Results

The appraisal at stage three/four is carried out for the alternative assumptions regarding the supply of cane to the project, that is, cases 1, 2 and 3 However, the sensitivity analysis on the world price of sugar and the shadow price of foreign exchange carried out at stage two is not included, the project is examined only at the forecast world prices given in table 65 and a single shadow price of foreign exchange of 1 2 Table 73 shows in detail the derivation of the income changes created by the project for case 1, data on the income effects of cases 2 and 3 are given in summary form in table 75

Table 75 shows that the farmers and unskilled labour always gain from the project However, the Government loses in all cases except case 3, at a 5 per cent discount rate, when it has a small gain As we have seen, workers gain because they move to better-paying jobs and farmers because they shift to more profitable crops The loss experienced by the Government results chiefly from three factors, first, because it is the owner, it bears the costs of operating the mill, secondly, because it is

TABLE 75 INCOME CHANGES CREATED BY THE PROJECT, CASES 1, 2 AND 3[a]

(Millions of rupees)

Group	*Discount rate*	
	5%	*10%*
Case 1		
Government	−38 0	−110 2
Unskilled labour		
(a) Workers employed on the project	11 5	7 1
(b) Workers employed in construction and transport	9 0	6 9
Farmers[b]	48 4	26 5
Stage-two NPV	30 9	−69 7
Case 2		
Government	−65 0	−124 8
Unskilled labour		
(a) Workers employed on the project	11 5	7 1
(b) Workers employed in construction and transport	9 6	7 2
Farmers[b]	36 2	20 1
Stage-two NPV	−7 7	−90 4
Case 3		
Government	4 0	−87 3
Unskilled labour		
(a) Workers employed on the project	11 5	7 1
(b) Workers employed in construction and transport	9 0	7 0
Farmers[b]	113 2	60 6
Stage-two NPV	137 7	−12 6

[a] Based on the world sugar prices from table 65 and a shadow price of foreign exchange of 1 2

[b] Supporting documentation in table 76

the potential importer of alternative supplies of sugar, the amount of the domestic ex-mill price over the world market price is treated as a loss to the Government, thirdly, because it is the importer and exporter of additional supplies of internationally traded foodstuffs, the crops forgone as a result of the expansion of sugar-cane cultivation are treated as costs for the Government The distribution of the income gains to farmers is analysed in detail in appendix B to this chapter It is estimated that, in cases 1 and 2, approximately 33 per cent of gains to the group as a whole go to those with *per capita* income below the base level, in case 3 the proportion is around 40 per cent Farmers with *per capita* income above the national average take over 50 per cent of the gains in cases 1 and 2 and just under 50 per cent in case 3

The final stage-three/four NPV of the project is found by applying the different adjustment factors for consumption given in table 74 to the consumption changes

TABLE 76 INCOME GAINS FOR DIFFERENT INCOME GROUPS OF FARMERS, CASES 1, 2 AND 3 AT DISCOUNT RATES OF 5 PER CENT AND 10 PER CENT

Farmers, grouped by income level (rupees per year per capita*)*			*Income gain (millions of rupees)*		*Marginal propensity to save*[a] *(%)*	*Change in savings*	
			5%	*10%*		*5%*	*10%*
			Case 1				
(a)	0-600	(400)	3 1	1 7	0	0	0
(b)	600-1 200	(950)	13 2	7 2	0	0	0
(c)	1 200-2 400	(1 700)	6 9	3 8	0	0	0
(d)	2 400-4 800	(3 450)	0.2	0 1	2	0 004	0 002
(e)	4 800-9 600	(5 350)	3 1	1 7	21	0 6	0 3
(f)	9 600+	(15 500)	3 7	2 0	26	1 0	0 5
(g)	Landlords		18 2	10 0	26	4 7	2 6
			48 4	26 5		6 3	3 4
			Case 2				
(a)	0-600	(400)	2 5	1 4	0	0	0
(b)	600-1 200	(950)	10 0	5 5	0	0	0
(c)	1 200-2 400	(1 700)	5 4	3 0	0	0	0
(d)	2 400-4 800	(3 450)	0 4	0 2	2	0 01	0 004
(e)	4 800-9 600	(5 350)	2 4	1 3	21	0 5	0 3
(f)	9 600+	(15 500)	2 7	1 5	26	0 7	0 4
(g)	Landlords		12 8	7 2	26	3 3	1 9
			36 2	20 1		4 5	2 6
			Case 3				
(a)	0-600	(400)	8 3	4 4	0	0	0
(b)	600-1 200	(950)	36 0	19 2	0	0	0
(c)	1 200-2 400	(1 700)	16 6	9 0	0	0	0
(d)	2 400-4 800	(3 450)	0 7	0 5	2	0 01	0 01
(e)	4 800-9 600	(5 350)	7 2	3 9	21	1 5	0 8
(f)	9 600+	(15 500)	8 7	4 6	26	2 3	1 2
(g)	Landlords		35 7	19 0	26	9 3	4 9
			113 2	60 6		13 1	6 9

[a]Calculated from data in *Household Income and Expenditure Survey, 1971/72*

created by the project and adding these adjusted values for consumption to the value of savings and government income resulting from the project The final stage-three/four NPV can be expressed in a slightly more detailed form to that given above on page 145

$$Y_4 = Y_G + \sum_L (Y_L + AF_{dL}) + \sum_F s_F Y_F + \sum_F (1 - s_F Y_F + AF_{dF})$$

$\sum_L Y_L + AF_{dL}$, L = a, b, is the adjusted value of the income change for unskilled workers, it is the sum of the adjusted values of income going to groups a and b All workers' income is taken to be consumed, so that the distribution AFs for groups a and b are applied to their total changes in income

$\sum_F s_F Y_F$, F = a, b, c, , g, is the change in farmers' savings, it is the sum of the changes for the seven groups of farmers a to g

$\sum_F \left[(1 - s_F)Y_F + AF_{dF}\right]$ is the adjusted value of the change in farmers' consumption it is the sum of the changes for the seven groups of farmers a to g

The results of the appraisal at stage three/four are given in table 77 Several points should be stressed

At stage three/four, the income or consumption gains accruing to unskilled workers are increased by approximately 11 per cent above their value at stage two The increase is only 11 per cent because the new consumption levels of the workers and their families resulting from the project are above the base level Therefore, although the initial consumption level of these workers is relatively low, the weights of 1 06 and 1 17, used to value their increases in consumption, are close to 1 0

The increases in consumption of farmers as a group are reduced at stage three/four below their stage-two value because most of the consumption gains in all cases accrue to those with *per capita* consumption levels considerably above the base level Landlords and the richest group of farmers receive between 33 per cent and 39 per cent of total income gains, these two groups are given a very low consumption weight of 0 09, which implies that a rupee of consumption in their hands is worth only Rs 0 09 in the hands of those at the base level of consumption The consumption gains to farmers as a group are reduced below their stage-two value by 33 per cent in case 1, 31 per cent in case 2 and 26 per cent in case 3

The stage-two and stage-four NPVs and IRRs of the project are compared below for each of the three cases at discount rates of 5 per cent and 10 per cent

	Case 1 NPV (millions of rupees)			*Case 2 NPV (millions of rupees)*			*Case 3 NPV (millions of rupees)*		
Stage	*5%*	*10%*	*IRR (%)*	*5%*	*10%*	*IRR (%)*	*5%*	*10%*	*IRR (%)*
Two	31	−70	6	−8	−90	4	138	−13	9
Four	19	−76	6	−15	−94	4	114	−25	9

Although the NPV of the project is always lower at stage three/four, the IRR for each case is the same at stage two and stage three/four The major factor explaining this similarity in results is that a significant proportion of the income flows generated by the project, namely, government income and private savings, are not adjusted at stage three/four

The discussion in chapter II suggests that while in theory the opportunity cost rate of return on public-sector projects will differ between stages two and four of an appraisal, in the calculations for Pakistan it is difficult to identify a significant change in this parameter It is argued that the same range of values of 10-12 per cent used at

stage two can be applied at stage three/four as a test of the acceptability of public investment Since the IRR of the project does not change between stages two and three/four for any of the cases examined, the conclusion must be that the project remains unacceptable after its distributional effects have been incorporated into the appraisal

TABLE 77 STAGE-THREE/FOUR NPV AND IRR OF THE PROJECT, CASES 1, 2 AND 3 AT DISCOUNT RATES OF 5 PER CENT AND 10 PER CENT[a]

(Millions of rupees)

	Case 1		*Case 2*		*Case 3*	
Item	*5%*	*10%*	*5%*	*10%*	*5%*	*10%*
Government income	−38 0	−110 2	−65 0	−124 8	4 0	−87 3
Savings of farmers	6 3	3 4	4 5	2 6	13 1	6 9
Consumption of unskilled labour[b]	22 7	15 6	23 4	15 9	22 7	15 7
Consumption of farmers[b]	28 3	15 4	21 9	12 1	74 4	39 7
Stage-three/four NPV	19 3	−75 8	−15 2	−94 2	114 2	−25 0
Stage-three/four IRR (%)	6		4		9	

[a] Based on world sugar prices from table 65 and a shadow price of foreign exchange of 1 2
[b] Supporting documentation provided in table 78.

TABLE 78 VALUATION OF CONSUMPTION GAINS OF UNSKILLED LABOUR AND FARMERS, CASES 1, 2 AND 3 AT DISCOUNT RATES OF 5 PER CENT AND 10 PER CENT

Group	*Consumption gain at 5% (millions of rupees)*	*AF_d (%)*	*Final stage-four value (millions of rupees)*	*Consumption gain at 10% (millions of rupees)*	*AF_d (%)*	*Final stage-three/four value (millions of rupees)*
			Case 1			
Unskilled labour						
(a) Workers employed on the project	11 5	6	12 2	7 1	6	7 5
(b) Workers employed in construction and transport	9 0	17	10 5	6 9	17	8 1
	20 5		22 7	14 0		15 6
Farmers, grouped by income level (Rs *per capita*)						
(a) 0-600	3 1	148	7 7	1 7	148	4 2
(b) 600-1 200	13 2	8	14 2	7 2	8	7 8
(c) 1 200-2 400	6 9	−38	4 3	3 8	−38	2 3
(d) 2 400-4 800	0 196	−68	0 06	0 098	−68	0 03
(e) 4 800-9 600	2 5	−75	0 6	1 4	−75	0 3
(f) 9 600+	2 7	−91	0 2	1 5	−91	0 1
(g) Landlords	13 5	−91	1 2	7 4	−91	0 7
	42 1		28 3	23 1		15 4

Group	*Consumption gain at 5% (millions of rupees)*	AF_d (%)	*Final stage-four value (millions of rupees)*	*Consumption gain at 10% (millions of rupees)*	AF_d (%)	*Final stage-three/four value (millions of rupees)*
		Case 2				
Unskilled labour						
(a) Workers employed on the project	11 5	6	12 2	7 1	6	7 5
(b) Workers employed in construction and transport	9 6	17	11 2	7 2	17	8 4
	21 1		23 4	14 3		15 9
Farmers, grouped by income level (Rs *per capita*)						
(a) 0-600	2 5	148	6 2	1 4	148	3 5
(b) 600-1 200	10 0	8	10 8	5 5	8	5 9
(c) 1 200-2 400	5 4	−38	3 3	3 0	−38	1 9
(d) 2 400-4 800	0 39	−68	0 1	0 196	−68	0 06
(e) 4 800-9 600	1 9	−75	0 5	1 0	−75	0 2
(f) 9 600+	2 0	−91	0 2	1 1	−91	0 1
(g) Landlords	9 5	−91	0 8	5 3	−91	0 5
	31 7		21 9	17.5		12 1
		Case 3				
Unskilled labour						
(a) Workers employed on the project	11 5	6	12 2	7 1	6	7 5
(b) Workers employed in construction and transport	9 0	17	10 5	7 0	17	8 2
	20 5		22 7	14 1		15 7
Farmers, grouped by income level (Rs *per capita*)						
(a) 0-600	8 3	148	20 6	4 4	148	10 9
(b) 600-1 200	36 0	8	38 9	19 2	8	20 7
(c) 1 200-2 400	16 6	−38	10 3	9 0	−38	5 6
(d) 2 400-4 800	0 69	−68	0 2	0 49	−68	0 1
(e) 4 800-9 600	5 7	−75	1 4	3 1	−75	0 8
(f) 9 600+	6 4	−91	0 6	3 4	−91	0 3
(g) Landlords	26 4	−91	2 4	14 1	−91	1 3
	100 1		74 4	53 7		39 7

CONCLUSIONS

This appraisal, like those in chapters III and IV, has focused primarily on illustrating the approach to cost-benefit analysis set out in the *Guide* However, it has also generated valuable information about the project under consideration It is possible, consequently, to comment briefly on the three main claims made originally by the sponsoring authorities of the project It was claimed that

(a) The project would save foreign exchange,
(b) It would stimulate a domestic equipment industry,
(c) It would raise income levels in the locality of the project

It has been shown that the project will save foreign exchange The question, however, is one of the ratio of the cost of the resources used in the project to the benefits derived from this direct foreign-exchange effect At stage two the costs and benefits involved are estimated and expressed in shadow prices The results suggest that the desirability of the project from the point of view of its effect on efficient resource allocation rests upon three main factors First is the movement of future world prices for sugar, which will determine the gross value of the foreign exchange saved by the project Second is the opportunity cost of supplying the mill with sugar-cane This cost is discussed in detail in appendix B to this chapter Of major significance are the yields obtainable for both sugar-cane and alternative crops and the world market value of those crops that could otherwise have been produced on land used for cane cultivation The third factor is the returns available on other government projects If the most optimistic assumptions regarding future sugar prices and improvements in agricultural productivity are used, the project has an IRR of 11 per cent, if the most pessimistic combination of assumptions is taken, the project has an IRR of less than 5 per cent The single most likely IRR is estimated to be 6 per cent, an IRR substantially below the range of estimates of 10-12 per cent for the stage-two opportunity cost rate of return In other words, the costs involved in saving the foreign exchange value of sugar imports can be said to be excessive, since the rate of return on the total resources committed to the project is below the return estimated for alternative public-sector projects Therefore, the results suggest that simply from the viewpoint of foreign-exchange savings the project is not justified

The second claim that the project would stimulate a domestic equipment producing industry has not been examined in detail The project is one of several that could have been financed under the 1970 agreement between the Governments of China and Pakistan Thus, any stimulation of local production of equipment could have arisen from the implementation of another project, and benefits in the form of the development of expertise in the production of sugar equipment cannot be attributed specifically to the project under examination

The third claim is that the farmers who supply the mill with sugar-cane will receive a higher income The analysis of this benefit establishes two main points First, the cost to the economy of growing sugar-cane, that is, the income lost from other crops displaced as a result of the shift to cane cultivation, is likely to be considerably higher than the value of sugar-cane at the price paid by the project The farmers gain, therefore, at the expense of the rest of the economy Secondly, most of the gains in income go to well-off groups of farmers Thus, when consumption weights are introduced into the appraisal, the NPV of the project is lower at stage three/four than at stage two In other words, the income changes created by the project have an undesirable effect on income distribution and actually reduce the project's social worth

The final conclusion must be that, on the basis of the assumptions used here, the project appears to be an undesirable means of committing government resources

Appendix A

PROJECT DATA

The main source of data on the project is the PCI Planning document prepared by the sponsoring authority for the Planning Division, Government of Pakistan, supplemented by information collected in Pakistan during 1977 The main changes made to the data in the original PCI document are described below

The original data are in 1973 prices, while the appraisal uses mid-1977 prices Several key items associated with the project—sugar, sugar-cane, molasses and unskilled labour—are valued at prices current in 1977 Other items for which unit price data at 1977 prices are not available are increased in value by the rise in the all-Pakistan wholesale price index between October 1973 and mid-1977

The mill has a capacity to process 1,500 tons of sugar-cane a day The utilization rate used for the appraisal depends upon how much sugar-cane is assumed to be available Three alternative assumptions are used case 1, the most likely, case 2, the most pessimistic, and case 3, the most optimistic The capacity utilization rates corresponding to these cases are set out below

CAPACITY UTILIZATION RATES

Year	*Case 1*	*Case 2*	*Case 3*
3	9 6	9 6	9 6
4	51 6	51 6	51 6
5	62 0	62 0	62 0
6	74 1	59 3	78 6
7	78 9	60 4	88 5
8	88 7	66 6	100 0
9	98 4	72 7	↓
10	100 0	78 9	↓
11	↓	81 3	↓
12	↓	83 8	↓
13	↓	86 2	↓
14	↓	88 7	↓
15	↓	91 1	↓
16	↓	93 6	↓
17	↓	96 0	↓
18	↓	98 4	↓
19	↓	100 0	↓
20	↓	↓	↓
21	↓	↓	↓
22	↓	↓	↓

The figures for years 3-5 of the project's life are actual figures for the years 1974/75-1976/77

The supply of sugar produced by the project is determined by both the total supply of sugar-cane crushed by the mill and the percentage recovery rate, that is, the sugar per ton of sugar-cane The actual recovery rate for the project in its first years of operations is lower than the average rate for mills in Pakistan, chiefly because of the poor quality of cane received by the mill The recovery rates assumed in the appraisal and those in the original PCI document are given below

RECOVERY RATE

(Percentage of sugar per unit of sugar-cane)

Year	*Original PCI*	*Assumption used here*
3	8 0	8 0
4	8 5	8 2
5	8 75	7 2
6	9 0	8 5
7	↓	8 75
8	↓	9 0
9	↓	↓
10	↓	↓
11	↓	↓
12	↓	↓
13	↓	↓
14	↓	↓
15	↓	↓
16	↓	↓
17	↓	↓
18	↓	↓
19	↓	↓
20	↓	↓
21	↓	↓
22	↓	↓

Again, the figures for years 3-5 are actual figures Because of the low actual recovery rate in year 5, the appraisal assumes a slower build-up to a 9 per cent recovery rate than the original PCI document

The cost of chemicals and packing materials is treated as a variable cost, varying in direct proportion with capacity utilization

The working life of the project is taken to be 20 years, the life given in the original PCI document A scrap value of 10 per cent of the original capital cost is placed on plant and buildings in year 22 This valuation is arbitrary However, the results of the appraisal are not sensitive to the choice of terminal value

Total labour costs are found by increasing the wage bill in the PCI document to accord with the rise in the wholesale price index The costs for unskilled and semi-skilled labour are estimated by multiplying the number of workers in this category given in the PCI document by an assumed wage for factory employees of Rs 450 per month, the figure used as the wage cost of semi-skilled factory operatives in several recent feasibility reports The PCI document mentions 252 permanent semi-skilled and unskilled workers These workers are not identified in detail However, they appear to include labourers, sweepers, security guards, cooks and semi-skilled workers, such as mechanical fitters and welders The assumed monthly wage is probably too high for the unskilled labour and too low for the semi-skilled workers It is used as an approximate average for both unskilled and semi-skilled categories The mill also employs seasonal unskilled labourers during the crushing season For how long these workers are employed is not known, however, and their wage costs are not shown separately Only the wage bill for the 252 semi-skilled and unskilled workers is revalued by the AF for unskilled labour The wage costs remaining after the deduction of this wage bill are assumed to cover payments to skilled workers and managerial and professional staff

The total capital costs for the project at 1977 prices are obtained by increasing the original costs at 1973 prices by the rise in the wholesale price index over the

period October 1973-July 1977 The financial plan of the project set out in table 63 is therefore hypothetical and does not reflect the actual equity or loan inflows to the project the actual inflows are at current prices, not at the constant 1977 prices used in table 63 Furthermore, in drawing up this table it was assumed that short-term loans at generous repayment terms would be available to cover operating losses in the early years This treatment of the financial transactions of the project shows only how a financial cash flow, in the sense that the term is used in the *Guide*, might be drawn up

Appendix B

ASPECTS OF THE SUPPLY OF SUGAR-CANE[a]

Agriculture in the Larkana District and the limitations on the supply of sugar-cane

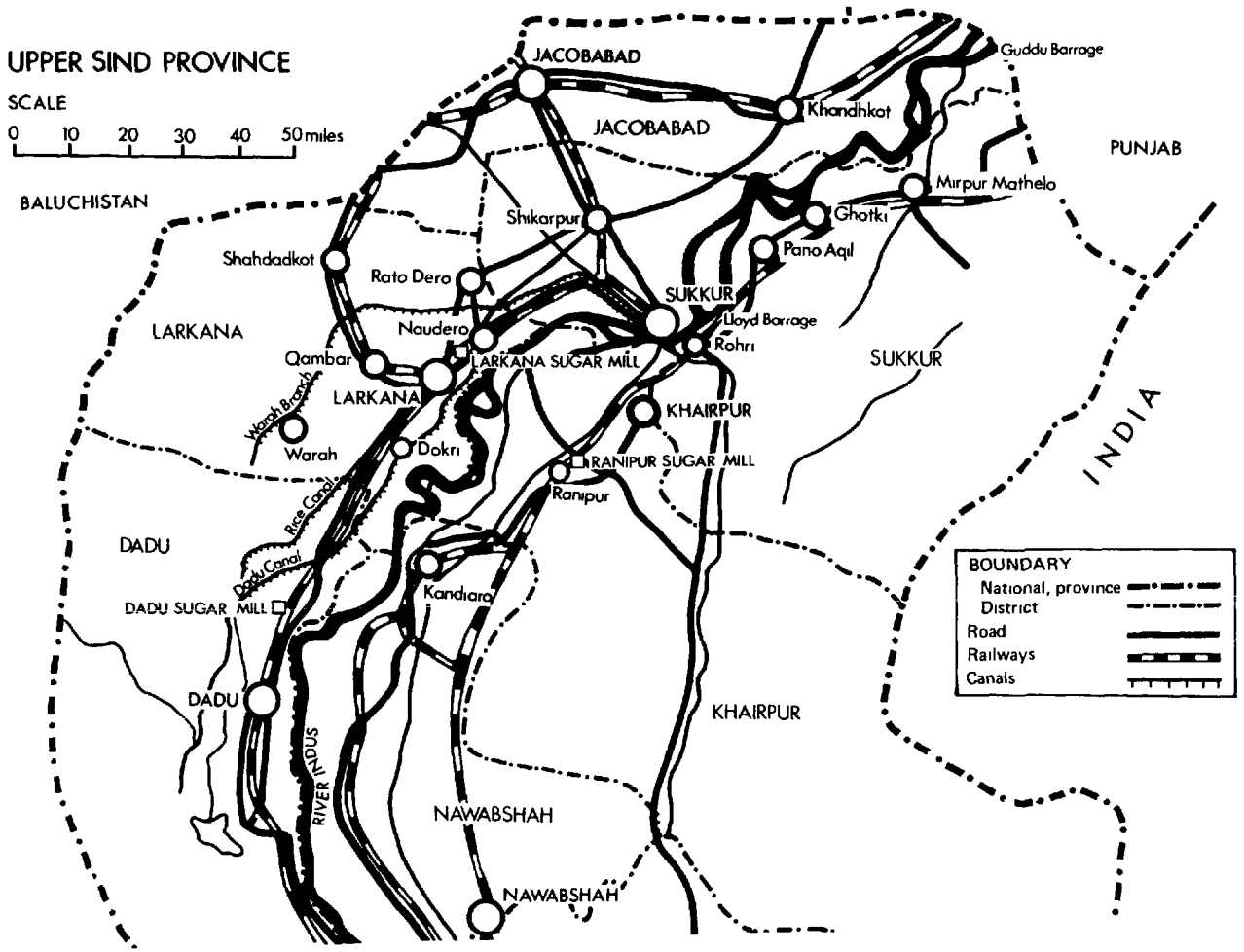
Larkana District is located in the north of Sind Province and is bordered by the districts of Jacobabad to the north-west, Sukkur to the north-east, Khairpur to the east and Dadu to the south (see map) It is irrigated by three main canals—the Dadu Canal, the Rice Canal and the Warah Branch of the North-West Canal The rainfall is less than 5 inches per year, so that agriculture is impossible without irrigation The relief of the cultivated area is mainly flat Water for irrigation is almost entirely supplied by the canals, and there are very few tube-wells

Both the Dadu Canal and the Warah Branch are perennial and were originally designed for dry crops [b] The Rice Canal is non-perennial and designed exclusively for the cultivation of rice. However, with the introduction of IRRI rice, rice yields have increased, and more and more of the dry crop land has been turned over to a combination of a summer rice and a winter wheat crop Since the cultivation of rice requires the flooding of paddy fields, farmers have been using more irrigation water than the design capacity of the canals. The consequence has been extensive waterlogging and problems of salinity

The Larkana sugar-mill was originally intended to draw its supply of sugar-cane from the areas designated for dry crops but at present used for rice One of the expected benefits of using this source of supply was that the amount of irrigation water supplied in the kharif (summer) season would be reduced and thereby the extent of the waterlogging. In fact, in 1976/77, Larkana District supplied considerably less than half the sugar-cane delivered to the mill Four reasons can be given for the failure of farmers in Larkana District to supply sufficient sugar-cane

[a] A more detailed discussion of the data presented in this appendix is given in D J Potts, "The shadow price of sugarcane a case study from Pakistan", PPC Discussion Paper No 20 (Bradford, United Kingdom, University of Bradford, November 1978) Copies available on request from the author

[b] Crops that, unlike paddy, do not require flooding of fields


UPPER SIND PROVINCE
SCALE
0 10 20 30 40 50 miles
JACOBABAD
Guddu Barrage
Khandhkot
JACOBABAD
PUNJAB
Mirpur Mathelo
Ghotki
Pano Aqil
BALUCHISTAN
Shikarpur
Shahdadkot
Rato Dero
SUKKUR
Lloyd Barrage
Rohri
LARKANA
Naudero
Qambar
LARKANA SUGAR MILL
SUKKUR
LARKANA
KHAIRPUR
Warah Branch
Warah
Dokri
RANIPUR SUGAR MILL
Ranipur
INDIA
Rice Canal
DADU
Dadu Canal
Kandiaro
DADU SUGAR MILL
BOUNDARY
National, province
District
Road
Railways
Canals
DADU
KHAIRPUR
RIVER INDUS
NAWABSHAH
NAWABSHAH

(a) Farmers are often reluctant to move quickly into a new crop, and sugar-cane is a new crop for most farmers in Larkana District The extent of this reluctance appears to be greater in this district than elsewhere,

(b) Sixty per cent of the land in Larkana District is farmed under a sharecropping system under which traditionally a greater proportion of additional income derived from changing to sugar-cane cultivation accrues to the landlord than to the tenant Consequently, some opposition to the cultivation of sugar-cane has come from tenant farmers,

(c) Sugar-cane, an annual crop, requires more working capital than many farmers have at their disposal,

(d) Paddy cultivation imposes extra costs on farmers growing sugar-cane, since water from the flooded paddy fields seeps on to adjacent fields and damages the roots of the sugar-cane Persistent seepage also causes salinity, which reduces yields Sugar-cane cultivation is advantageous to farmers only if they can obtain greater returns than on other crops, which they cannot do under such conditions The result has been that sugar-cane cultivation has been restricted to areas that are higher than the general level of land or receive insufficient irrigation water for paddy or in which a large block of land has been turned over to dry crops

Not only has the mill been unable to obtain sufficient cane from Larkana District, but even by taking large quantities of sugar-cane from the surrounding four districts (particularly Sukkur District), it has not been able to obtain enough cane to reach capacity operation Furthermore, these sources of supply are threatened by competition A new mill at Ranipur has removed Khairpur District as a source of supply for the Larkana mill, while a new sugar-mill in Dadu District will also remove Dadu as a source The Ranipur mill also competes for supplies in Sukkur District, and, as a private-sector mill, it can offer cash credit facilities that the Larkana mill cannot as yet offer

The operation of the mill is therefore constrained by low yields, insufficient local acreage and competition for more distant sources of supply In addition, the need to obtain cane from long distances has led to a low extraction rate of sugar How these factors will develop in future is uncertain, so three alternative supply assumptions have been framed in relation to the above constraints

The assumptions regarding supply

Data for years 1974/75, 1975/76 and 1976/77 are available in terms of maunds of cane crushed by district [c] A rough forecast is available for 1977/78 Figures for the average yields of sugar-cane for each district[d] are used to estimate the acreages under cane in the district Table 79 shows these acreages and assumed yields for the first four years of operation, including the 1977/78 forecast

[c] Data supplied by the cane manager, Larkana sugar-mill.

[d] *Agricultural Statistics of Pakistan*, vol. II (Islamabad, Ministry of Agriculture, 1975), Agricultural Research Centre, Islamabad, Extra Assistant Director for Agriculture, Larkana District, Potts, *op. cit.*, p. 11

The three cases used are based on the data in table 79 Case 1 assumes a steady increase of 2,000 acres per year in the acreage of sugar-cane in Larkana District Dadu and Khairpur Districts are assumed to cease as sources of supply while the acreages in Sukkur and Jacobabad Districts are assumed to remain constant until the increase in cane obtained from Larkana District brings the mill to full-capacity operation From then on it is assumed that the mill prefers closer sources of supply and therefore replaces this acreage with land in Larkana District Case 1 also assumes constant yields over the life of the project The assumed rate of increase in project acreage and maintenance of supplies from Sukkur District implies some success in controlling the growth of rice on dry crop land and also an ability to maintain supplies of sugar-cane in the face of competition from other mills

TABLE 79 ACREAGES SUPPLYING LARKANA SUGAR-MILL BY DISTRICT AND ASSUMED YIELDS, 1974-1978

	1974/75		*1975/76*		*1976/77*		*1977/78*	
District	*Acreage*	*Assumed yield (maunds per acre)*	*Acreage*	*Assumed yield (maunds per acre)*	*Acreage*	*Assumed yield (maunds per acre)*	*Acreage*	*Assumed yield (maunds per acre)*
Larkana	2 859	180	3 406	280	5 041	330	6 061	330
Sukkur	282	280	4 103	300	7 576	330	7 576	330
Jacobabad[a]	92	180	2	280	156	330	500	330
Khairpur[b]	–	180	2 320	280	462	330	–	330
Dadu	205	180	1 997	280	2 612	330	1 015	330

[a] Figures for 1977/78 include any other sources not given above (i.e., Jacobabad assumed to be a residual).

[b] Figures for Khairpur include a small supply from Nawabshah District.

Case 2 represents a pessimistic assumption As with case 1, yields are assumed to remain constant, but the annual increase in acreage available in Larkana District is assumed to be only 500 acres In 1977/78, it is assumed that only 4,546 acres are available from Sukkur District, owing to competition from the Ranipur mill Supply from that district is assumed to rise evenly over the next four years to 7,576 acres Case 2 implies considerable difficulty in raising the acreage under sugar-cane because of the predominance of paddy cultivation

Case 3 represents an optimistic assumption and is similar to case 1 except that yields are assumed to increase by 20 maunds per year from the 1977/78 level (350 maunds per acre) until they reach a total of 500 maunds per acre Case 3 implies considerable success in extension efforts to raise yields to those levels at present achieved by the better farmers

Since the cane-crushing capacity of the mill is 6,750,000 maunds per year, the acreage requirement is 20,455 for cases 1 and 2 and 13,500 for case 3, when yields reach 500 maunds

Farmers' costs and income

An estimate of an average farm budget for sugar-cane is derived from a variety of sources [e] Data for Larkana District with yields of 330 maunds are given in table 80, assuming that the farmer takes two ratoon crops Most costs are assumed not to vary with location or yield, however, labour costs are assumed to vary with yield as do the development cess and octroi, while transport costs vary with both yield and location.[f]

The net benefit to the farmer from growing sugar-cane is the net revenue from sugar-cane less the forgone net revenue from alternative crops Three alternative crop combinations are considered, in each case with a rabi (winter) wheat crop and a kharif (summer) crop The reason for assuming an alternative of two crops is that the main constraint on the land supply is water availability, and one acre of an annual crop like sugar-cane deprives the farmer of irrigated land for one acre in both kharif and rabi The three alternative kharif crops considered are rice, cotton and jowar

A cotton/wheat combination is considered to be the main alternative in both Sukkur and Khairpur Districts, particularly in those areas on the east bank of the River Indus For other areas the main alternative combinations are rice/wheat and jowar/wheat It is assumed that in these areas, at least initially, two-thirds of the area diverted to sugar-cane will come from land formerly growing jowar, a dry crop, in kharif However, the amount of such land available (mainly land at the heads of watercourses) is strictly limited, and thus it is assumed that, once a total of 5,000 acres has been reached in Larkana District, all further land diverted will have to come from areas at present growing rice and wheat Such an assumption conforms with the experience of the mill that the acreage under sugar-cane can be expanded fairly rapidly initially in each area but will eventually come up against the problem of diverting land away from paddy cultivation

Tables 81, 82, 83 and 84 give details of average farm budgets for wheat, rice, cotton and jowar.[g] The net revenue per acre to the farmer is the net revenue from the sale of sugar-cane minus the cost of growing the sugar-cane minus the revenue lost from alternative crops plus the costs saved by not growing those crops The

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[e] The main sources other than verbal communications for both sugar-cane and the crops replaced are Toaha Qureshi and others, *The Impact of Technological Changes on Per Unit Cost and Returns in Agriculture in Sind Province of Pakistan* (Tandojam, Sind Agricultural College, Department of Agricultural Economics and Rural Sociology), mimeographed figures for the economics of production of major crops in Pakistan (Agriculture Research Council), *Cotton Price Policy for 1977/78,* Agricultural Commodities Price Policy Cell (Ministry of Agriculture, Co-operatives and Land Reform), *Review of Prices of Major Agricultural Commodities,* Agricultural Commodities Price Policy Cell (Ministry of Agriculture, Co-operatives and Land Reform)

[f] Estimated transport costs for 1976/77 by district were supplied by the cane manager, Larkana sugar-mill. On the basis of these figures, the following estimates are used for transport costs paid by the mill and by the farmers

District	*Cost to mill (Rs/maund)*	*Cost to farmers (Rs/maund)*
Larkana	0.53	0.74
Jacobabad	1 36	1 08
Dadu	1 23	1 15
Sukkur	1 32	1 29
Khairpur	1 42	1 33

[g] Sources as in footnote *e*

yields assumed for the alternative crops are based on recorded yields in Larkana District as shown in table 85 They are assumed to be constant throughout the life of the project partly because no significant trend appears either upwards or downwards and partly because the most important changes to consider for farmers' net income are changes in relative yields, the present low levels of sugar-cane yields indicate more scope for increasing yields of sugar-cane than for increasing yields of any other crop

TABLE 80. AVERAGE ANNUAL[a] COST OF PRODUCTION AND NET REVENUE FOR ONE ACRE OF SUGAR-CANE IN LARKANA DISTRICT WITH YIELDS OF 330 MAUNDS

(Rupees)

Item	*Owner farmer*	*Tenant*	*Land-lord*
Costs			
Labour 29 man-days at Rs 8 + interest at 12%[b]	260		
Bullock work-days 9 at Rs 12 + interest at 12%	121		
Repair of implements etc.	25		
Cost to tenant[c]	406	406	
Farmyard manure 5 cartloads plus interest at 12%	168		
Joint costs[d]	168	84	84
Seed 60 maunds at 5 50 every 3 years + interest at 12%	123		
Water rate	40		
Cost to landlord[e]	163		163
Total cost	737	490	247
Revenue			
Sugar-cane 330 maunds at Rs 5 90	1 947		
Less			
Octroi and development cess at Rs 0 21 per maund	69		
Transport at Rs 0 84 per maund	277		
Fertilizer 2 bags (urea) at Rs 68 + 12% interest	152		
Fertilizer 1 bag (DAP) every 3 years at Rs 72 + 12% interest	27		
Pesticide 1 bag (furodan) at Rs 66 + 12% interest	74		
Net payment by factory	1 348	674	674
Value of cane tops 82 5 maunds at Rs 2	165	165	
Total revenue[f]	1 513	839	674
Net revenue	776	349	427

[a] Averaged over three years—one plant crop and two ratoons.

[b] Interest charge is included for those costs the farmer incurs before receiving his revenue. Interest was included for a one-year period for sugar-cane but for half a year for other crops.

[c] All labour and bullock costs as well as repair of farm implements are assumed to be paid by the tenant

[d] All other input costs except seed, water rates and land rates are shared equally by landlord and tenant.

[e] The costs of seed, water rates and land taxes are borne by the landlord

[f] For each crop (sugar-cane and cotton) 50 per cent of the value of the crop is taken by the landlord and 50 per cent by the tenant. For food crops a 60 per cent share for the tenant is assumed, since tenants may take some of the crop before harvest for personal consumption In addition it is assumed that crop residues (rice straws) are used by the tenant as fodder for his animals.

These notes apply also to tables 81-84.

For this study the following per acre yields are assumed throughout

Wheat	14 maunds grain, 14 maunds straw
Rice	30 maunds paddy, 30 maunds straw
Jowar	10 maunds grain, 20 maunds straw
Cotton	8 maunds phutty, 8 maunds sticks

The rice estimate is converted to paddy equivalent by applying a factor of 1.5 to a rice yield of 20 maunds per acre. The assumed yield of jowar is considerably higher than the average yield because the land replaced by sugar-cane is likely to be irrigated and considerably better than the average land used for this crop, which is grown mainly in areas short of water. The assumed yield for cotton is derived from an estimate of 7.6 maunds in Larkana District, which is assumed to be similar to the yield in Sukkur District [h]

TABLE 81 COST OF PRODUCTION AND NET REVENUE FOR ONE ACRE OF WHEAT IN UPPER SIND

(Rupees)

Item	*Owner farmer*	*Tenant*	*Land-lord*
Costs			
Labour: 20 man-days at Rs 8 + interest at 12% per annum for 6 months	170		
Bullock work-days: 8 at Rs 12 + interest at 12% per annum for 6 months	102		
Repair of implements etc.	7		
Cost to tenant	279	279	
Fertilizer: 1 bag urea + interest at 12% per annum for 6 months	72		
Farmyard manure: 3 cartloads + interest at 12% per annum for 6 months	95		
Transport, marketing and octroi	21		
Joint costs	188	94	94
Seed: 1 maund + interest at 12% per annum for 6 months	42		
Water rate	19		
Cost to landlord	61		61
Total cost	528	373	155
Revenue			
14 maunds wheat at Rs 37	518	311	207
14 maunds straw at Rs 10	140	140	–
Total revenue	658	451	207
Net revenue	130	78	52

[h] This estimate is implied in data received from the Extra Assistant Director, Agriculture, of Larkana District, and may be compared with yields of 7, 7 and 9.5 maunds used by the Agricultural Commodities Price Policy Cell for years 1975/76, 1976/77 and 1977/78 as representative yields for Pakistan under average resource conditions.

TABLE 82 COST OF PRODUCTION AND NET REVENUE FOR ONE ACRE OF RICE (IRRI-PAK) IN UPPER SIND

(Rupees)

Item	*Owner farmer*	*Tenant*	*Land-lord*
Costs			
Labour 26 man-days at Rs 8 + interest at 12% per annum for 6 months	220		
Bullock work-days 9 at Rs 12 + interest at 12% per annum for 6 months	114		
Repair of implements etc.	18		
Cost to tenant	352	352	
Fertilizer 1 bag urea + interest at 12% per annum for 6 months	72		
1 bag DAP + interest at 12% per annum for 6 months	76		
Insecticide Nursery and crop sprays + interest at 12% per annum for 6 months	34		
Manure 0.5 cart + interest at 12% per annum for 6 months	16		
Transport, marketing and octroi	48		
Joint costs	246	123	123
Seed 0.35 maunds at Rs 35 + interest at 12% per annum for 6 months	11		
Water rate	18		
Cost to landlord	29		29
Total cost	627	475	152
Revenue			
30 maunds paddy at Rs 30	900	540	360
30 maunds straw at Rs 4	120	120	
Total revenue	1 020	660	360
Net revenue	393	185	208
Net revenue rice/wheat combination	523	263	260

TABLE 83 COST OF PRODUCTION AND NET REVENUE FOR ONE ACRE OF COTTON IN UPPER SIND

(Rupees)

Item	*Owner farmer*	*Tenant*	*Land-lord*
Costs			
Labour 29 man-days at Rs 7[a] + interest at 12% per annum for 6 months	215		
Bullock work-days 10 at Rs 12 + interest at 12% per annum for 6 months	127		
Repair of implements etc.	17		
Cost to tenant	359	359	
Fertilizer 1 bag urea + interest at 12% per annum for 6 months	72		
0.5 bag DAP + interest at 12% per annum for 6 months	38		
Plant protection + interest at 12% per annum for 6 months	53		
Transport, marketing and octroi	30		
Joint costs	193	96	97
Seed 0.25 maund + interest at 12% per annum for 6 months	16		
Water rate	18		
Cost to landlord	34		34
Total cost	586	455	131
Revenue			
Cotton phutty 8 maunds at Rs 125	1 000	500	500
Sticks 8 maunds at Rs 4	32	32	
Total revenue	1 032	532	500
Net revenue	446	77	369
Net revenue cotton/wheat combination	576	155	421

[a]Cotton-picking is often performed by women. The opportunity cost of female labour is assumed to be lower than that of men.

TABLE 84 COST OF PRODUCTION AND NET REVENUE FOR ONE ACRE OF JOWAR IN UPPER SIND

(Rupees)

Item	*Owner farmer*	*Tenant*	*Land-lord*
Costs			
Labour 16 man-days at Rs 8 + interest at 12% per annum for 6 months	136		
Bullock work-days 6 at Rs 12 + interest at 12% per annum for 6 months	76		
Repair of implements	5		
Cost to tenant	217	217	
Fertilizer 1 bag urea + interest at 12% per annum for 6 months	72		
Transport, marketing and octroi	21		
Joint costs	93	46	47
Seed + interest at 12% per annum for 6 months	8		
Water rate	11		
Cost to landlord	19		19
Total cost	329	263	66
Revenue			
Grain 10 maunds at Rs 40	400	240	160
Straw 20 maunds at Rs 6	120	120	
Total revenue	520	360	160
Net revenue	191	97	94
Net revenue jowar/wheat combination	321	175	146

TABLE 85 YIELDS (MAUNDS PER ACRE) OF MAJOR CROPS IN LARKANA DISTRICT

	Year					
Crop	*1969/70*	*1970/71*	*1971/72*	*1972/73*	*1973/74*	*1974/75*
Irrigated wheat	14 0	13 9	14.5	14 0	15 8	14 3
IRRI-PAK rice	17 7	18 4	21 1	21 1	21 1	19 0
Jowar	6 7	6.5	6 7	6 0	5 9	5 8

Source *Agricultural Statistics of Pakistan, 1975,* vol. II

The data on average farm budgets are used in conjunction with estimates of the locational source of sugar-cane supplies, which define the nature of the crops replaced Net resource costs at market prices incurred in the cultivation of sugar-cane are then derived by subtracting the value of resource costs used for replaced crops from the value of resource costs used for sugar-cane For some items, such as labour and bullock power, net resource costs are negative because the two crops replaced use more of these resources than does sugar-cane The changing pattern of the location of sugar-cane supplies is such that the relative values of different net

resource costs change over time The biggest single net resource costs are the value of the various crops replaced and the extra cost of transporting sugar-cane The net revenue that accrues to farmers is the difference between the revenue from the sugar-cane crop and the net resource costs calculated as above

Estimating the shadow price of sugar-cane

Sugar-cane, a non-traded good in Pakistan, is shadow priced on the basis of its cost of production The cost of land is measured through the opportunity cost of alternative crops rather than through land rent

The formulation for the shadow price of sugar-cane can be expressed as

$$Sp_{ct} = \frac{1}{A_t Y_t}\left(\sum_j [(x_{jt} D_{pj} + AF_j) + AF_f] + \sum_n [(x_{nt} D_{pn} + AF_n) + AF_f] + [(x_t L + AF_l) + AF_f]\right)$$

where

Sp_{ct} is the shadow price of sugar-cane in year t

A_t is the total area supplying sugar-cane to the factory in year t

Y_t is the yield of sugar-cane in year t

$x_{jt}D_{pj}$ is the value of traded good j used in growing sugar-cane net of any costs saved Included in this category are the traded crops forgone that are used as a proxy for the cost of land x_{jt} refers to the physical quantity of commodity j at time t while D_{pj} is the domestic price of commodity j

AF_j is the adjustment factor for commodity j

AF_f, AF_n, AF_l the subscript of f refers to foreign exchange, n to non-traded commodity n, l to labour

$x_{nt}D_{pn}$ is the value of non-traded good n net of any goods saved estimated as for traded goods

$x_t L$ is the value of net labour costs at market prices

The shadow price of sugar-cane is calculated only in relation to the costs borne by the farmer Transport costs paid by the mill are treated separately The shadow prices of the various costs are applied to the costs incurred for each year to find the shadow price for sugar-cane in that year This shadow price, expressed in rupees per maund, can then be compared with the price paid by the mill to obtain an appropriate adjustment factor both before and after applying a foreign-exchange adjustment It is assumed, for lack of other information, that the shadow price of the cost items will remain constant over the life of the project, although, owing to changes in sources of supply and yields, the shadow price of sugar-cane will change considerably over the life of the project

Shadow prices are calculated for wheat, rice, cotton, urea, DAP and pesticide In addition, AFs are calculated for agricultural goods and transport The AF for agricultural goods is a weighted average of the AFs for wheat, rice, cotton and jowar The weights used are the values of the crops forgone in growing sugar-cane averaged over several cases.[i] The AF for transport is based on the data given in the appendix to chapter II and amended in this case-study for the different shadow wage used However, the farmer's transport costs include a significant item of octroi and

[i] Potts, *op. cit.*, p. 44.

development cess (indirect taxes), so that the AF is reduced to take these into account

Details of the calculations of the shadow prices are shown below[1] in the form of conversion factors AFs may be obtained by subtracting 1.0 from the conversion factor

Wheat

C.i.f. price	= Rs 1,335 per metric ton = Rs 49 8 per maund
Transport costs (Karachi to Larkana by rail)	= Rs 3 5 per maund
Shadow price Rs 49 8 + 3 5	= Rs 53 3
Price to farmer	= Rs 37 per maund
Conversion factor	$= \frac{53\ 3}{37} = 1\ 44$
With a shadow exchange rate of 1 2, conversion factor	$= \frac{(49\ 8 \times 1\ 2) + 3\ 5}{37} = \frac{63\ 3}{37} = 1\ 71$

Rice (medium quality)

F.o.b. price	= Rs 1,965 per metric ton = 73 3 per maund
Transport cost	= Rs 3 5 per maund
Milling cost	= Rs 1 0 per maund
Shadow price of rice	= Rs 73 3 – 4 5 = Rs 68 8

If one maund of paddy is equivalent to two-thirds maund of rice and one-third maund of husk (valued at Rs 3 per maund) and the domestic price of paddy is Rs 30 per maund,

Conversion factor	$= \frac{(68\ 8 \times 2/3) + (3 \times 1/3)}{30} = 1\ 56$
With a shadow exchange rate of 1 2, conversion factor	$= \frac{[(73\ 3 \times 1\ 2) - 4\ 5] \times 2/3 + (3 \times 1/3)}{30} = 1\ 89$

Cotton

One maund of phutty, or raw cotton, is taken to be equivalent to two-thirds maund of cotton seed and one-third maund of lint Cotton lint is exported at an f.o.b. price of Rs 506 per maund while the domestic price of cotton seed (non-traded) is Rs 45 per maund. The ginning cost is taken as Rs 70 per 3 maunds and transport of cotton lint to the port at Rs 3 5 per maund Farmers are paid Rs 125 per maund of phutty

[1] Potts, *op. cit.*, p. 43. Handling costs for wheat, rice and cotton are omitted, since adequate data are not available. These costs are fairly small but raise the shadow price of wheat and lower the shadow prices of rice and cotton. On balance their effect on the shadow price of sugar-cane is likely to be insignificant

Shadow price for cotton = (2/3 x 45) + (506 x 1/3) – (1/3 x 70) – (3 5 x 1/3)
= Rs 174 2

Conversion factor $= \frac{174\ 2}{125} = 1\ 39$

With a shadow exchange rate of 1.2,

conversion factor $= \frac{(2/3 \times 45) + (506 \times 1\ 2 \times 1/3) - (1/3 \times 70) - (3\ 5 \times 1/3)}{125} = 1\ 66$

Urea

C.i.f price = Rs 1,307 per ton
Rail transport = Rs 101 per ton
Domestic price = Rs 1,384 per ton
Shadow price = Rs (1,307 + 101) = Rs 1,408

Conversion factor $= \frac{1,408}{1,384} = 1\ 02$

With a shadow exchange rate of 1 2, conversion factor $= \frac{(1,307 \times 1\ 2) + 101}{1,384} = 1\ 21$

DAP

C.i.f price = Rs 1,580 per ton
Rail transport = Rs 101 per ton
Domestic price = Rs 1,466 per ton
Shadow price = Rs (1,580 + 101) = 1,681

Conversion factor $= \frac{1,681}{1,466} = 1\ 15$

With a shadow exchange rate of 1 2, conversion factor $= \frac{(1,580 \times 1\ 2) + 101}{1,466} = 1\ 36$

Pesticides

The c.i.f value of imports is Rs 277 4 million Government subsidies amount to Rs 88 3 million If transport and handling costs are assumed to be 10 per cent of the c.i.f value,

Conversion factor $= \frac{(277\ 4 + 27.7)}{(277.4 + 27\ 7 - 88\ 3)} = 1\ 41$

With a shadow exchange rate of 1 2, conversion factor $= \frac{(277.4 \times 1.2) + 27\ 7}{(277\ 4 + 27\ 7 - 88\ 3)} = 1\ 66$

Table 86 lists conversion factors and hence the relevant AFs The agricultural output conversion factor is used to revalue the items labour, bullock power, manure and water rates Jowar is treated as a non-traded commodity for which the market price is equal to the shadow price, as are the items implements and by-products

The relevant conversion factors are applied to each of the net cost items derived from the crop budget data and the total costs adjusted accordingly in each year and for each case The adjusted value for farmers' costs, excluding the cost of cane seed, is then divided by the revenue from sugar-cane net of the cost of cane seed to derive conversion factors for sugar-cane, which can then be multiplied by Rs 5 90 to give the shadow prices indicated in table 66 Cane seed is eliminated from both sides

TABLE 86 CONVERSION FACTORS AND ADJUSTMENT FACTORS FOR COMMODITIES AFFECTED BY THE GROWTH OF SUGAR-CANE

	Before foreign-exchange adjustment		*After foreign-exchange adjustment*	
Item	*CF*	*AF (%)*	*CF*	*AF (%)*
Wheat	1 44	44	1 71	71
Rice	1 56	56	1 89	89
Cotton	1 39	39	1 66	66
Urea	1 02	2	1 21	21
DAP	1 15	15	1 36	36
Pesticide	1 41	41	1 66	66
Agriculture	1 41	41	1 66	66
Transport	0.46	−54	0 54	−46

because the shadow price of cane seed is assumed to be the same as that of cane and cannot therefore be determined before the shadow price of sugar-cane has been estimated

The value of the crops forgone and the yield of sugar-cane are the two most important factors in determining the shadow price of sugar-cane The low shadow price given to transport costs reduces the effect on the shadow price of sugar-cane of variations in distance from the source of supply, but this shadow price does not distinguish between qualities of cane Reduction of the sucrose extraction rate is one of the most important costs incurred in transporting sugar-cane for long distances The shadow price of sugar-cane rises as the source of supply is changed to land close to the mill, land on which rice and wheat are now being cultivated The rise in the shadow price will probably be compensated by an increased sucrose extraction rate A further effect, not considered in estimating the shadow price of sugar-cane, is that waterlogging in Larkana District may be reduced through the cultivation of dry crops

Distribution of the benefits to farmers

Tables 80-84 show the net revenue to farmers cultivating various crops under both owner-cultivator and sharecropping land-tenure systems Data given in the Pakistan Census of Agriculture[k] indicate that 60 per cent of the land in Larkana District is owned by landlords and farmed by tenants, almost all of whom operate under sharecropping arrangements whereby the crop is split 50 50 between landlord and tenant Several variations exist, but the predominant pattern appears to be one whereby the tenant supplies all the labour, bullock power and tools and the landlord pays for the seed and rates and taxes All the other costs are shared equally as are the returns, although the tenant will probably keep the by-products However, the landlord is able to enforce his 50 50 share more easily for cash crops like sugar-cane and cotton than he is for staple food crops like wheat, rice and jowar Consequently, the landlord's share of food crops is likely to be nearer 40 per cent in practice, and that assumption has been used in tables 80-84

[k] *Pakistan Census of Agriculture, 1972*, vol. II (Lahore, Agricultural Census Organization, 1975), p. 3.

The districts assumed to be shifting from rice or jowar to sugar-cane are Larkana, Dadu and Jacobabad In all three cases it is assumed that 60 per cent of the land under sugar-cane is farmed by tenants and 40 per cent by owners In fact the proportion of land sharecropped is slightly less in Dadu and rather more in Jacobabad

Land under sugar-cane in Sukkur and Khairpur Districts is assumed to have come predominantly from land on which cotton was grown Since landlords are not likely to gain much, if anything, from shifting from cotton to sugar-cane at existing prices and yields, owing to the distribution of benefits under existing land-tenure arrangements, all this land is assumed to be farmed by owners

The net revenue from growing sugar-cane in Larkana, Dadu and Jacobabad Districts is therefore assumed to accrue 40 per cent to owner farmers and 60 per cent to landlords and tenant farmers The proportion gained by landlords and by tenants is determined according to the pattern of sharecropping indicated above All net revenue obtained by owner farmers in Sukkur and Khairpur Districts is assumed to accrue to them

To estimate the distribution of net benefits by income class the distribution of land holdings in the relevant districts must be considered The data relating to Larkana District are assumed also to apply to Dadu and Jacobabad, while the data relating to Sukkur District are assumed also to apply to Khairpur Table 87 shows the distribution of landholdings for owner farmers and tenant farmers in Larkana District and for owner farmers in Sukkur District

TABLE 87 LANDHOLDINGS, FAMILY SIZE AND AVERAGE FARM SIZE

A. For owner farmers in Larkana District

Category of farm (acres)	*Share of landholdings (%)*	*Average size of household (number)*	*Average size of farm in category (acres)*
0-5	9 0	5 8	2 6
5-12.5	24 2	7 8	7 4
12.5-25	19 2	9 3	17 2
25-50	13 1	11 9	31 6
50-150	15 4	9 2	73 7
150+	19 1	10.7	349 6

B. For tenant farmers in Larkana District

Category of farm (acres)	*Share of landholdings (%)*	*Average size of household (number)*	*Average size of farm in category (acres)*
0-5	13 0	5 8	3 1
5-12 5	58 9	7 3	7 7
12.5-25	23 3	9 3	16 1
25-50	4 7	11 9	30.1
50-150	0 1	9 2	55 7
150+	–	10.7	

TABLE 87 *(continued)*

C. For owner farmers in Sukkur District

Category of farm (acres)	*Share of landholdings (%)*	*Average size of household (number)*	*Average size of farm in category (acres)*
0-5	11 3	5 4	2 6
5-12 5	29 4	6 2	8 0
12 5-25	26 7	7 3	16 4
25-50	13 6	8 0	31 7
50-150	11 6	9 1	79 7
150+	7 4	7 1	234 0

Source Derived from *Pakistan Census of Agriculture, 1972* (Lahore, Agricultural Census Organization, 1975), pp 18, 24 and 283

Estimates of household income per acre are obtained for Larkana District by adding to the net revenue data for a crop of wheat and rice an estimate of the proportion of labour and bullocks supplied by that household For Sukkur District, the same procedure is followed with a crop of wheat and cotton (see table 88)

TABLE 88 PROPORTION OF LABOUR AND BULLOCKS SUPPLIED BY HOUSEHOLD

Category of farm (acres)	*Family labour (%)*	*Households owning bullocks (%)*
0-5	100	60
5-12 5	100	90
12 5-25	100	90
25-50	95	90
50-150	80	90
150+	50	90

Source Derived from *Pakistan Census of Agriculture, 1972* (Lahore, Agricultural Census Organization, 1975), pp 3, 275 and 317

Household income per double-cropped acre is then estimated by including in the revenue figures an estimate of the proportion of labour supplied within the household Table 89 shows the estimates for Larkana (owner farmers and tenant farmers) and Sukkur (owner farmers)

TABLE 89 HOUSEHOLD INCOME PER DOUBLE-CROPPED ACRE IN LARKANA AND SUKKUR DISTRICTS

(Rupees)

Category of farm (acres)	*Larkana*		*Sukkur, owner farmer*
	Owner farmer	*Tenant*	
0-5	1 043	783	1 098
5-12 5	1 107	847	1 167
12 5-25	1 107	847	1 167
25-50	1 088	828	1 148
50-150	1 029	769	1 090
150+	912	–	975

Table 90 shows estimates of average cropping intensity (as a percentage of 200 per cent for owner farmers and tenant farmers in Larkana District and owner farmers in Sukkur District. These percentages are then applied to the figures for income in table 89 and for the average area and household size in table 87 to derive table 91, an estimate of *per capita* household income for owner farmers and tenant farmers in Larkana District and owner farmers in Sukkur

TABLE 90 AVERAGE CROPPING INTENSITY IN LARKANA AND SUKKUR DISTRICTS

(Per cent of 200 per cent)

Category of farm (acres)	*Larkana*		*Sukkur, owner farmers*
	Owner farmers	*Tenants*	
0-5	90	85	80
5-12.5	85	85	70
12.5-25	75	65	70
25-50	70	60	70
50-150	60	80	60
150+	50	–	50

Source. Derived from *Pakistan Census of Agriculture, 1972* (Lahore, Agricultural Census Organization, 1975), pp. 99 and 105

TABLE 91 ESTIMATES OF *PER CAPITA* HOUSEHOLD INCOME IN LARKANA AND SUKKUR DISTRICTS

(Rupees)

Category of farm (acres)	*Larkana*		*Sukkur, owner farmers*
	Owner farmers	*Tenants*	
0-5	421	356	423
5-12.5	954	759	1 054
12.5-25	1 535	953	1 835
25-50	2 022	1 257	3 184
50-150	4 946	3 725	5 728
150+	14 899	–	16 067

Six income classes were chosen for subsequent analysis with estimated mean values for *per capita* income of (Rs) 400, 950, 1,700, 3,450, 5,350 and 15,500, respectively for the classes (Rs) 0-600, 600-1,200, 1,200-2,400, 2,400-4,800, 4,800-9,600 and 9,600 and above. The income estimates in table 91 classified according to the above division of classes and type of land tenure indicated in table 87, are combined with income-distribution estimates given in table 92 to derive table 93, which shows the distribution of net revenue from the cultivation of sugar-cane accruing to different classes of farmers in various years. A substantial proportion of the net revenue to farmers is likely to accrue either to landlords or to large farmers.

TABLE 92 DISTRIBUTION OF NET REVENUE BY LAND TENURE

(Thousands of rupees)

District and type of land tenure	*1974/75*	*1975/76*	*1976/77*	*1977/78*	*1978/79*	*1979/80*	*1980/81*	*1981/82*	*1982/83*	*1983/84*	*1984/85*	*1985/86*	*1986/87*	*1987/88*	*1988/89*	*1989/90*	*1990/91*	*1991/92*	*1992/93*	*1993/94*
								A Case 1												
Sukkur/ Khairpur owner farmers	(47)	(500)	243	386	→		386	306	210	115	19									
Larkana landlords	(237)	413	1 043	1 050	1 199	1 399	1 599	1 787	1 972	2 157	2 343	2 380	→							
Larkana tenants	(421)	98	605	626	725	828	931	1 027	1 122	1 217	1 312	1 331	→							
Larkana owner farmers	(439)	341	1 098	1 117	1 281	1 484	1 686	1 876	2 063	2 250	2 437	2 474	→							
								B Case 2												
Sukkur/ Khairpur owner farmers	(47)	(500)	243	232	270	309	348	386	→								378	354	330	306
Larkana landlords	(237)	413	1 043	1 050	1 007	1 079	1 148	1 199	1 249	1 299	1 349	1 399	1 449	1 499	1 549	1 599	1 648	1 694	1 741	1 787
Larkana tenants	(421)	98	605	626	612	656	699	725	750	776	802	828	854	879	905	931	956	979	1 004	1 027
Larkana owner farmers	(439)	341	1 098	1 117	1 079	1 157	1 231	1 281	1 332	1 383	1 433	1 484	1 534	1 585	1 636	1 686	1 736	1 782	1 829	1 876
								C Case 3												
Sukkur/ Khairpur owner farmers	(47)	(500)	243	1 053	1 735	2 162	1 681	762												
Larkana landlords	(237)	413	1 043	1 266	1 695	2 304	3 005	3 815	4 452	4 690	4 917	5 020	→							
Larkana tenants	(421)	98	605	846	1 226	1 755	2 380	3 106	3 714	3 999	4 252	4 342	→							
Larkana owner farmers	(439)	341	1 098	1 408	1 948	2 707	3 591	4 615	5 444	5 793	6 113	6 241	→							

TABLE 93 DISTRIBUTION OF NET BENEFITS TO FARMERS

(Thousands of rupees)

Category of income	*1974/ 75*	*1975/ 76*	*1976/ 77*	*1977/ 78*	*1978/ 79*	*1979/ 80*	*1980/ 81*	*1981/ 82*	*1982/ 83*	*1983/ 84*	*1984/ 85*	*1985/ 86*	*1986/ 87*	*1987/ 88*	*1988/ 89*	*1989/ 90*	*1990/ 91*	*1991/ 92*	*1992/ 93*	*1993/ 94*
									A Case 1											
0-600	(100)	(13)	205	226	253	285	316	337	355	374	392	396	→							
600-1 200	(466)	16	834	899	1 019	1 153	1 287	1 388	1 484	1 579	1 674	1 693	→							
1 200-2 400	(174)	(19)	448	493	551	621	692	736	775	815	854	862	→							
2 400-4 800	(7)	(68)	34	53	53	53	53	43	30	17	4	1	→							
4 800-9 600	(73)	(5)	197	217	242	273	305	324	342	360	378	381	→							
9 600 +	(87)	28	228	242	273	312	351	381	410	438	467	473	→							
landlords	(237)	413	1 043	1 050	1 199	1 399	1 599	1 787	1 972	2 157	2 343	2 380	→							
									B. Case 2											
0-600	(99)	(13)	205	209	207	224	241	253	261	269	277	285	293	301	308	316	323	328	332	337
600-1 200	(466)	16	834	854	844	910	974	1 019	1 052	1 086	1 119	1 153	1 186	1 220	1 253	1 287	1 317	1 340	1 364	1 388
1 200-2 400	(174)	(19)	448	452	450	487	523	551	569	586	604	621	639	656	674	692	706	716	726	736
2 400-4 800	(7)	(68)	34	32	37	43	48	53	53	53	53	53	53	53	53	53	52	49	46	43
4 800-9 600	(73)	(5)	197	199	198	214	230	242	250	258	266	273	281	289	297	305	311	316	320	324
9 600 +	(87)	28	228	231	226	244	261	273	283	293	302	312	322	331	341	351	359	367	374	381
landlords	(237)	413	1 043	1 050	1 007	1 079	1 148	1 199	1 249	1 299	1 349	1 399	1 449	1 499	1 549	1 599	1 648	1 694	1 741	1 787
									C Case 3											
0-600	(99)	(13)	205	356	531	716	822	905	973	1 041	1 103	1 126	→							
600-1 200	(466)	16	834	1 346	1 989	2 734	3 319	3 894	4 370	4 689	4 974	5 080	→							
1 200-2 400	(174)	(19)	448	776	1 092	1 534	1 720	1 840	1 933	2 059	2 174	2 220	→							
2 400-4 800	(7)	(68)	34	144	237	296	231	107	4	4	4	4	→							
4 800-9 600	(73)	(5)	197	339	501	668	748	799	838	892	941	961	→							
9 600 +	(87)	28	228	347	500	677	810	938	1 040	1 106	1 168	1 192	→							
landlords	(237)	413	1 043	1 266	1 695	2 304	3 005	3 815	4 452	4 690	4 917	5 020	→							

Appendix C

WORLD MARKET FOR SUGAR

Sugar is traded internationally for the most part on the basis of fixed price and long-term contracts. Sales to the EEC countries from exporters in African, Caribbean and Pacific countries under the Lomé Convention, and to the Union of Soviet Socialist Republics from Cuba are of this nature, sales from one EEC member country to another are also subject to long-term agreements. The residual supplies, not sold under these special arrangements, are traded freely on the world market. It is estimated that in 1977 around 16 million tons of sugar, out of a total world production of 90 million tons, were sold on the free world market.[a] Such sales are based on short-term contracts at current market prices. A purchaser such as Pakistan would buy sugar on the free market at current prices.

Prices on the free, or non-controlled, part of the world market have been highly volatile in recent years. As a result of shortages, prices rose dramatically in 1974. Prices came down gradually during 1975, and this fall continued through 1976 and 1977. In July 1977, the price had fallen to close to the annual average of 1972. Table 94 gives data on the f.o.b. prices for free-market sales.

TABLE 94. SUGAR PRICE (f.o.b. CARIBBEAN PORTS)

		Cents/lb (current prices)
1972		7.4
1973		9.6
1974		30.0
1975		20.5
1976		11.6
1977	January	8.4
	February	8.5
	March	9.0
	April	10.1
	May	9.0
	June	8.0
	July	7.3

Source: *Monthly Bulletin of Statistics*, vol. XXXI, No. 12 (1977).

Prices in 1977 were below estimated production costs of many producers, a figure quoted widely for United States costs is 13.5 cents/lb.[b] As a response to this situation, a new International Sugar Agreement was concluded in 1977 under which exporters agreed to restrict their exports through a system of export quotas, the objective is to keep surplus stocks off the world market and to stabilize prices within a range of 11-21 cents/lb.

[a] See "A step towards stabilising a volatile commodity", *Financial Times*, 7 October 1977.

[b] *Ibid*.

With this volatility in sugar prices on the free world market, simply projecting the average 1977 price over the working life of the project is likely to give misleading results The approach followed in this appraisal is to use forecasts for the world price of sugar based on estimates of the costs of production for various sugar exporters to value the output of the project The prices are weighted averages of the production costs of exporters with the weights given by the estimated share of producers in sugar coming on the free world market This approach assumes that on average in the long run the price of sugar cannot deviate substantially from long-run production costs without generating supply changes, which will move the price back towards production costs This argument is likely to apply only in terms of the long run, and in particular years world prices need not equal production costs However, these forecast values are used in the absence of alternative data The original forecasts are converted to 1977 prices through multiplication by an index of international inflation [c] The forecasts in 1977 prices are given below

Year	*Price (cents/lb)*
1977/78	11 1
1978/79	12.0
1979/80	13 1
1980/81	13 1
1981/82	13 1
1982/83	13 1
1983/84	13 1
1984/85	15 3
↓	↓
1993/94	15 3

The forecast values imply a gradual rise in the world price of sugar relative to other internationally traded items, in 1978/79, a relative rise of 9 per cent is forecast, and, in 1984/85, another rise of 16 per cent The long-run price forecast from 1984/85 on is approximately the mid-point of the price range of 11-21 cents/lb within which the signatories of the International Sugar Agreement hope to stabilize the sugar price

In the appraisal at stage two, the sensitivity of the results to fluctuations in sugar prices ±10 per cent of the forecast values is tested it shows that a price of 10 per cent below the forecast value will reduce substantially the project's NPV and reduce the IRR to below 5 per cent in cases 1 and 2 and to 7 per cent in case 3 A price 10 per cent below the forecast value implies a long-run price after 1984/85 of 13 8 cents/lb, which is high in relation to prices for sugar sales in 1977 If the International Sugar Agreement manages to stabilize prices only at the bottom of the target range, that is, 11 cents/lb, the net worth of the project will be decreased still further The appraisal shows that a 16 per cent increase in the world price of sugar above the forecast value is required to give case 1, the base case, an IRR of 10 per cent, this implies a long-run world market price of 17 7 cents/lb after 1984/85 This price can be interpreted as a long-run break-even price for the project, since it would raise the IRR of case 1 to the bottom of the range of measures of the opportunity cost of government investment It is well above prices at the end of 1977 of around 7 5 cents/lb and can probably be considered unrealistically high

[c] Based on the c.i.f prices of developed countries' exports of manufactures.

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