A STUDY OF TURKISH PLANNING WITH PARTICULAR REFERENCE TO PROJECT EVALUATION TECHNIQUE

by

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TABLE OF CONTENTS

PART III

CASE STUDIES ON PUBLIC PROJECT EVALUATION

LIST OF ABBREVIATIONS

DPA	–	Directly Productive activities
D.S.I.	–	State Water Works Department
E.I.E.	–	Electric Research and Planning Centre
FFYP	–	First Five-Year Plan
ICOR	–	Incremental capital-output ratio
IRR	–	Internal rate of Return
M.E.T.U.	–	Middle-East Technical University
NPV	–	Net Present value
NVA	–	Net Value Added
PMP	–	Private marginal productivity
PV	–	Present Value
S.E.E.	–	State Economic Enterprises
S.E.K.A.	–	Cellulose and Paper Enterprises.
SDR	–	Social Discount Rate
S.I.B.	–	State Investment Bank
SMP	–	Social Marginal Productivity
SOC	–	Social overhead capital
SPV	–	Social present value
SPO	–	State Planning Organisation
VA	–	Value added

S U M M A R Y

This study which is concerned primarily with the project evaluation technique during the First Five-Year Plan 1963-67, is divided into three parts. Part I examines the First Plan in respect to its major objectives, production targets, sectoral programming technique pursued in the formulation of the Development Plan. Part II deals with the market imperfections in developing countries and the basic reasons which have led to the introduction of various theoretical investment criteria. Part III discusses the project evaluation technique of the SPO and government investment agencies by introducing two case studies taken from the public sector and appraises them in the light of basic principles cited in Part II.

The comprehensive planning approach in Turkey began in 1962 with the launching of [illegible] in objectives were to achieve, an overall 7 percent growth rate (on average) to promote rate of industrialisation, to reduce deficit in the balance of payments, to create greater employment opportunities and to reduce income disparities. The SPO has followed the "method of successive approximation" or "planning in stages". This planning methodology comprises macro-economic stage, sectoral stage and project appraisal stage. For the macro-growth model aggregate figures on income, consumption, savings, investment, exports and imports were collected and the interrelationship among these variables were examined. By the application of simple Harrod-Domar model, an investment volume of 18.3 percent of GNP was found necessary to attain a 7 percent rate of growth, capital-output ratio being 2.6. Accordingly, domestic savings and foreign savings represented 14.8 percent and 3.5 percent of GNP respectively. The total investment requirements needed by the First Plan were forecast to reach 59.7 billion T.L. out of which 35.8 billion T.L. were to be invested by the public sector.

Public/

Public sector, therefore, was expected to undertake 60 percent of the total size of the investment programme. The main reasons for giving a greater role to the public sector was due to pressing and urgent needs for ensuring structural changes in the economy in respect of gross national product, foreign trade, labour force and pattern of industrialisation. The First Plan put the economy largely in the hands of the public sector where the government's aim was to achieve a larger share of manufacturing industry in the GNP and thus to accelerate industrialisation by intensifying its participation in the large-scale industries through its State Economic Enterprises (SEE).

The second stage of the planning methodology was concerned with the determination of production targets for various sectors over the five-year period. This stage was based on an input-output table and partly on "partial sector analysis". The production projections for sectors were made according to the increase in final demand which would arise from a 7 percent rate of growth in the GNP. However, the input-output table which was worked out has not even satisfied the SPO planners themselves. Some planners maintain that the sectoral production targets were based primarily on the "partial sector analysis" and less on the input-output model.

Determination of investment programmes at sectoral level was made on the basis of projects, programmes and sector reports. In actual fact Turkey has followed a "departmental approach" in its investment allocation, namely that sectoral allocation of investment was influenced by the bargaining power among various ministries and government departments.

Despite the remarkably high rate of growth in 1963 and 1966 (i.e. 7.5 per cent and 8.8 percent) the overall rate of growth set in the Plan was not achieved in the first five years of the Plan. The actual increase in the GNP/

GNP was, on average, 6.5 percent in the period 1962-66 - GNP rising from 61.9 billion T.L. to 79.5 billion T.L.

Part II has discussed critically the various investment criteria which have been advanced in the last two decades. Therefore, this part has provided some enlightenment on the market imperfections which have led many economists to suggest different criteria for social evaluation of investment projects. Among all those pointed out the most appropriate criterion is the social present value (SPV) rule which uses "accounting" prices and which takes into account the effect of investment project on various economic targets, i.e. national income, balance of payments, employment etc.

The object of Part III has been to investigate the theoretical investment criteria adopted in Turkey and to examine critically the project evaluation technique adopted in the First Five-Year Plan. The social present value criterion which takes account of present value of benefit and cost streams by using a social discount rate, has been applied to two industrial projects which are taken from the public sector.

The Case Study No.1 is a kraft paper and cellulose project which has already been executed by the SEKA organisation and the Case Study No.2 is Keban Hydro-Electric project vs. its Thermal alternative. The present value of benefits to costs ratio of the Paper Project is found to be 2.4 at 12 percent discount rate and 2.0 at 14 percent discount rate. On the other hand, the internal rate of return of the project has been found to be 12.06 percent.

In the case study no.2, the E.I.E. applied "equivalent annual cost" criterion to the Keban hydro-electric vs. Thermal alternative. Also, the evaluation has been made on market prices without considering social prices of inputs and outputs. However, since the two projects' life spans are different (Keban hydro-electric with 50 years and Thermal with 35 years) an accurate comparison/

comparison between the two has been made by bringing them to the same life period. With the aid of social present value (SPV) rule the two projects have been compared by the "lowest Common multiple" method. They are also compared by assuming an infinite period of renewal for both projects.

It has been shown that the choice between the hydro-electric and the Thermal is very sensitive to the variations in the social price of foreign exchange and social discount rates. If social price of foreign exchange is taken as 1.33 and social discount rate as 10 percent, the Keban Hydro-electric project loses its attractiveness and the choice becomes in favour of the Thermal project.

The main shortcomings of the project evaluation technique in Turkey can be summarises as follows:

(i) The criteria used in the Plan period varied between the simple accounting profitability criterion (used by SEKA), social present value (used by SPO in Case Study No.1); and "equivalent annual cost" criterion (applied by E.I.E. in Case Study No.2). Thus, there has been no uniformity in the application of investment criteria nor in the project evaluation method. While the SPO used "shadow" prices for certain inputs such as foreign exchange and wage rates, the E.I.E. did not consider "shadow" prices in any way. The discount rate applied in social benefit-cost analysis has varied between government agencies where the SPO applied a 12 percent rate of discount for industrial projects and E.I.E. 6 percent rate of discount in the evaluation of Keban hydro-electric. The fact that each planning agency was left free to apply its own investment criteria is a misleading approach to resource allocation and investment selection.

(ii) In the evaluation of kraft paper project the SPO has taken into account the benefits resulting from the project such as value added, foreign exchange savings, and benefits to consumers, but external effects of the project/

project on other sectors (i.e. forestry timber, transport, cement etc.) have been neglected. This defect is even more vivid in the appraisal of Keban Hydro-electric by the E.I.E. Though the latter is a multi-purpose project indirect benefits such as flood control, irrigation, navigation, fishing and external benefits to nearby mining industry have not been estimated and left outside social benefit cost analysis.

(iii) Total benefits and costs of the paper project are calculated on the basis of static assumptions in regard to sales revenue, prices received for outputs, future demand for the product, operating costs and economic life of the project. No attempt has been made to see how the choice will be affected by changes in all these variables where for more accurate analysis it is necessary to make some estimate of the possible outcomes and of the likelihood of their occurring.

(iv) Alternative projects with different scale of production, different production techniques and different location have not been made available during the First Five Year Plan. For instance, though Keban hydro-electric was compared to its Thermal alternative this is not sufficient for providing a wide range of investment choices. In actual fact, most of the industrial projects did not have a sufficient number of alternatives and this drawback has been mainly due to the lack of data, time, and qualified experts who could carry out alternative project studies.

Despite all its defects the First Five-Year Plan, however, has paved the way for a planned economic development which encouraged the application of new planning techniques and the collection of more uniform data for sectoral programming and project evaluation.

INTRODUCTION

This study is mainly directed towards an appraisal of the project evaluation technique adopted during the Turkish First Five-Year Plan, 1963-67.

The discussion has been conducted at the following three distinct levels. First, an attempt has been made to analyse the macro and sectoral aspects of the planning methodology in order to provide a proper background to the studies of investment project evaluation. Second, some efforts have been made to provide a critical survey of general investment criteria which have been extensively discussed in the last two decades. Of course, the theoretical investment criteria were discussed with the belief that these will provide a better understanding and pertinent guidelines for the project appraisal technique in Turkey. Accordingly, the criteria of investment allocation and particularly project evaluation technique applied in the First Five-Year Plan have been assessed by examination of some of the investment projects which are included in the investment programme of the First Plan.

The Turkish First Five-Year Plan is probably the first comprehensive planning attempt to deal with the various economic problems of the Turkish economy. Actually, the rate of income growth in the last decade has been of an unsatisfactory level and it has shown great fluctuation from one year to another. While the effect of weather conditions on agriculture was a major reason for such oscillation one should not ignore the fact that resources available for industries have been misallocated on inefficient criteria which did not increase the productive capacity of the economy. The inflation faced during 1954-58 was a consequence of the social overhead bias resource allocation which stemmed from deficit financing and remained the basic policy at the time. It was then believed that over investments in social overhead capital (i.e. transport and communications, electric power stations, hydro-dams etc.) would result in self-sustained economic growth. But this policy has proved to be a failure.

Indeed towards the end of the last decade (1958-60) the rate of growth dropped to almost 2.5 per cent per annum which was far below the rate of population growth (.3 per cent per annum). There was a pressing need to increase the rate of growth of the economy and to raise the standard of living of the people.

As a result of this population explosion (as compared to world standards) and low growth in non-agricultural industries, a tremendous unemployment problem arose and the number of prople unemployed rose to 1.5 million in 1962 plus the huge disguised unemployment in agriculture (i.e. one million).

The most important problem which confronted the Turkish economy was the balance of payments deficit which put Turkey under a great burden of debt to the rest of the world. Turkey's foreign debt obligations rose almost to $ 1 billion of which $ 666 million fell into the First Five-Year plan period. Trade deficit has also been another setback for economic growth as Turkey's export structure remained more or less static over 15 years. Almost 77 per cent of the total exports derived from agricultural products which are subject to fluctuations in foreign demand.

It was felt for a long time that these problems could not be tackled adequately unless the country pursued comprehensive economic planning, and admitted the fact that planning is essential to balanced development. This was finally acknowledged in Law No.91 of September 1960, which created the State Planning Organisation as the government's planning and advisory body.(1)

As its first task the Planning Organisation drafted the long-term development plan which is based on a fifteen-year perspective and indicates that the social and economic life in Turkey over this period will be planned subject to the essential safeguards of a democratic system. It was within this framework that in 1962 it set up the First Five-Year plan, 1963-67.

The subject of investment criteria is vast and an extremely challenging one. In the last two decades, there has been some extensive work on the subject and economists who studied this particular field, have suggested various investment criteria as being a substitute for private profitability criteria which depend on market mechanism.

Since the price mechanism in advanced countries operates more perfectly than in less developed countries; the problem of departing from the general commercial profitability rules is not as serious as it would be in developing countries. In general market imperfections are so vast in less developed countries that it becomes necessary to digress from the simple commercial profitability rule to some kind of investment

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(1) Later, this organisation was fully endorsed in the New Turkish Constitution of July 1961.

criteria which could lead to a more efficient allocation of investments.

What are these imperfections in the market mechanism which make the private profitability criteria a less desirable rule?

As far as developing countries are concerned these could be listed briefly as follows: a) market prices are not competitive because of market imperfections arising from monopolistic influences, taxes, tariffs and indivisibilities. Consequently the market price of a product or a service does not reflect its real value; b) private benefit estimates do not take into account the net benefits arising from economic interdependencies; c) private rate of return criteria may lead to a choice of investment projects which though they are profitable from a private point of view, may not be acceptable from the general economy's point of view; d) the rate of return rule applied by the private sector in its static set-up does not allow for dynamic considerations; e) lack of experience and information in developing countries make it difficult for the private sector acting in a decentralised form to forecast correctly the expected rates of return. This is in addition to the lack of unified and systematic accounting procedures. The Government, however, through its various planning and statistical institutions, has an adequate supply of required skills.

Most developing countries are now formulating their development plans with the hope of achieving a desirable path of growth. Under such circumstances the government "will often wish to modify consumers' power over the pattern of production in the interest of what it considers a preferable path of development. Consequently the development Committees' welfare function is substituted for that of consumers' acting independently".

It is not surprising to mention that the earlier discussion of investment criteria shows a modification of the price mechanism and its conventional rules. The modern discussion of theoretical investment criteria can be divided into three groups. First, Polak and Buchanan have discussed investment methods of allocation in terms of balance of payments and income effects, suggesting that given investment funds (including foreign-exchange) should be used either to increase export capacity or lead to import substitution. Second, some economists such as A.R.Kahn, R. Nurkse, W.A.Lewis, J. Tinbergen and H.B. Chenery have recommended that investment projects should be chosen according to "the social marginal productivity (SMP)" method of allocation, provided the aim of economic policy is to maximize the present aggregate level of output [(1)]. Other development planners such as H. Leibenstein, W. Galenson, O Eckstein and A.K. Sen suggest that investment projects should be selected on the basis of reinvestible surplus which the initial investment gives rise to, provided the goal is to maximize the rate of capital formation and the rate of growth of output over time.

Though some reference will be made to the last groups of theoretical investment criteria, most of my emphasis will centre on the first and second groups of theoretical investment criteria. It must be noted that the three sets of investment criteria mentioned above are appropriate within the conditions to which they are applicable. In other words, each of these investment criteria aims at achieving a certain goal in the economy. Each is directed to a specified policy objective which that particular country wants to maximize.

It is impossible to go into the details of each group of criteria in this thesis, nor is this the purpose of this study. However, given the conditions prevailing in the Turkish economy and the objective function which is to maximize output at present, I feel that the social marginal productivity criterion which is suggested by Professor H.B.Chenery would be the most relevant one to consider. Therefore, I shall be concentrating more on it than others. It is, perhaps, pertinent to mention the fact that social benefit-cost analyses which are recently presented by O.Eckstein, Prest and Turvey and I.M.D. Little do not, in principle, differ from the social marginal productivity rule which I have mentioned above. The principles governing the last two and the similarities between them, will be explained in the relevant chapters.

The plan of this thesis will be in the following fashion. The thesis is divided into three parts. Part I of this thesis is confined to the presentation of the Turkish First Five-Year Plan (1963-67), which was inaugurated in 1963. This is the first plan in Turkey which is comprehensive [(2)] in form and new in planning technique. The First Plan will be examined in reference to its basic objectives, production targets, total size of investment programme and finally, the allocation of investment among sectors. These aspects of the First Five-Year Plan will be discussed

(1) Here, maximizing present level of output refers to not a point of time but to short-time horizon

(2) Despite the fact Turkey had launched two separate Five-Year Industrialization plans in the past (1934-38; 1939-43) these plans were simply

(contd. on p.5

in Chapter 1. Though my main task in this thesis is to concentrate on the project evaluation technique introduced during the First Plan period, it has seemed reasonable to me to throw some light on the question of production projection, formulation and the pattern of investment allocation in the First Plan.

In Chapter 2 the total size of the plan and the projected pattern of allocation at the sectoral level are critically examined. The planning methodology of the State Planning Organization, which is applied in the First Plan has also been outlined and assessed in the light of more advanced planning technique.

Though I am more inclined to deal with the micro analysis of investment allocation, I feel it is necessary to concentrate shortly on "sectoral" allocation of investment. This may provide a comprehensive picture of the entire investment allocation technique employed in the First Plan.

I feel that the sectoral-stage should be regarded as an inseparable part of the micro-stage since both are closely interrelated and are the basic determinants of economic growth in an economy. The project appraisal stage may not be meaningful so long as it is considered separately from the sectoral allocation of investment and the reverse is true.

The sectoral programming approach pursued by the SPO planners is critically examined in the light of advanced methods of allocation of investments. The final section of Chapter 2 provides a brief reference to the implementation results of the First Plan as far as rate of growth of national income, savings and investment allocation are concerned. These results are critically surveyed.

Part II is primarily concerned with the following problems: a) the fundamental economic principles of free market mechanism and the basic reasons for departing from the commercial profitability criteria, particularly in less developed countries; b) a broad view of the prelim-

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Note 2 continued from page 4:

partial industrial plans which aimed at establishing the basic key indusies at the time; and they can hardly be considered as comprehensive in the true sense of the word inary investment criteria suggested in the earlier writings on investment criteria; c) exposition of the social marginal productivity and social benefit-cost analysis as the most appropriate allocational device for investment.

In more detail Chapter 3 will deal with the market mechanism and the private profitability rule which takes various forms in investment appraisal. It is argued that private profitability criteria which present themselves in different forms (i.e. internal rate of return, accounting profitability rate, pay-off period, private net present value) need some modification before they can be used for project evaluation and project selection. In other words, if the private profitability rule is to be used it is necessary to correct for market imperfections by using social prices and also necessary to take into account external economies which arise from economic interdependencies.

Chapter 4 critically discusses the capital-output ratio (or capital turnover rule) which is the first criterion introduced in the field of investment criteria. Its shortcomings and its possible applicability will also be examined.

Chapter 5 discusses the social marginalproductivity criterion which is well advanced by H.B. Chenery. It is critically examined and its applicability to underdeveloped countries is assessed. In addition, the relationship between SMP and social benefit-cost analysis is emphasized and the similarities between the two social criteria are sought in order to avert confusion at this stage.

It will be shown that the two criteria are more or less identical and the basic principles which are applicable in one, are also applicable in the other. It is the purpose of this chapter to argue that the social marginal productivity rule or, broadly, social benefit-cost analysis is the most appropriate device for investment evaluation and project selection. This point will be strongly substantiated throughout the thesis by introducing various theoretical and practical evidences in its favour.

Social benefit-cost analysis,which I briefly outline in Chapter 5, is what I shall be using in the case studies in Part III, of this thesis. It is the conviction of the present author that the theoretical background presented in Part II will be quite useful in providing a good framework for the subsequent chapters where project analysis will be introduced. It is true that the basic principles being laid down here are more relevant to developing countries than advanced countries. But it must be stressed that many basic principles remain the same whether it is a developing or developed economy.

Project appraisal (micro analysis of investment) and the choice of investment criteria will be reserved for Part III consisting of four chapters, three of which deal with the Caycuma paper and cellulose project and the fourth which deals with the Keban Hydro-Electric Project vs. Thermal alternative. Part III constitutes the largest part of the thesis and it contains the above case studies. Both projects are public industrial projects which are evaluated by different planning agencies. This part also deals with the projects from the point of view of society as a whole showing that especially for industrial projects social cost-benefit analysis is both important and possible.

More specifically Chapter 6 outlines SEKA's [1] presentation and evaluation of the Caycuma paper project (Case Study No.1). The evaluation method of SEKA is later critically assessed.

Chapter 7 introduces the same project, this time as presented and evaluated by the SPO planners. This is followed, in Chapter 8, by a comprehensive and detailed assessment of the SPO's project evaluation technique where I shall examine the basic shortcomings of their evaluation method and shall also question their investment criteria which they have applied to all industrial projects. Besides I shall present the various variables and parameters they have chosen in the project evaluation. Where it is possible I shall attempt to introduce my own parameters which seem reasonable to me in view of the limited information I have obtained in this field.

I shall also test the SPO's investment decision by applying the internal rate of return rule which I feel can be quite useful during the final decision on industrial projects.

Case Study No.2, that is the Keban Hydro-Electric Project vs. Thermal alternative is discussed in Chapter 9. This case study is based

(1) SEKA is a state economic enterprise which is responsible for undertaking paper and cellulose projects.

on avrious reports. I have obtained from DSI[1], E.I.E.[2] and the Ministry of Energy and Natural resources. The Hydro-electric Project and the Thermal Alternative are first described and later are presented as evaluated by the E.I.E. Following these, the evaluation method and the investment criterion employed by the E.I.E. are appraised and the basic shortcomings of their evaluation system will be emphasized.

The same investment project is later evaluated on the basis of social present value (SPV) which I shall defend throughout this study. I complete my project analysis by introducing "shadow" or "accounting" prices especially for capital and foreign-exchange inputs. By the sensitivity analysis, the investment decision will be checked and the selection of parameters (i.e., discount rate, foreign exchange rate) will be appraised. With insufficient data and information I am unable to make estimates for these parameters. But as a project-evaluation, what I am doing is to approach the problem of estimating these parameters by introducing sensitivity analysid.

In addition, the Keban Hydro-electric and the Thermal project are tested by applying the internal rate of return rule which I also applied in the case study No.1. This provides a double-check on the final investment decision to be taken. This latter analysis is included in Appendix B of Chapter 9.

The conclusion (Chapter 10) aims at providing a summary of the major shortcomings of the project evaluation technique in Turkey and it presents some guidelines for more efficient and desirable economic evaluation methods for public investment projects.

It must be stressed that, in this thesis, I am not attempting to come up with any theoretical criteria of my own; my purpose is simply to see the feasibility of investment criteria that are already used in the Turkish planning experience, particularly during the First Five-Year Plan. In other words, I shall endeavour to reassess the investment projects which are already selected and executed by applying the most suitable criteria.

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(1) DSI is State Water Works Department attached to the Ministry of Energy and National Resources.

(2) E.I.E. is planning and research unit of the Ministry of Energy and National Resources.

PART I

ECONOMIC PLANNING IN TURKEY

CHAPTER 1

THE FIRST FIVE-YEAR PLAN - 1963-1967

Introduction

Following the May 1960 Revolution in Turkey, the State Planning Organization (SPO), was established(1), and its main task was to draw up a Fifteen-Year Development Plan in order to deal in a systematic way with the country's more intractable long-term problems.

It was felt for a long time that the major economic problems of the country; namely the prospects of achieving a higher rate of growth in output and income; creating higher employment opportunities; and finally to achieve a viable balance of payments; could only be solved by resorting to a Comprehensive Plan embracing the national economy as a whole. It was also recognised that a planning approach was essential for balanced development.

It was to this end that in 1962, the First Five-year Plan 1963-1967, was launched with a fifteen-year perspective and approved by the parliament in 1962. The SPO made its projections and forecasts for the First Five-Year Plan as well as the Fifteen-Year Development Plan 1963-1977(2); and laid down the general directions for official policies.

As in many underdeveloped countries the Turkish Fifteen-Year Development Plan was not exclusively production-orientated. By this long-term plan Turkey aimed at achieving the following objectives:(3)

1) to promote a high rate of growth with a high level of employment;

2) to achieve a balance in external payments;

3) to train sufficient numbers of high level scientific and technical personnel in every field as required for Turkey's development;

4) to realise all these targets according to the principles of equity and social justice; in other words to reduce existing inequalities in income and wealth.

A - More specifically Turkey proposed to achieve an annual rate of growth of 7 per cent with Gross National Product increasing from

(1) The SPO was created in September 1960 with a special Law as the government Planning and Advisory body.

(2) The Fifteen-Year Development was to embrace three Five-Year Plans.

(3) See, The First Five-Year Development Plan 1963-67, SPO, Ankara, 1963, p.31.

T.L. 52.7 billion in 1962 to T.L. 145.3 billion at the end of 1977(1).

This implies a rise of 175 per cent during the Fifteen-Year period. A 7 per cent annual rate of growth in GNP, given almost 3 per cent population growth, leaves only a 4 per cent increase in per capita income. Per capita income consequently was estimated to increase from $200 in 1961 to $355 in 1977.

B. Investment coefficient required to sustain this rate of growth was estimated to be, on average, 18.3 per cent of GNP for the First Five-Year Plan and 21 per cent for the next ten years. In order to increase investment from its low level of 16.3 per cent in 1962 to 19.4 per cent GNP at the end of the plan, the share of private consumption expenditure in the GNP was expected to decline from 73.2 per cent to 67.9 per cent over the same period and also to 63 per cent by 1977. (2)

The volume of real savings, was therefore to increase by restricting consumption and re-allocating these released resources into other fields which were conducive to a higher level of savings. In other words the Development Plan aims at deepening the capital base of the economy through rapid expansion of heavy industries such as basic product incustries. The main idea here is to rely more on domestic sources rather than foreign savings.

C. The third major goal of the Development Plan was to ensure the highest possible level of employment opportunities at satisfactory income levels.

The plan estimated that the total additional employment that investment and production targets could provide was 6.8 million; but this falls short of the estimated 7.5 million unemployed labour force (plus 1 million disguised unemployed in agriculture).

It was the forecast of the Fifteen-Year Development Plan that the industrial sector would absorb a notable number and proportion of unemployed labour force during the First and subsequent Five-Year plan

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(1) For these figures, see Planning in Turkey, Special Issue, Summary of the FFYP, SPO, Ankara, 1963 pp. 16-17 (These figures are based on 1961 prices).

(2) See, Planning in Turkey, Special Issue, p.17

periods. As can be seen from Table 1, the share of active population in industry was planned to rise from 9.8 per cent in 1962 to 15.6 per cent at the end of 1977. However, the largest part of the active population would be absorbed by services rather than industry. The employment in agriculture, on the other hand, was expected to drop considerably over the 15-year period (from 77.4 per cent to 58.1 per cent).

TABLE I - ACTIVE POPULATION BY SECTORS
1962-1967 - PERCENTAGE

SECTORS	1962	1967	1972	1977
Agriculture	77.4	71.1	64.4	58.1
Industry	9.8	11.9	14.0	15.6
Services	12.8	17.0	21.6	26.3
Total	100.0	100.0	100.0	100.0

Source: First Five-Year Plan 1963-67, p. 36, p.400

D. Another major objective of the Development Plan is to reduce Turkey's dependence on foreign sources or elimination of the deficit in the balance of payments.

According to Development Plan projection, the current external deficit, that was equal to 4 per cent of the GNP in 1962, was expected to drop to 2.8 per cent in 1967 and probably disappear by the end of the Second Five-Year Plan (1968-1972)(1).

Accordingly a great emphasis was to be placed on expanding exports during the Fifteen-Year period. The export policy of Turkey would be to diversify export goods which, for a long time, had been confined to a small number of traditional items. Priority was given to promoting the export of manufactured goods and to the expansion of import-substituting industries(2) The deficit in external payments was also anticipated to be remedied by increase of revenue from invisible items(3); and by a change in the

(1) See FFYP 1963-1967, p.116, Tables 49 and 50

(2) A large amount of investments in import-substituting industries was planned for the First-Plan period and the effects were expected to be felt by the end of 1967. FFYP, p.38.

(3) Invisible revenues were expected to derive from tourism and infrastructure investments with FFYP and the expansion of shipping industry, op. cit., p.38.

pattern and structure of imports.

b) Objectives and production projections

In what follows, I shall outline the maih objectives of the First Five-Year Plan and explain the projection of output, and labour force in various sectors; and structural change visualised during the plan period.

The First Five-Year Plan that was approved by the Grand National Assembly in 1962 was to be operative from January 1963 to December 1967(1). The First Plan deals with the economy from various aspects within a macro- growth model. The First Five-Year Plan aimed at achieving the following objectives:(2)

1. To attain an annual 7 per cent rate of growth of GNP, the pattern of investment being designed to achieve this tsrget;

2. To accelerate industrial growth and raise the surplus of agricultural production with a view to expanding exports and meeting the growing industrial demand for raw materials;

3. To provide greater employment opportunities;

4. To stabilize and improve the balance of payments position by a diversified pattern of exports;

5. To raise the proportion of investment financed by domestic savings;

6. To maintain relative price stability through government control and allow the market mechanism to play a greater part in price determination;

7. To render the State Economic Enterprises (SEE) able to provide for their investments from their own resources.

Agricultural Sector

Agricultural production was expected to increase from 34.6 billion T.Liras in 1962 to 36.4 billion T.Liras in 1963 and to 43.56 billion T.Liras in 1967 (See Table 3). This implied that total agricultural production would record an increase of 25.6 per cent over the plan period(3). It can be noted that the largest proportion of agricultural output comes from livestock products, cereals and fruit and vegetables. This trend seems to be attained during the plan period .

Over the plan period the composition of agriculture would

(1) See Planning in Turkey, Special Issue, Summary of the FFYP. SPO., Ankara, 1963, p.8.

(2) See FFYP 1963-67, p.31, also OECD, Turkey, Feb.1966, pp. 5, 24, 25

(3) For this note see next page

only change marginally since five years is not a sufficient period to witness radical change. Cereals and livestock products would still constitute a half of the agricultural products during the plan period, though the share of the former in the total would fall from 23.1 per cent to 21.3 per cent(1).

In planning an agricultural programme the SPO have laid the following objectives:(2) to contribute to the maintenance of a 7 per cent rate of growth in GNP without resorting to inflation; to raise agricultural production in order to meet the industrial demand for raw materials; to improve nutritional levels; to contribute to the reduction of unemployment and to avoid unplanned urbanization beyond the employment capacity of non-agricultural sectors.

In planning agriculture, two broad goals were kept in mind; first to free the overall economy from the stronghold of agriculture, and second, to expand the agricultural sector to the rural population.

INDUSTRY.

Turkey with the First Plan had aimed at giving a greater role to the industrial sector than any other sector so that the economy could experience a higher rate of growth. It was believed that the realization of a 7 per cent rate of growth in the overall economy would largely depend on the development that could take place in industry as comprising manufacturing, energy and mining.

It is contemplated in the First Plan that these three sectors taken together would provide a rise in industrial output from 21.2 billion T. Liras in 1962 to 36.2 billion T. Liras at the end of the plan period. This represents a rise of 70 per cent over five years. The major component of industrial sector, manufacturing was expected to increase from 18.2 billion T.L. to 31.4 billion T. Liras over the same

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Note (3) from page 12:
Agricultural output was expected to increase by 85 per cent over the 15-year Development plan amounting to 42.7 billion T.L. in 1977 (in terms of net value added). This indicates a 4.2 per cent growth per annum.

(1) See First Five-Year Plan 1963-67. SPO, Ankara, 1963, pp.148-9.

(2) FFYP, 1963-67. SPO, Ankara, 1963, p.129

period as representing 72.8 per cent increase. But the largest increase was anticipated to take place in Energy which was projected to increase from 648.0 million T.Liras to 1.187 billion T.Liras at the end of the plan period. (See, Table 3).

The manufacturing industry which accounted for almost 13 per cent of the GNP in 1962 was planned to increase to 17.7 per cent of the GNP by the end of the First Plan (in terms of value added) (1) Largest emphasis was placed on heavy industry both in terms of its share in total manufacturing output and also in the total investments.

TABLE 3 - PRODUCTION TARGETS OF BASIC INDUSTRIES
(million T.L. at 1961 prices)

Sectors	1962	1963	1967	1967 index (1962=100)	Annual rate of Growth %
Agriculture	34,690.0	36,470.0	43,560.0	125.6	4.7
Mining and quarry	2,341.4	2,583.9	3,577.4	152.8	8.7
Manufacturing	18,203.5	20,867.1	31,462.1	172.8	11.5
Energy	648.0	729.1	1,187.7	183.3	12.8
Transport and Communications	3,378.2	3,744.9	5,340.2	158.1	9.6
Total	59,261	64,395.0	85,127.4	143.7	7.5

Source: The FFYP, 1962-67, p.124

The share of heavy industry in total value added was expected to rise from 38 per cent to 50 per cent over the plan period. The share of light industry in contrast was expected to drop from 62 per cent to 50 per cent of manufacturing value added over the same period (Table 4)

TABLE 4 - COMPOSITION OF MANUFACTURING INDUSTRY

	Share of Manufacturing output in total value added (percentage)		Increase in Manufacturing output (value added)
	1963 - 1967		1963 - 1967 period
(1) Light Industry	62	50	33
(2) Heavy Industry	38	50	110
Total	100	100	

(1) See FFYP 1963-67, p.185, Table 85.

(See next page for Sources and notes on Table 4)

Source and notes for Table 4:

Source: OECD. The Turkish FFYP 1963-67 by an expert group for the OECD Consortium for Turkey, July 1963, p.64 and also FFYP, p.185.

(1) Light industry comprises food, beverages, tobacco, textiles and clothing.

(2) Heavy industry includes paper, rubber, chemicals, basic metals, machinery, electrical machinery, transport equipment and others.

Table 3 and 4 indicate that Turkey has proposed to transfer the basis of the economy from being consumer goods to producer goods. The production of the latter industries was expected to accord a rise of 110 per cent as compared to the former's 33 per cent increase over the plan period.

Over the First Five-Year Period a faster rate of growth in producer-goods industries was expected in order to fill the gap resulting from non-importation of similar goods from abroad. The purpose here was seen to enable the economy to stand more on its own feet and to depend less on imported capital-goods.

The main principles cited in the first plan can be outlined as:[1] to raise national income and output and living standards. Thus to achieve a yearly average rate of growth of over 11 per cent, to encourage import-substituting industries and provide protection to new, emerging industries during a specified period of adjustment; to increase the employed number by 520,000 over the plan period.[2]

In summary, the broad objective of the industrial policy was to achieve a considerable self-sufficiency in industrial products previously imported, to expand industries the products of which could be exported and to set up basic heavy industries to change the structure of the economy

Transport and Communications

As another major sector transport and communications was also to grow in line with the development in other sectors. For this purpose the output of this sector was projected to increase from 3,378.2 billion

(1) FFYP, 1963-67, p.183 and p.400.

(2) Employment in industry was planned to increase from 1,250,000 in 1962 to 1,770,000 at the end of the plan. Ibid, p.400, Table 355

T.Lires to 5,340.2 billion T.Lires during the five-year period (See Table 3). These figures represented an increase of 58 per cent or annual rate of growth of 9.6 per cent.

The services as a whole were envisaged to grow yearly by 7.2 per cent [1].

From the first Five-Year Plan projections it can be noticed that the structure of the economy was expected to reflect considerable changes over this period. The share of agriculture in Gross National Product was to drop from 43.8 per cent in 1962 to 38.3 per cent by the end of 1967. But the contribution of industrial sector was to grow considerably as a result of the fall in agriculture. The share of industry (including manufacturing, mining and energy) would increase from 16.8 per cent of GNP to 21.4 per cent at the end of the fifth year.

Services, on the other hand was expected to lose its relative importance in the overall economy (See Table 5).

TABLE 5 - Percentage share of Sectors in the GNP, 1962-1967

	1962	1963	1967
Agriculture	43.8	43.0	38.3
Mining and Quarry	3.2	3.3	3.6
Manufacturing	12.8	13.5	16.7
Energy	0.8	0.9	1.1
Transport and Communications	3.9	4.1	4.6
Other services	35.5	35.2	35.7
Total	100.0	100.0	100.0

Source: FFYP, 1963-67, pp.36, 37, 125.

Clearly the development is to be achieved predominently through industrialization. The plan had also recognised the importance of agricultural expansion in order to foster industrial growth. The plan states that: the industrial sector can only develop if there is substantial

(1) FFYP, 1963-67, p.125

growth in the agricultural sector. (1) This points to the fact that a balanced growth between the two major sectors was expected during the first plan. Another important conclusion here is that the overall economy would depend more on commodity sectors (i.e. manufacturing, mining, agriculture etc.) than non-commodity sectors.

As far as foreign trade is concerned it was anticipated that exports would increase by 31.4 per cent over the plan period. Export projection for the plan period is presented in Table 6. The major items of exports are agricultural products, industrial products, and mine and quarry products.

According to the First Plan Projection, exports of agricultural products as a whole would record an increase of almost 30 per cent. Industrial crops (i.e. cotton tobacco, oil) which constituted the largest part of exports was expected to rise by only 22 per cent. Also the relative importance of industrial crops was to drop from 37 per cent to 35 per cent at the end of 1967. This considerable drop in the exports of these items was due to the fact that development of domestic industries would lead to increased domestic demand for a number of export items which were previously exported i.e. growth of vegetable oil industry, growth of textile industry (2).

Exports of industrial products (manufactured goods) on the other hand, was expected to increase by 47 per cent over the five years and also increasing their share in total exports from 16 per cent to 18 per cent in the same period. Though exports of mine ores would increase in absolute terms, these products would lose their relative importance in the structure of exports (falling from 6.4 per cent to 5.8 per cent).

(SEE NEXT PAGE FOR TABLE 6)

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(1) See FFYP, 1963-67, p.463

(2) See FFYP, 1963-67, p.463

TABLE 6 - Export Projections for the First Five-Year Plan 1963-67 - Million $

	1963	1964	1965	1966	1967
1. Agricultural products	269.8	291.2	298.0	329.5	348.5
(a) cereals, pulses, food crops	17.8	18.2	18.6	19.0	19.4
(b) fruit and vegetables	84.2	93.7	86.5	103.5	105.4
(c) industrial crops and forestry products	131.0	138.2	146.1	152.9	160.7
(d) livestock, hunting and fishery	36.8	41.1	46.8	54.1	63.4
2. Industrial products	56.0	60.9	71.5	73.4	82.3
3. Mine and quarry products	22.0	22.0	24.0	24.3	26.0
Total	347.8	374.3	393.5	427.2	457.2

Source: The FFYP, 1963-67, p.469

TABLE 7 - Percentage Distribution of Main Export Items - 1963-67

	1963	1967
1. Agricultural products	77.5	76.2
2. Industrial products	16.1	18.0
3. Mine and Quarry products	6.4	5.8
Total	100.0	100.0

Source: These are computed from Table 6

As can be noticed from Table 7, the Plan seems to have contemplated a notable change in the structure of exports.

The anticipated change in imports during the First Plan can be seen in Tables 8 and 9. Imports are given as three main groups: 1) capital goods; 2) consumer goods and 3) raw materials.

Total import requirements of the First Plan were computed after import-replacement values expected from new investments were deducted from these figures.

(SEE NEXT PAGE FOR TABLE 8)

TABLE 8 - Import Projection of the First Plan, 1963-67 million $

Types of Goods	1963	1964	1965	1966	1967
1. Investment goods	241.1	274.1	296.1	332.1	363.0
2. Raw materials	234.5	261.5	299.5	325.0	363.5
3. Consumer Goods	71.4	76.4	84.5	87.5	93.5
Total	547.0	612.0	680.0	744.9	820.0
U.S.Agricultural Surplus	60.0	60.0	60.0	60.0	50.0
Total	607.0	672.0	740.0	804.9	870.0
Import Substitution	-40.0	-45.0	-110.0	-130.0	-166.0
Total Import requirements	567.0	627.0	630.0	674.9	704.0

Source: The FFYP, 1963-67, p.468

If import substitution is taken into account imports in 1967 would rise by 26.5 per cent over the 1962 estimates (1). The largest increase was estimated to be in the import of raw materials (55 per cent over 5 years) followed by imports of investment goods (50 per cent); and imports of consumer goods (31 per cent). These figures represent a considerable shift against importation of consumer goods and more toward importation of raw materials and capital goods. This trend is due to the fact that import-substitution industries would, during the plan period, depend heavily on the raw materials and capital goods.

The structural change imports would undergo can be seen in Table 9. The share of consumer goods in total imports was expected to decline from 13.2 per cent to 11.5 per cent; while the proportion of raw materials in total would increase from 42.8 per cent to 44.3 per cent. Though the volume of imports of capital goods was expected to increase considerably, the proportion of the latter in total imports would remain almost constant.

(1) But if 1963 is taken as a base year, imports would record a rise of 24.1 per cent over the five-year period (including Import substitution).

TABLE 9 - Percentage share of Imports by Type of goods, 1963-67 Million $

	1963		1967	
	Value	%	Value	%
1. Investment Goods	241.1	44.0	363.0	44.2
2. Raw materials	234.5	42.8	363.5	44.3
3. Consumer goods	71.4	13.2	93.5	11.5
Total	547.0	100.0	820.0	100.0

Source: It is computed from Table 8

c) Total Investment Requirements

In what follows, I shall examine the total capital requirements of the First Plan comprising domestic and external savings; also, the composition and distribution of investment resources among sectors.

As we saw earlier, the first objective of the plan was to maintain a sufficiently high rate of income growth. Therefore the rate of growth was set at 7 per cent per annum. This rate shows an almost 2 per cent increase over the average annual rate of growth of 5.3 per cent which was attained in the last decade.

It was noted that the growth of the economy is heavily dependent upon the performance of agriculture which accounts for about 40 per cent of GNP. Agriculture was therefore recognized to be the main determinant of the annual rate of growth. The "Plan Strategy" was therefore stated that this rate of growth must be an average rate over the First Plan period. Though it has not been mentioned, it appears that a compound rate of growth was implied by the planners (1).

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(1) By applying compound rate of growth formula this assertion can be tested:

$$Pn = Po\,(1 + r)^n$$
$$\log Pn = \log Po + n \log (1 + r)$$
$$\log (1+r) = \frac{0.1468}{5} = 0.02936$$
$$1+r = 1.069$$
$$r = .069$$
$$r = 6.9 \text{ per cent}$$

$Pn = 73.9$ billion TL
$Po = 52.7$ billion TL
$n = 5$ years
$\log Pn = \log 73.9 = 1.8686$
$\log Po = \log 52.7 = 1.7218$

As can be seen from Table 10, GNP was expected to rise from 52.7 billion T.liras in 1962 to 73.9 billion TL in 1967. This amounts to a.40 per cent cumulative increase by the end of the plan.

In order to achieve this major goal, or more specifically a 7 per cent annual rate of growth, the First Plan devoted 18.3 per cent of GNP to investments. Over the plan period total investment requirements were to increase from 9.6 billion T.Liras to 14.3 billion T.Liras. Putting it differently, total investment outlay projected for the whole period, amounted to 59.6 billion T.Liras (at 1961 prices).

It was estimated by the SPO that an ICOR of 2.6:1 would be valid during the plan period, 1963-67. Given the rate of growth in GNP and the incremental capital-output ratio, the investment-coefficient required for attaining this target was estimated. In fact this is simply an application of Harrod-Domar growth model[(1)] which shows the relationship between the rate of savings s, the rate of income growth g, and incremental-capital-output ratio, α .

The reason why the ICOR was rather low in the First Plan as compared to the earlier period (3.5:1 for the period 1950-60) can be attributed to the past performance of the investment expenditures and to their impact on the over-all production capacity. Several reasons can be listed: first, social overhead capital and infrastructure investments in the period 1950-60 were quite high and were especially in the fields of transportation, hydroelectric-power, education and health. The planners believed that the previous investments would contribute more to productivity during the plan period because they would be entering the production stage by then; Second, prior to the First Plan there was also a considerable amount of idle capacity in some important branches of industry. For instance there was

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(1)

$$g = \frac{s}{\alpha}$$

$$s = \alpha \cdot g$$

$$s = 2.6 \times 7$$

$$= 18.2 \text{ per cent of GNP}$$

The marginal or ICOR for the whole economy is the value of the addition to capital (net investment) divided by the addition to income (net national income). This concept which emerged with the Harrod-Domar model is now widely used in many development programmes as a tool to determine the total capital requirements to achieve a certain rate of growth of income.

remarkable unutilized capacity in the machinery, textile, sugar and cement industries and particularly those operated by the State Economic Enterprises. In textile and machinery industries, only 30 percent and 35 percent of the existing capacities were utilized. In addition to these there was also a notable idle capacity in transportation. Third, in the First Plan, it was believed, the capital-mix would be given a significantly different composition than it was in the last decade. The planners hoped that a reduction in housing construction and infrastructure investments with high capital-output ratios would be achieved during the implementation of the First Plan. Finally, it was felt that better techniques and management, and organization would have a considerable effect on the capital-output ratio (1).

During 1950-1960 period the average investment level represented 13 percent of GNP with domestic finance reaching 10.6 percent and foreign capital 2.4 percent of GNP. Prior to the First Plan, during 1957-61 period the total investment reached the level of 14.8 percent of GNP, domestic savings and foreign capital representing 12.8 percent and 2 percent respectively.

As Table 11 indicates, the First Plan required a substantial increase in the total capital requirements for financing development. Accordingly, the share of total investment in the GNP was expected to increase from 16.3 per cent in 1962 to 19.4 percent at the end of the plan period. This implied that, on average, 18.3 percent of GNP was devoted to capital formation. Domestic and foreign savings, on the other hand, were to constitute 14.8 per cent and 3.5 percent of GNP respectively.

Against the increase in the investment target the ratio of domestic savings to income was expected to rise from 12.9 percent to 16.5 percent over the five year period. In other words, domestic savings rose to 12.2 billion T. Liras in 1967 as compared to 7.3 billion T.Liras in 1963.

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(1) For these details see Y. Kucuk, The Macro-Model of the Plan, in Planning in Turkey, Middle-Eastern Technical University Publications, Ankara, June, 1967, pp.85, 86; K. Bulutoglu, Financing Turkey's Development Plan in Planning in Turkey, Ibid, pp.182, 183, 184; also, see First Five-Year Plan, 1963-1967, op.cit., p.126.

TABLE 10 - Expenditure Targets of the First Five-Year Plan 1963-67 Billion TL. (1961 prices)

Years	GNP		Private Consumption		Private Investment		Current public Expenditure		Public Invest-ment		Current Account Deficit	Total Invest-ment
1962	52.7	=	38.6	+	3.5	+	7.6	+	5.1	-	2.1	8.6
1963	56.4		40.5		3.8		8.6		5.8		2.3	9.6
1964	60.3		43.0		4.2		9.0		6.6		2.5	10.8
1965	64.5		45.4		4.7		9.5		7.1		2.2	11.8
1966	69.0		47.6		5.3		10.5		7.8		2.2	13.1
1967	73.9		50.2		5.9		11.5		8.4		2.1	14.3
Total	376.8		265.3		27.4				40.8			68.2

Source: First Five-Year Development Plan, 1963-67, p.108; also Tables 49 and 50, p.116.

TABLE 11 - Investments, Domestic and External Savings as Percentage of GNP

Years	Investments	Domestic Savings	External Savings
1957	13.1	12.4	0.7
1958	13.9	13.1	0.8
1959	15.7	12.6	3.1
1960	15.9	13.5	2.4
1961	15.2	12.4	2.8
1962	16.3	12.3	4.0
1963	17.0	12.9	4.1
1964	17.9	13.8	4.1
1965	18.3	14.9	3.4
1966	19.3	15.8	3.2
1967	19.4	16.6	2.8

Source: It is computed from Table 10

The prospects of augmenting domestic savings was related to the increase expected in per capita income and to the possibilities of restraining the increase in consumption out of additional incomes. The realisation of domestic savings targets would give us a marginal savings-income ratio of 26.5 per cent (1), a ratio that was much greater than the rate achieved in the past. The marginal domestic savings in the period 1957-60 was calculated to be 16.5 per cent.

Private consumption, as a result, was anticipated to decline considerably during the plan period,(a drop from 71.8 per cent to 67.9

p. 24 - paragraph 2, should read:

Private consumption, as a result, was anticipated to decline relatively during the plan period (a drop from 71.8% to 67.9% of GNP)

providing incentives for private savings in order to absorb the increases in disposable private incomes.

TABLE 12 - A verage and Marginal Domestic Savings, 1962-1967 Billion TL (1961 prices)

Years	GNP	Total Investment	Current Account Deficit	Domestic Savings	Average Savings S/GNP	Marginal Savings AS/AGNP
1962	52.7	8.6 -	2.1	6.5	10.4	-
1963	56.4	9.6	2.3	7.3	12.9	21.6
1964	60.3	10.8	2.5	8.3	13.7	25.6
1965	64.5	11.8	2.2	9.6	14.8	30.9
1966	69.0	13.1	2.2	10.9	15.7	28.0
1967	73.9	14.3	2.1	12.2	16.5	26.5
		Average Marginal Domestic Savings				26.5

Note: I have arranged this Table from the figures given in Table 10 (or FFYP, p.108 Table 50).

Domestic savings are calculated by deducting current account deficit from total investments given for each year.

Marginal domestic savings is the ratio between the increment in domestic savings and the increment in the GNP. Average marginal propensity to save can be found as 26.5. This implies that every 100 T.Liras increase in the GNP will induce a saving of 26.5 T.Liras.

(1) For the calculation of the marginal propensity to save, see Table 12.
(2) See FFYP, p.108, Table 50
(3) See OECD, Turkey, May 1963 and 1966, p.15; also FFYP, p.435

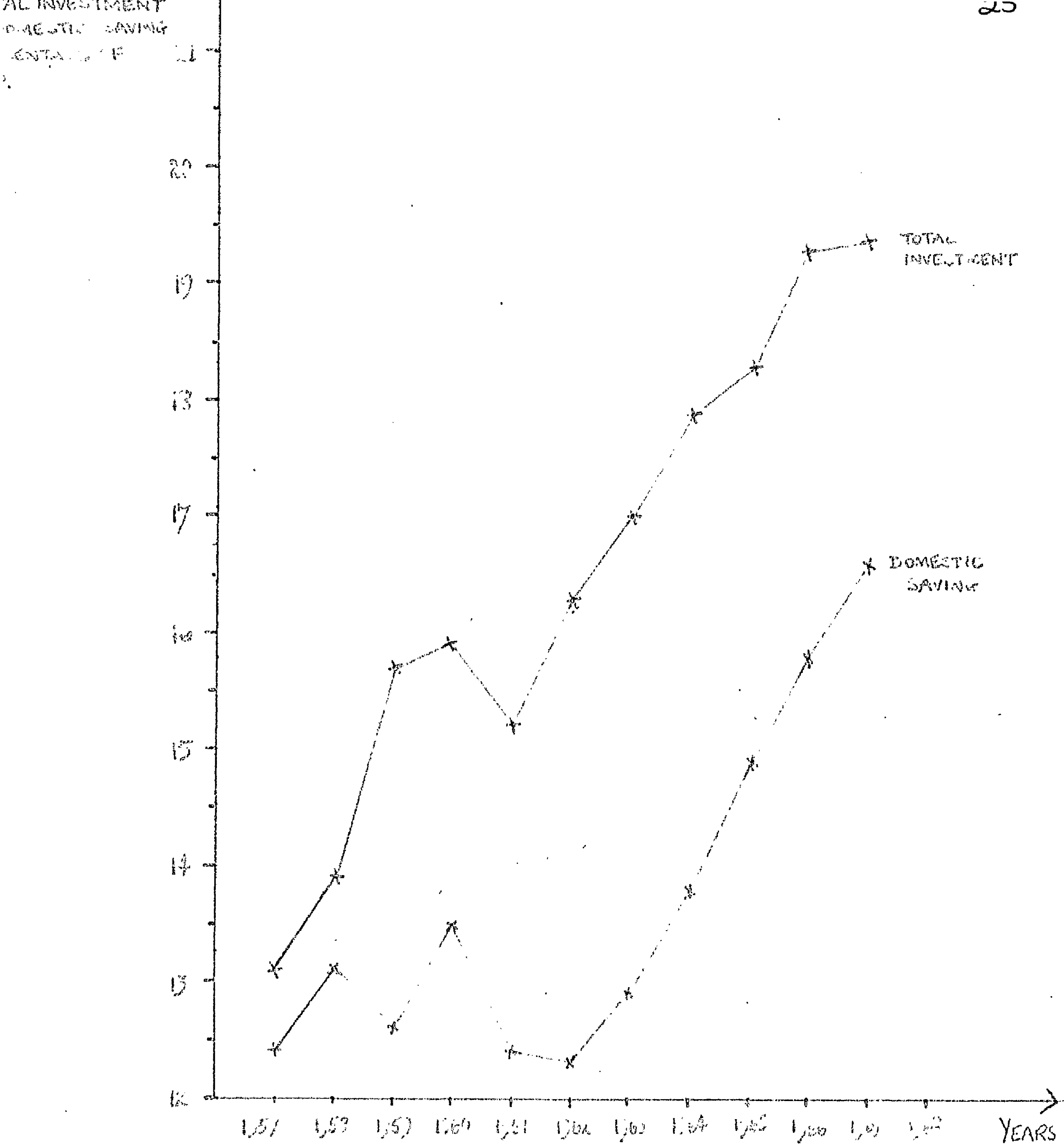

FIGURE 1 – INVESTMENT COEFFICIENT AND DOMESTIC SAVING AS PERCENTAGE OF GROSS NATIONAL PRODUCT.

For the realization of the First Plan targets a substantial amount of foreign capital was needed. Foreign capital requirements were to be provided by the OECD Consortium established in 1963.

The deficit to be financed from external sources during the plan period, amounted to $1,398 million (or 13.4 billion T.Liras). This implies a foreign capital requirement of $280 million per annum. However, if "net error and omission" item of $35 million is included, annual foreign-exchange requirements would increase by another $175 million. Consequently, the total foreign capital outlay was expected to reach $1,573 million (or an annual average of $315 million) (1).

The amount of foreign capital required was computed as a residual item. First, private savings and their possible growth during the five years period were calculated under the assumption of a 7 per cent rate of growth of GNP. Also, public savings which could be obtained through the government were computed. Finally, total investment requirements which were not covered by domestic savings represented the share of the foreign capital needed to finance the plan. (2)

As can be seen from Table 11, external savings which stood as 4.0 per cent of GNP in 1962 were expected to decline considerably, to 2.8 by 1967. This indicates that the First Plan relied heavily on domestic savings rather than external savings during its implementation.

d) The Pattern of Investment Allocation

The composition of investment may help us to see the plan strategy adopted for the first five years of the Development Programme. As we noted earlier, total investments (public and private) required to

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(1) Total foreign aid requirements were expected to decline from $349 million in 1963 to $270 million at the end of the plan period. See FFYP, p.467, Table 374; also H. Getin, Foreign Economic Relations in the Plan, in Planning in Turkey, p.242

(2)
$$FC = (I-S)/Y$$
$$FC = [r.\alpha - (S_1 + S_2)]/Y$$
$$= (7 \times 2.6 - 14.7)/Y$$
$$FC = 3.5/Y$$
$$FC = 3.5/100$$

$Y = 100$
S_1 = private saving
S_2 = government saving
α = ICOR
r = rate of growth

attain an average rate of growth of 7 per cent per annum were estimated to amount to 59.6 billion T.Liras.

The largest proportion of total investment funds were allocated in order of magnitude to housing, agriculture, manufacturing, transport and communications, the last being devoted to energy, education and other services (See Table 13).

The largest proportion of total capital was devoted to housing which constituted 20.3 per cent of the total (amounting to 12.1 billion T. Liras). In fact two-thirds of this investment was to be undertaken by the private sector. The dominance of this sector in the overall investment programme was the main worry of the planners and reduction of it by certain policy measures were to be introduced in order to change the composition of investment in favour of productive sectors.

Out of the total capital outlay, 10.5 billion TL.[1] was allocated to agriculture which is the predominant sector in the economy. Agricultural investment represented 17 per cent of the total. The reason for giving such importance to agriculture was a basic reflection of the plan strategy which emphasized the duel importance of agriculture and industry.

The agricultural sector was to maintain a rate of growth of 4.7 per cent [2] per annum in order to meet the growing industrial demand for raw materials (i.e. food and agricultural products processing industries); to expand exports and to absorb more of the unemployed labour force. In other words, a 26 per cent rise was contemplated in the total agricultural output and this was believed to be achieved by an efficient allocation of investments. Given the fact that the limit of cultivable land was reached by 1959 the most effective instrument was to shift from extensive farming

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(1) In fact investments in agriculture amounted to 11.3 billion T.Liras, if non-monetized contribution of farmers was included. This latter was estimated to reach 725 million TL during the plan period.
Total agricultural investments were planned to rise from 1,275 million TL in 1963 to 3,065 million TL at the end of the plan period. See OECD First Five-Year Plan 1963-67. Consortium for Turkey, July 1963, p.47.

(2) Annual rate of growth in agriculture was 4.1 per cent during the period 1952-59. FFYP, op. cit., p.148

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The agricultural sector was to maintain a rate of growth of 4.7 per cent (2) per annum in order to meet the growing industrial demand for raw materials (i.e. food and agricultural products processing industries); to expand exports and to absorb more of the unemployed labour force. In other words, a 26 per cent rise was contemplated in the total agricultural output and this was believed to be achieved by an efficient allocation of investments. Given the fact that the limit of cultivable land was reached by 1959 the most effective instrument was to shift from extensive farming

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(2) Annual rate of growth in agriculture was 4.1 per cent during the period 1952-59. FFYP, op. cit., p.148

TABLE 13 GROSS INVESTMENTS 1963 - 1967

Sectors	Million TL at 1961 prices	As percentage of Total Gross Investments
Agriculture	10,548.4	17.7
Mining and Quarrying	3,233.0	5.4
Manufacturing	10,089.2	16.9
Energy	5,134.0	8.6
Transport and Communications	8,159.4	13.7
Services	3,965.9	6.6
Housing	12,116.0	20.3
Education	4,227.0	7.1
Health	1,346.9	2.3
Tourism	827.0	1.4
Total	59,646.8	100.0

Source: FFYP, 1963-1967, SPO, Ankara 1963, p.121

into intensive farming technique. To this end the First Plan distributed the Agricultural investment in the following manner: out of total agricultural capital outlay 45.3 per cent was devoted to irrigation works followed by 15.0 per cent in tractors and farm equipment; 6.1 per cent in land improvement; 8.8 per cent in forestry; 4.2 per cent in animal husbandry; 2.6 per cent in fisheries and the remaining 18 per cent in other agricultural branches.(1)

As can be seen, the first priority was given to projects aiming at constructing and expanding irrigation schemes. Investment devoted to irrigation projects amounted to 5.4 billion TL. in the first five year period (an increase from 361 million TL. to 1.624 billion TL.)

Investment in irrigation projects was regarded to be of vital importance for agricultural production in the Plan period as well as in the future. It was estimated that such capital intensive projects would put an additional area of 515,000 hectares under irrigation and also improve the existing irrigation scheme. (2)

Most of the increase in planned agricultural output is to come from vertical expansion rather than horizontal expansion since the latter had already reached its limits.(3) It was for this reason that utmost importance was given to irrigation and drainage projects, fertilizer schemes and other complementary projects (complementary investments in canal distribution systems and farm irrigation works).

The second priority in agriculture was given to tractors and farm equipment which was estimated to receive 15 per cent of total investments (total of 1,690 mill. TL). The aim was here to increase the number of tractors to 48.000 by 1967. Land improvement projects ranked third in the scale of priorities, receiving 684 million TL. in the five year period.

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(1) See the FFYP 1963-67, SPO, Ankara, 1963, p.145, Table 59

(2) The total area under irrigation before the plan was estimated to be 1,115,000 hectares. Over the plan period (1963-67) an additional area of 515,000 hectares were to be irrigated.

(3) In fact Turkey reached the limit of cultivable land in 1963, where it amounted to 25.3 mill. hectares. The cultivable land in 1967 was expected to increase to 25.4 million hectares. See FFYP op. cit., p.154, Table 65. Therefore the Plan stated that the problem in turkey was how to decrease the amount of land under cultivation, to control erosion and to arrive at a balanced pattern of land use. FFYP, 1963-67, p.153.

This group includes projects on improvement of pastures, prevention of erosion, reclamation and drainage of marshes and swamps.(1)

The rest of capital investment included projects on agricultural extension and training services and forestry products. The investment on agricultural training and extension was planned to amount to 409 million TL. (2)

An important nature of investments in agricultural is that 67.3 per cent of total would be undertaken by the public sector while the remaining 32.7 per cent would be by the private sector. This large share of public investment was due to irrigation projects which are to be undertaken by the government because they are of a social overhead nature which requires large capital outlay.(3)

The third major allocation of total capital investment was made by the manufacturing industry totalling 10.0 billion T.Liras. This outlay, on average, represented almost 17 per cent of the total investment needed by the Plan.

As was pointed out earlier, Turkey had assigned an important role to the manufacturing industry during the first plan period. Manufacturing which accounted for almost 13 per cent of GNP in 1962 was expected to grow sharply, representing 17.7 per cent of GNP by the end of the first plan.(4)

Within the manufacturing industry, a particular emphasis was placed upon heavy industry both in terms of its share in total manufacturing output and in total manufacturing investments. The share of heavy industry in total value added was expected to rise from 38 per cent to 50 per cent over the five years. On the other hand the share of light industry was projected to decline from 62 per cent to 50 per cent of value added in the same period. (See Table 4)

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(1) FFYP, 1963-67, p.145

(2) *Ibid.*, p.146

(3) Irrigation projects took the largest proportion of foreign exchange requirements with 30.1 per cent during the plan period followed by tractors and equipment (22.5 per cent), forestry (7.5 per cent) and fisheries (5.8 per cent), FFYP, pp.146-7

(4) See FFYP 1963-67, p. 185, Table 85.

With the emphasis put on the heavy industry the plan correspondingly allocated 81 per cent of total manufacturing capital outlay to heavy industry while the remaining 19 per cent went to light industry.(1) This was an expression of a deliberate shift in the plan strategy as far as industrialization is concerned.

Heavy industry, which requires large plants and techniques, is not so common in Turkey; therefore the first plan relied more on the role of foreign enterprise for introducing know-how and also on the SEE which could undertake large scale industrial units.

As can be seen from Table 14 and Chart 2, the time pattern of manufacturing investments appears to be strange. On the one hand, the manufacturing output in GNP was expected to rise from 12.8 per cent to 18 per cent over the plan period and on the other hand the share of manufacturing investment in total was to decline sharply throughout the plan period (a decline from 23 per cent to 11 per cent).

Both in terms of absolute and percentage share manufacturing investment was projected to be very high in the first three years where annual investment constituted 23 per cent, 21.8 per cent and 18.9 per cent respectively. This pattern of allocation can be explained by the large investments required for EREGLI Steel and Iron Plants which were scheduled for the first three years.(2)

In more detail, the distribution of manufacturing investments was as follows:

Food, beverages and tobacco which in 1962 accounted for 1/3 of manufacturing value added received 10 per cent; textiles and clothing which generate another 1/3 of manufacturing output was to receive 9 per cent of manufacturing investments. Basic metals which amounted to 9 per cent of manufacturing output received 21 per cent; chemicals which represented 5.5 per cent of manufacturing output were planned to take 27 per cent of manufacturing capital outlay. The remaining 33 per cent of

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(1) See OECD First Five-Year Plan, 1963-67. By an expert group for the OECD. Consortiums for Turkey, July 1963, p.64. Light industry includes food, beverages, tobacco, textiles and clothing. Heavy industry comprises in order of magnitude, chemicals, basic metals, machinery, paper, transport equipment, rubber and other industries, Ibid, p.64

(2) FFYP, 1963-67, pp.120-121

the total manufacturing investment was allocated to machinery, paper, rubber, transport equipment and others.(1)

Investments in textiles and the clothing industry in the plan period were to be directed towards modernization, replacement and balancing of existing productive facilities as well as to additions to the already established capacity. It was thought by the SPO that these investments would ensure better utilisation of production capacity and by reducing costs would have greater export possibilities.

It is a known fact in Turkey that private entrepreneurs are usually investing in the traditional light scale industries such as clothing and textiles rather than large-scale heavy industries. This attitude of the private firms is conditioned by the specific requirements of heavy industry which calls for greater plants, more capital and unfamiliar expertise. Thus diversion of private investments from light into heavy industry was to be encouraged by certain policy measures such as warning entrepreneurs in light industry of over-capacity, refusing them special investment allowances and import licences for their machinery and equipment.(2)

Next in order of magnitude comes investments made in transport and communications and energy which constitute social overhead sectors. Both sectors during the plan period received 8.1 billion TL.(3) and 5.1 billion TL. respectively (see Table 14). The percentage share of investments in transport and communication constituted 13.7 per cent.(4) of total investment outlay of the plan while energy only constituted 8.6 per cent of the total. Both taken together represented 22 per cent of the total.

60 per cent of the total capital outlay in transport was devoted to highways by which the aim was to connect large towns and also to build rural roads. The remainder was allotted 30 per cent to railways and

(1) FFYP, 1963-67 op. cit., p.186

(2) OECD, Turkish FFYP. An expert group for OECD consortium for Turkey, July, 1963. pp.88-90).

(3) Out of this amount 3.5 billion TL. was allocated to communication systems. FFYP

(4) In the first half of the 1950's Turkey devoted about 24 per cent of total investments to transport and communications

10 per cent to seaports and airports. (2.8 billion TL., 1.3 billion TL. and 411 million TL. respectively).[1]

The capital expenditure in the energy sector was projected for the construction of hydro-electric power and thermal stations, the expansion on existing generating capacity and for the extension of the distribution network to supply power to towns and villages with no electricity. The investment in energy during the plan period was expected to reach 5.0 billion T.Liras which was to be divided about half and half between power plants and transmission distribution systems.[2]

As far as education was concerned, investment projects aimed at achieving a rise in the general level of education and the supply of skilled manpower for economic and social development of the country. The level of capital investment allotted to this sector during the plan period stood at 4.2 billion TL. representing 7.1 per cent of the total investments of the plan.

In mining which includes petroleum extraction and refining there was an allocation of 3.2 billion TL in order to meet the production target that was to be doubled over the plan period. In other words the mining industry that accounts for 3.2 per cent of the GNP was assigned 5.4 per cent of total overall investments.

Investments in health projects had aimed at improving health conditions and ensuring a more efficient use of resources. The investments in this sector constituted 2.3 per cent of the gross total investment amounting to 1.3 billion T.Liras during the five year period.

Finally the least amount of investment out of the total was devoted to tourism which was planned to receive 827 million TL. which represented 1.4 per cent of the total (an increase of 33% over the plan period.) This considerable increase in tourism investment was owing to the fact that tourism was expected to be the fastest growing sector in the

(1) OECD, Turkish FFYP 1963-67, op. cit., p.89

(2) The main hydro-plants included in the first plan are the Keban Hydro-dam and Ciceroz which are completed now.

TABLE 14 - Gross Investments 1963-1967
(million TL. at 1961 prices)

	1963	1964	1965	1966	1967	Total
Agriculture	1,213.2	1,712.2	2,182.0	2,590.0	2,851.0	10,548.4
Mining and quarrying	457.8	735.2	794.6	809.9	435.5	3,233.0
Manufacturing	2,166.3	2,359.9	2,276.9	1,726.4	1,559.7	10,089.2
Energy	706.4	850.0	1,057.9	1,233.5	1,286.2	5,134.0
Transport and Communications	1,298.0	1,355.9	1,482.3	1,851.9	2,171.3	8,159.4
Services	581.0	426.1	637.0	1,030.0	1,291.8	3,965.9
Housing	2,085.0	2,229.0	2,390.0	2,594.0	2,818.0	12,116.0
Education	660.0	783.0	795.0	836.0	1,153.0	4,227.0
Health	200.5	230.1	278.2	320.2	317.9	1,346.9
Tourism	145.5	148.2	164.7	175.6	193.0	827.0
Total	9,513.7	10,829.6	12,058.6	13,167.5	14,077.4	59,646.8

Source: FIRST Five Year Development Plan, 1963-67 SPO, Ankara, 1963, p.121

economy providing the greatest improvement in the balance of payments.(1)

TABLE 15 Sector Investment in Relation to Total Annual Investments (as percentages)

	1963	1964	1965	1966	1967	Total
Agriculture	12.8	15.8	18.1	19.7	20.2	17.7
Mining and quarrying	4.8	6.8	6.6	6.1	3.1	5.4
Manufacturing	22.8	21.8	18.9	13.1	11.1	16.9
Energy	7.4	7.9	8.8	9.4	9.1	8.6
Transport and Communications	13.7	12.5	12.3	14.1	15.4	13.7
Services	6.1	3.9	5.3	7.9	9.2	6.6
Housing	21.9	20.6	19.8	19.7	20.0	20.3
Education	6.9	7.2	6.6	6.4	8.2	7.1
Health	2.1	2.1	2.3	2.4	2.3	2.3
Tourism	1.5	1.4	1.3	1.3	1.4	1.4
	100.0	100.0	100.0	100.0	100.0	100.0

Source: FFYDP, 1963-1967. Op. cit., p.123. It is computed from Table 14.

(1) The actual number of visitors in 1966 reached the level of 440,000 and this number was expected to increase by 50 per cent at the end of the plan period, reaching the level of 620,000. Accordingly tourism revenue in 1967 was expected to reach $48 million, that is 6 times the level in 1962. See, OECD, Turkish FFYP, 1963-67, op. cit., p.96

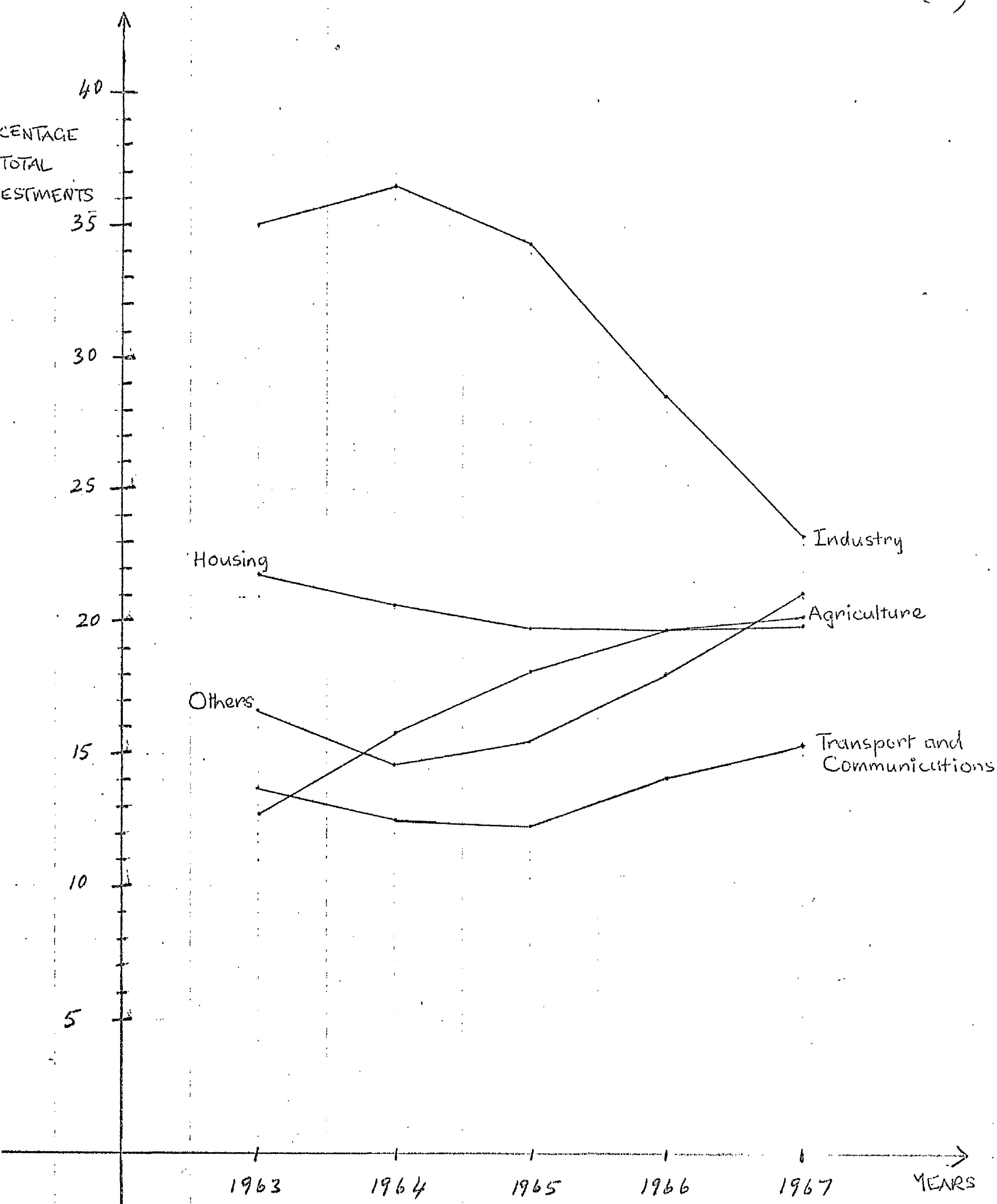

FIGURE 2 - Sectoral Investment as Percentage of total Investments

Note: (1) Industry includes mining, manufacturing and energy
(2) Others include services, education, health and tourism.
(3) Figures from Table 17

CHAPTER 2

APPRAISAL OF THE FIRST FIVE-YEAR PLAN (1963-67)

(a) INTRODUCTION

The first five-year plan will be examined here in relation to the size of investment and the determination of the rate of growth; to the composition of overall investment and its distribution between public and private sectors. Second, the investment programme will be appraised in the light of different classification systems which are widely used in less developed countries. The investment strategy endorsed by the plan will also be compared to the strategy adopted in other countries. Third, the planning methodology that was adopted during the formulation of the plan will be critically appraised. This includes macro-model and sectoral programming stages. (The project stage which includes economic evaluation of projects will be the subject-matter of part III, of this thesis). Finally, the implementation results of the first five-year plan will be exposed in order to see what lessons could be drawn from it for further planning process in Turkey.

(b) THE SIZE OF THE PLAN

As I have pointed out earlier, total investments required by the first plan reached 59.7 billion TL. out of which 35.8 billion TL. were to be invested by the public sector. For achieving an annual growth rate of 7 per cent the first plan devoted 18.3 per cent of GNP to investments.

During 1950-60 period gross investment represented 13 per cent of GNP, gross domestic savings being 10.6 per cent and external resources 2.4 per cent. Later in period 1957-61 total capital requirements rose to 14.8 per cent of GNP, domestic savings and foreign sources constituting 12.8 per cent and 2 per cent respectively. (See Chapter 1).

It follows that the first plan brought a considerable increase in total capital requirements (almost 4 per cent higher) in order to attain a 7 per cent growth rate. The above figures do not mean that Turkey had reached its maximum capacity of providing financial resources through domestic savings. As we noticed in Chapter 1, the marginal rate of saving was computed to be 26.5 per cent. Though this rate was quite a bit higher than the previous period (1957-61) Turkey could have achieved a much higher domestic savings/GNP ratio as well as marginal rate of saving.[1] However, as compared with other countries, this rate does not appear very ambitious. For instance Pakistan's third five-year plan (1965-70) aimed at a marginal rate of saving of about 27 per cent.[2]

Domestic savings which constituted 14.8 per cent of GNP should have been put at least at 16 per cent of GNP so that, together with 3.5 per cent foreign savings, total investment represented 20 per cent of GNP. The ratio of gross investment to GNP may at first look quite a reasonable target compared with other countries. But in my thinking the problem of raising the average investment/GNP ratio should be decided within the context of each individual country's taxation potentiality. Accordingly in Turkey, had the proposed fiscal reforms been accepted during the formulation of the plan, total investment could have reached 20 per cent of Gross National Product. As a matter of fact during the discussion of the plan some members of the SPO insisted that the target rate of growth be raised to 8 per cent instead of the present 7 per cent. If the former rate was chosen, the total investment of the plan would have come to 20 per cent.[3]

Estimation of total investments was proceeded at two levels of approximation. At macro-level, the experience regarding the overall capital-output ratio in the 1950-1960 decade was evaluated. According to a preliminary evaluation, gross capital/output ratio turned out to be 2.6: 1.

Tentatively, total capital requirements were calculated on the basis of this gross capital/output ratio to obtain the required rates of growth in national income.

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(1) There are reasons to believe that Turkey with the introduction of more radical fiscal and taxation reforms could have achieved a higher average domestic savings or/and higher marginal rate of saving.

(2) See, Mahbub Ul Hag, Problems of formulating a Development Strategy in Pakistan, OECD. Development Plans and Programmes, 1964, p.116.

(3) From simple Harrod-Domar Growth model this can be clearly seen:

$$g = \frac{S}{C}$$

$$8 = \frac{S}{2.6}$$

$$= 20.8 \text{ per cent of GNP}$$

There is some evidence to show that the SPO was forced to refrain from a choice of a more ambitious rate of growth because of the conflict that arose between themselves and particularly Ministry of Finance. In actual fact the conflict was so serious that some eminent members of the SPO had to resign from their departments.(1)

One may ask: was a 7 per cent rate of growth a feasible choice? The answer can be "no" for the following reasons:

i) During the period 1950-62 average annual rate of growth had reached the level of 5.3 per cent, and some years annual rate exceeded even 6 per cent.(2) Without a systematic treatment of fiscal and monetary policies and without substantial commitment from aid-giving agencies a 6 per cent rate of growth was surpassed; this implies that the target rate of growth of 7 per cent was an attainable rate with little effort.

ii) Second, compared with other countries, a 7 per cent growth rate does not appear to be high enough if we consider the population rate of growth which is almost 3 per cent per annum. This obviously would leave a 4 per cent growth rate which was accepted as a minimum rate by OECD for less developed countries for the 1960-1970 period, (Development decade). Turkey then seemed to have aimed at achieving only a minimum target rate of growth that was specified for developing countries.

iii) Third, to determine the rate of growth on the basis of the past performance only cannot be a plausible method. For, if the total investment resources in 1950-60 period were allocated on more rational investment criteria a growth rate higher than 6-7 per cent could have been easily attained. The argument in the period 1950-60, as shall be seen below, had centred around the social overhead capital-first (3) thesis which proved to be a futile one as was supported by the experiences in many developing countries. Heavy investment in social overhead capital supported by deficit financing had resulted in a very low rate of growth(4)

(1) See J.Tinbergen, Methodological background of the Plan in Planning in Turkey, METU Public, No.9, Ankara, 1967, p.77

(2) In years 1955, 1956 and 1957 the annual rate of growth was 7.4 per cent, 6.8 per cent and 6.3 per cent respectively. From figures in FFYP 1963-67, p.14-108

(3) Utilized capacity of highways and railways was 63 per cent and 20 per cent respectively. Also there was a substantial idle capacity in Energy.

(4) Average rate of growth was 3.2 per cent for period 1954-58 and 3.3 per cent for period 1959-62. Computed from the FFYP, 1963-67, pp.14, 108.

(3 per cent) in the second half of the 1950's; that was a manifestation of the failure of the SOC-first" argument.

The pattern of allocation by then was an indication of the waste of resources due to unplanned and inconsistent allocation of investment. Those resources would have obtained a higher rate of growth if they were directed toward productive sectors such as agriculture, and manufacturing industry.

iv) Finally, as will be seen in the last section, the actual rate of growth over the first 4 years of the plan implementation reached 6.4 per cent which indicates that the 7 per cent rate of growth could be easily maintained.

(c) COMPOSITION OF THE INVESTMENT PROGRAMME

At the outset it may be useful to distinguish the respective roles given in the First Plan to public and private sectors. The types of activity that were planned to fall within the domain of public sector can be useful for providing a framework for public project evaluation in Part III.

We have pointed out elsewhere that the public sector was to undertake about 60 per cent of the total size of the investment programme. As can be seen from Table 1, public sector investments were expected to reach 35.7 billion TL. over five-years as compared with private sector's 23.9 billion TL.

The reason for a strong government predominance in the sphere of development can be explained as follows: the urgent need for ensuring structural changes in the economy, with respect to GNP, labour-force, foreign trade and commodity to be supplied made it essential for the government to become directly involved in the economic development process by putting the economy largely in the hands of the public sector.

The long-term goal in Turkey like in most developing countries was, of course, a large share for the manufacturing industry in the Gross National Product. A change in the structure of the economy could be possible only by developing the manufacturing sector. The present economic structure characterised by a large proportion of the total working force in primary production is somewhat unbalanced and should be cured by an all-out drive for manufacturing industry. The government wanted to intensify its participation in large-scale industries by its State Economic Enterprises (SEE). These industries include steel-iron, machinery and equipment, chemicals, paper and rubber.

Second, the expansion of agricultural output stopped sharply by the end of 1956 when the limit of cultivable land was reached. Agriculture which was originally dependent on extensive farming and weather conditions was suffering from a large surplus of labour force which exerted a serious pressure on peasant agriculture.(1)

TABLE 1 - Plan Investment Projections for Public and Private Sectors - 1963-1967

YEARS	PRIVATE		PUBLIC		TOTAL	
	Billion TL.	% of GNP	Billion TL.	% of GNP	Billion TL.	% of GNP
1963	3.8	6.7	5.8	10.3	9.6	17.0
1964	4.2	7.0	6.6.	10.9	10.8	17.9
1965	4.7	7.3	7.1	11.0	11.8	18.3
1966	5.3	7.7	7.8	11.3	13.1	19.0
1967	5.9	8.0	8.4	11.4	14.3	19.4
TOTAL	23.9		35.7		59.6	
Average Annual Increase	11.0		10.6		10.7	
As percentage of total Investments	40.0		60.0		100.0	

Source: The First Five-Year Plan 1963-67, p.108

It was due to this background that the government laid considerable emphasis on manufacturing industry, for the latter could offer, in the long run, larger employment opportunities. In fact, according to plan projection employment in industry was to grow by 32 per cent as compared to 5.6 per cent in agriculture.(2)

(1) At the beginning of the plan era, there was over 1 million unemployed in agriculture.

(2) See First Five-Year Plan 1963-67, SPO, Ankara, 1963, p.400.

Third, there was a chronic strain developed on the balance of payments via relative stagnation of the export demand for primary products on which Turkey's foreign trade position depends. The government felt that import substitution industries which are by nature capital-intensive but pressure-reducing on the balance of payments in the long-run should be initiated. These industries were needed to feed other sectors of the economy and also lessen the dependence of the country on the imported capital goods.

Finally, the government was eager to improve technical skill and know-how which the private sector was not able to introduce because proper knowledge of markets and technology is both costly and difficult to obtain, and a lack of knowledge would hinder the establishment of otherwise profitable industries. The difference between the private entrepreneur and the planners who act for the government is one of time. This is the time between each of them becoming aware of new opportunities.

In conclusion the government took the responsibility of raising the productive capacity of the economy as well as the social overhead capital investment required for the former.

As can be seen from Tables 2 and 3, total public expenditure (current and capital expenditure) during the plan period amounted to 100.03 billion TL. Current expenditure and capital expenditure budgets received 59.2 billion TL and 40.7 billion TL. respectively. Total public expenditure in the plan was projected to rise from 24.7 per cent of GNP in 1962 to 27.4 per cent in 1967 (a 10 per cent increase).

Accordingly, public capital expenditure constituted 39 per cent of the total public expenditure at the beginning of the plan and 41.4 per cent at the end of the plan - an increase of 6.2 per cent over the plan period. Public current expenditure, on the other hand, was projected to decline from 61 per cent to 58.6 per cent in the same period.

It must be noted that, though the rise in capital expenditure was encouraging, it was far from being satisfactory for achieving the plan objectives. It is evident that a 6.2 per cent increase in public capital expenditure was very insignificant and recurrent expenditure (i.e. defence and general administration) could have been squeezed much further than it was already in the First Plan.

TABLE 2 PUBLIC EXPENDITURE TARGETS 1963-67
Billion TL (1961 prices)

Year	Current (1) Expenditure	Investment Expenditure	Total public Expenditure
1962	7.96	5.08	13.04
1963	9.07	5.80	14.87
1964	9.35	6.60	15.95
1965	10.01	7.10	17.11
1966	11.00	7.80	18.80
1967	11.90	8.40	20.30
Total	59.29	40.78	100.03

Source: FFYP, 1963-67, p.112

TABLE 3 PUBLIC EXPENDITURE AS PERCENTAGE OF GNP

Year	Current Expenditure	Investment Expenditure	Total public Expenditure
1962	15.10	9.64	24.74
1963	16.08	10.28	26.36
1964	15.50	10.94	26.45
1965	15.52	11.01	26.53
1966	15.94	11.30	27.25
1967	16.10	11.37	27.47

Source: FFYP, 1963-67, p.112

TABLE 4 CURRENT AND INVESTMENT EXPENDITURE AS PERCENTAGE OF TOTAL PUBLIC EXPENDITURE 1963-67

Year	Current Expenditure	Investment Expenditure	Total
1962	61.0	39.0	100
1963	60.9	39.1	100
1964	58.6	41.4	100
1965	58.5	41.5	100
1966	58.5	41.5	100
1967	58.6	41.4	100

Source: Computed from Table 52, FFYP, p.112

(1) Current expenditure includes development, domestic debt repayment and interest (on internal and external debts) and local administration.

The plan gives a broad indication of what is expected from the government investment. To quote from the plan: "If the private sector does not invest in a field which is regarded as necessary in the plan, and this situation creates significant bottlenecks in the economy, the state or public enterprises will readjust their investment programmes to assure the realisation of the necessary investments"(1)

But all this does not mean that the private sector was to play a less important role; on the contrary, private investments were expected to rise from 6-7 per cent of GNP to 8 per cent of the GNP over the same plan period.(2) This indicates a notable increase in the volume of private investments. In absolute terms, the private investments were planned to rise from 3.8 billion TL. to 5.9 billion TL. in the plan period (see Table 1). This is an underestimation as will be seen in Section (e). This projection implies that there would be an increase of 55 per cent in the total private investments. It can be concluded that the plan in fact had expected an equal performance from the private sector despite the fact that the plan cannot be binding for the private sector.(3)

The distribution of investments by investment activities in public and private sectors is not given by the plan and the only available table was the one provided by the OECD in the "Turkish First Five-Year Plan, 1963-67, Report by an Expert Group for the OECD Consortium for Turkey" (4) Table 5 indicates that the largest proportion of the public investment was devoted to indstry(including manufacturing, mining and energy) with 29.6 per cent followed by agriculture with 20.9 per cent; by transport and communications with 18.2 per cent; and the remaining 31.3 per cent was devoted to education, health housing and other services.

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(1) The First Five-Year Plan, 1963-67, p.55.

(2) Ibid., pp.109-110

(3) According to the plan the government was to take certain measures to encourage the private sector, i.e. by establishing environmental conditions, protection from foreign competition, encouraging investments by financial and fiscal policies. The government was also to provide equality between private and public sectors in respect of price policy, foreign exchange and capital. See The First Five-Year Plan, 1963-67 SPO, Ankara, 1963, pp. 56, 109.

(4) OECD, Turkish First Five-Year Plan, 1963-67, July 1963, p.6

The private sector, on the other hand, allocated almost half of its investment resources to housing (44.7 per cent), followed by manufacturing (25.7 per cent) and agriculture (12.9 per cent). Private investments devoted to energy, transport and mining are not very substantial as compared with government investments in the same activities.

TABLE 5 Distribution of Projected Plan Investments by Type of Activities, 1963-67 Billion TL (1961 prices)

	Public		Private		Total
	Amount	%	Amount	%	Amount
Agriculture	7.5	20.9	3.1	12.9	10.6
Mining and quarrying	2.1	5.9	1.1	4.7	3.2
Manufacturing	4.0	11.1	6.1	25.7	10.1
Energy	4.5	12.6	0.6	2.6	5.1
Transport and Communications	6.5	18.2	1.7	6.9	8.2
Housing	1.4	4.1	10.7	44.7	12.1
Services and Tourism (incl. education and health)	9.8	27.2	0.6	2.5	10.4
Total	35.8	100.0	23.9	100.0	59.7

Source: The Turkish First Five-Year Plan, 1963-67. Report by an Expert Group for the OECD Consortium for Turkey, July 1963, p.6

Of course, the private investment decisions cannot be forecast with great accuracy and therefore the distribution of investments between public and private sectors shown in Table 5, should be treated as a tentative indication of magnitude and direction.

The SPO's investment classification does not show us the true nature of the development plan and the investment strategy endorsed by it. Therefore, it may be necessary to examine the pattern of allocation on the basis of different but quite accepted classification systems. This way, a clearer picture can be obtained.

A. Under the first classification system we treat investment under the headings of productive investments, impulse investments, social investments and hoursing investments. In Table 6, which I have arranged from Table 5, productive investments are used to include agriculture, mining and manufacturing; impulse investments as including transport and communications and energy; social investments as including education, health, services, tourism; Housing as covering government and private dwellings.

The share of public sector in what I have termed "productive investments", exceeds the share of the private sector. Such is also the case with other types of investments such as impulse and social investments, except for item (d), in Table 6, where the private sector's contribution to the development of the housing sector far exceeds that of public sector.

The main points that can be drawn from Table 6 and 7 are:
1) Almost 40 per cent of total capital outlay designed for the plan period, 1963-67, was allocated to productive investments. Impulse investments constituted only 22.2 per cent of the total investment amounting to 13.3 billion TL. in the same period. Housing by itself received a substantial proportion of total investment representing 20.3 per cent of the total. Social investments ranked at the bottom of the overall investment programme (only 17.7 per cent).

2) The distribution of investments between public and private sectors under this type of classification is also interesting (see Table 7).

Almost 57 per cent of the productive investments, 83 per cent of impulse and 94 per cent of social investments were undertaken by the government or its A gencies.

Private sector, on the other hand, was exceedingly dominant in housing investments with 88 per cent, while its share in productive and impulse investments was 43 per cent and 17 per cent respectively. Private sector investments in impulse and social investments were less significant.

The amount of capital devoted to housing both within the private sector and as a percentage of total investments deserves special attention. Almost a quarter of total investment and also 45 per cent of total private investments are in housing sector alone. Manufacturing investment in private sector constituted only 25.7 per cent which signifies the importance of a

TABLE 6 Planned Distribution of Investment by Type of Investor and Activity, 1963-67 Billion TL (1961 prices)

Sector Activity	Public Sector	Private Sector	Total	As percentage of the total %
a) Productive Investments	13.6	10.3	23.9	40.0
b) Impulse Investments	11.0	2.3	13.3	22.2
c) Social Investments	9.8	0.6	10.4	17.5
d) Housing Investments	1.4	10.7	12.1	20.3
Total	35.8	23.9	59.7	100.0

Source: It is rearranged according to the figures given in Table 5.

TABLE 7 Distribution of investments between Public and Private sectors - 1963-67. By percentages

Sector	Public Sector	Private Sector	Total
a) Productive Investment	57	43	100
b) Impulse Investments	83	17	100
c) Social Investments	94	6	100
d) Housing Investments	12	88	100

Source: It is computed from Table 6.

shift in the allocation of investments in this sector.

Bearing this in mind the First Plan suggested the necessary measures (fiscal and monetary) in order to direct private investments into more productive activities, i.e. manufacturing or agriculture. In the plan projection, private investments in non-housing activities were expected to rise by 17 per cent as compared to 7 per cent increase in housing investments.(1) This, however, would seem, as implementation results indicated, to be a rather optimistic projection where the private sector, despite all the measures taken, insisted on concentrating in housing.

3) The considerably higher percentage of public investments in "productive investments" reflected the readiness of the government to direct public action toward accelerated development(2). The higher proportion here was due to the fact that the government was to undertake heavy industry in which the private sector was not interested.

B. A broader classification of investment allocation can also shed some light into the investment strategy of the Plan. Here, I shall look into the investment pattern from the angle of social overhead capital vs. directly productive activities.

In the directly productive investment category I have included agriculture (excluding irrigation), mining and quarrying, manufacturing and tourism(3). This investment category amounted to 19.2 billion TL. during

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(1) First Five-Year Plan 1963-67; Report by an Expert Group for the OECD Consortium for Turkey, July 1963, p.6

(2) The public sector intervention in industry in Turkey started as early as 1934 with the inception of the First Five-year Industrialization Programme (1934-38). Turkey during that period aimed at establishing the basic and key industries in order to stimulate industrialisation. The government, which was then impatient with the slow response from the private sector to undertake basic industries despite the encouraging fiscal and monetary measures provided, felt obliged to step in and initiate key industries such as steel-iron, chemicals, cement, textiles and clothing. These industries were (still are now) carried out by the state economic enterprises (SEE)which were established in the same period. For more details see the present author's M.A. thesis: "A study of the Turkish First Five Year Plan 1963-67 with special reference to Resource Allocation and Investment Decisions", Durham University, England, May 1966, Chapter 2.

(3) I have included tourism in the DPA category because it has been and still is the fastest growing sector in the economy and because it is providing the greatest improvement in the balance of payments. In other words rate of return on capital invested in tourism projects ranks higher than other alternative uses. In 1967 tourism revenue was 48 per cent higher than 1966 level and there is good evidence now that the number of tourists visiting Turkey is increasing by 20 per cent per annum. See Iktisadi Rapor 1968. Turkiye Ticaret odalari, Sanayi odolari re Ticaret Bonsalari Birligi, p.138

the plan period.

I have taken SOC in a very broad sense to include energy, transport and communications, irrigation, education, health and services. These taken together amounted to 28.2 billion TL. in the same period. It must be noted that I am following A.O.Hirschman's (1) definition of SOC which can be distinguished by the following conditions: (1) services which are in some sense basic to the carrying on of a great variety of economic activities; (2) services which are provided in almost all countries by public agencies or by private agencies subject to some public contol; (3) activities which cannot be imported; (4) those investments which require high capital-output ratios.

SOC investments of the First Plan had constituted 47.3 per cent of total investment as compared with 32.4 per cent in directly productive investments. (See Table 8). Housing, on the other hand, constituted 20.3 per cent of total.

It follows that the First Plan gave outstanding priority to the establishment of basic social infrastructure so as to provide firm ground for further industrialisation. It appears the SPO concentrated on economic and social infrastructure (energy supply, transport, irrigation and all other services) deliberately for they considered these as pre-conditions for industrial growth. But, needless to add, this allocation does not support the argument that the Plan is a directly productive plan as was advocated by the SPO.

It is true that basic economic facilities of the kind we have mentioned above are required in every type of production and their benefits (external) to other sectors of the economy can be immense. Marginal social benefits in SOC are so much in excess of marginal private benefits that the government's investments in these fields become inevitable.(2)

But our objection here is not to the inevitability of these investments but to the scale of priority given to SOC in the overall investment

(1) See A.O.Hirschman, The Strategy of Economic Development, Yale University Press, 1958, London, pp.83-84

(2) The profitability of a project to an entrepreneur depends on his profit and the turnover to capital invested while the government evaluates investment opportunities by the "value added" from all factors of production including labour. In the former case wages are considered as a cost to be deducted from profits whilst to the latter it constitutes "value added".

programme. Moreover, as shall be explained fully in subsequent sections, sectoral allocation to social overhead activities was based on inadequate sector analysis instead of an overall input-output table which could indicate the interaction between the two broad categories. Further, it seems that there is a contradiction in the plan in respect of its major objective, that is promoting industrial growth and thus productive capacity on the one hand, and the type of allocation which gave priority to SOC investments on the other hand. The plan appears to have diverted from its basic objective as can be read in the following quotation. The Plan states: "In order to make the best use of the country's economic resources certain public services must be given greater emphasis than in the past. These services which are the foundation of economic development include both the traditional public services, such as power supply, irrigation and hydro-dams which are the responsibility of the Central Authorities even in the most advanced countries. These services are pre-requisites for the investments to be made in productive fields." (1)

The above statement in the First Plan indicates that the plan relied considerably on the provision of SOC since the SPO felt that this would have a greater impact on the process of "creating capacity to creat wealth."

But this statement is contrary to the Plan objective which was to promote industrialization and a balanced growth of all sectors (as we shall see in the implementation).

TABLE 8 - Directly Productive vs. Social Overhead Capital Investments (1963-67) (1961 prices)

Sectors	Million TL.	Percentage of total
1. Directly productive Investments (DPI)	19,264.5	32.4
2. Social overhead capital (SOC)	28,266.3	47.3
3. Housing Investments	12,116.0	20.3
Total	59,646.8	100.0

Source: It is computed from Table 5.

(1) The First Five-Year Plan 1963-67, p.55

C. The investment strategy of the First Plan will be compared here with other developing countries in relation to the public investment strategy as well as overall investment strategy.

In Table 9, developing countries are classified according to their public investment strategy under three groups such as countries which are placing emphasis on commodity production and basic facilities; countries placing emphasis on commodity production and services; and finally countries placing emphasis on basic facilities and services. This classification method is what is applied by the U.N. Economic Commission in comparing various developing countries.

It can be seen from Table 9, that the public development programme in Turkey does not fall into groups (a) or (c); but probably it is much nearer to group (b). In actual fact the emphasis in the First Plan as far as the public investment programme is concerned is rather equally distributed among commodity production, basic facilities and services. It is apparent that the planned government investment was designed to enable the country to advance simultaneously in directly productive sectors, basic facilities as well as social services. This is tantamount to saying that the government had aimed at a balanced pattern of growth whilst giving more emphasis to commodity production. As Table 9 indicates public investment assigned to commodity production represented 37.9 per cent of the total, basic facilities being 30.8 per cent and services 31.3 per cent.

But while countries like India, Pakistan, and U.A.R. devoted almost half of their public investment to commodity production, Turkey in the First Plan devoted only 1/3 of its total public investments. Thus the role of the government in directly productive sectors in those countries appears to be more significant than it is in Turkey.

So far I have considered the public investment and its allocation. But, again taking the investment classification adopted by the UN. Economic Commission the overall investment programme can be compared with other less less developed countries.

According to total investment programme in the plan, Turkey allocated 40 per cent of the total to commodity production, 22.3 per cent in basic facilities and 37.7 per cent in services (including housing). (See Table 10).

Table 9 Planned Distribution of Public Investment - percentage

Country	Commodity Production				Basic Facilities			Services
	Total	Agric.	Min.	Manuf.	Total	Power	Trans. & comm.	
A. Group								
U.A.R.	55	24	1	31	25	6	19	20
India	48	21	-	27	42	17	25	10
Pakistan	48	35	3	10	29	10	19	23
Ceylon	47	23	-	24	30	10	20	23
B. Group								
Sudan	41	32	-	9	28	6	22	32
Jordan	45	45	-	-	26	-	26	28
(1)Turkey	37.9	20.9	5.9	11.1	30.8	12.6	18.2	31.3
C. Group								
Iran	37	19	2	17	37	11	26	26
Malaysia	30	25	-	1	39	19	20	31
Burma	27	15	2	10	37	8	29	36
Nigeria	27	14	-	13	44	19	26	29
Chile	15	6	-	8	43	17	26	42
Colombia	6	5	-	1	52	13	38	42

Source: UN. World Economic Survey, New York, 1965, p.37

Notes: A. Group indicates countries placing emphasis on commodity production and basic facilities

B. Group indicates countries placing emphasis on commodity production and services.

C. Group indicates countries placing emphasis on basic facilities and services.

(1) The figures for Turkey are placed in the Table so as to provide comparison. For Turkey, commodity production includes agriculture and irrigation, mining and manufacturing. Basic facilities include Power and Transport and Communications. Services include Housing, Education, Health, Tourism and other services.

In view of this classification, Turkey falls into group C. where the emphasis is both on basic facilities and services. It follows that 60 per cent of the total investment is assigned to social and economic overhead investments. This finding supports the second classification model we have applied earlier.

Countries like India, Pakistan, Bolivia and U.A.R., in contrast, have devoted larger proportion of their investment resources to commodity production (ranging from 53 per cent to 61 per cent). For instance, if we take industry as comprising manufacturing and mining, we notice that countries like Bolivia, Pakistan, India and U.A.R., out of their total resources devoted 44 per cent, 26 per cent, 31 per cent and 29 per cent respectively to industry. Turkey, in contrast to the above countries, assigned only 22.3 per cent of its total investment to industry(1).

It can therefore be pointed out that the Turkish Five-Year plan does not seem to justify the planners' assertion that the plan is an industrial development plan. It must, however, be noted what makes the plan less an industrialisation programme is the greater weight given to agricultural infrastructure (i.e. irrigation works) in commodity production and the excessive allocation persistant in the housing sector which is included in the "Services" category. Thus, investments in both sectors can be considered to be the main determinants of the Investment strategy of the First Plan.

To sum up the conclusions which are derived from this section:

1) The significant role of the public investment programme in the allocation of total investment is quite apparent. The Plan expected a notable performance from the public sector in the provision of physical and social infrastructure and in expanding the basis for further industrial growth, by placing great emphasis on heavy industry.

2) But, contrary to the plan objectives Turkey did not assign its total investment resources to directly productive sectors, but instead for the expansion of basic facilities and services. Also as compared to other countries Turkey, with the plan allocation of investments, falls into the category of countries where the emphasis is on the basic facilities and services.

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(1) Contrary to the planners' concept of industry, I have excluded power from industry and included it in basic facilities category so as to make it correspond to the UN. classification.

TABLE 10 - Planned Distribution of Total Investment [a]
(percentage)

Country	Commodity Production				Basic Facilities			Services
	Total	Agric.	Min.	Manuf.	Total	power	Transp. & Com.	
(1) Bolivia	61	14	32	12	17	6	11	23
Pakistan	54	27	4	22	24	7	18	22
U.A.R.	54	25[b]	-	29	28	12	15[c]	18
India	53	22	-	31	29	11	18	18
(2) Morocco	60	31	6	23	10	1	8	30
Tunisia	55	39	4	11	10	4	7	35
Trinidad	52	5	30	13	16	5	11	33
(3) Ethopia	49	23	5	20	24	4	20	28
Ghana	48	20	5	24	20	4[e]	16	32
Jordan	48	32	2	14	16	2	14	36
Sudan	43	25	1	16	23	3	20[f]	34
Venezuela	43	10	11	19	16	5	11	42
Turkey *	40.0	17.7	5.4	16.9	22.3	8.6	13.7	37.7
Chile	38	10	7	21	31	12[g]	19	31
Columbia	36	13	7	16	28	6	23	36
Iran	36	15	1	19	26	10	15	38

Source: UN. World Economic Survey, 1964, p.39

(a) For Bolivia, Ghana, Tunisia, data are for net investment

(b) including High Dam; (c) including Suez Canal; (d) Tertiary production; power, transport and communications and housing; (e) Volta River Project only; (f) including distribution; (g) Electric, petroleum and coal.

Notes (1) Countries indicating emphasis on commodity production and basic facilities

(2) Countries indicating emphasis on commodity production and services.

(3) Countries indicating emphasis on basic facilities and services.

* Turkey is placed in the table according to its investment strategy.

3) As can be noticed the investment strategy of the plan changes according to the type of investment classification one applies. Planners' classification makes the plan an industrial one since energy is included in industrial sector. But energy is often put under the heading of basic facilities or SOC. On the basis of Hirschman's and the UN definition, the plan becomes social overhead biased.

True, there is no uniform classification system for overall investment strategy, but the UN classification with some reservations can be considered as a useful one.

A closely related question to the above conclusion will be: is the "SOC-first" thesis an acceptable one?

Exponents of "heavy investment in basic economic facilities (SOC)" maintain that in the initial stages, if a developing economy devotes its resources primarily to the building up of an "infrastructure" of roads, railroads, power etc., the external economies created by these will bring about an acceleration in its rate of development. But it is questionable whether either practice or experience is such as to give the argument the strength of wide applicability.

India's First and Second Five-Year Plans can be quoted here. India's overinvestment and overcapacity in many "infrastructure" sectors had considerably slowed down the country's rate of economic growth. In 1960 the use of water from major irrigation projects was only at 65 per cent of capacity. Energy and power sectors had also a considerable degree of over-capacity(1). Consequently, in the First Five-Year Plan an increase of $3 billions in gross investment yielded an annual increase of $1.5 billions in gross output. Again $5 billion of investment yielded an annual increase of over $1 billion in the first two years of the Second Five-Year Plan (2).

Obviously the previous funds were spent in projects which do little to increase the stream of output. Less output will imply fewer resources to finance a sustained investment effort and the economy becomes stagnant.

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(1) See B.R. Shenoy, The Right Road to Indian Progress, Fortune, April 1960, p.246

(2) Ibid., p.246.The First plan represents a capital-output ratio of 2:1; and the Second Plan a ratio of 5:1.

Similarly in Turkey, prior to the First Plan, and during the period 1950-60, there was a considerable idle capacity in basic social overhead capital sectors. For instance the utilized capacity in highways and railways was 63 per cent and 20 per cent respectively(1). There was, in addition, an exceedingly high idle capacity in Energy and power in some regions while other areas had suffered from the absence of power facilities. Here again heavy investments in infrastructure sector supported by deficit financing had resulted in a very low rate of growth (3.3 per cent)(2) which was an indication of the common failure of the SOC-first argument adopted by the government.

Moreover, "social overhead capital" first argument depends mainly on the assumption that enterpreneurs will be eager to come forward once such basic facilities are established. But the validity of this assumption is rather dubious since entrepreneurs are extremely reluctant in less developed countries, to respond to such SOC facilities. This is so because private entrepreneurs lack experience, large sums of capital (no well-organised capital market), and most of all they are after quick returns on the capital invested. Thus, to base the economic growth of a country on the response of the private entrepreneurs to such basic facilities is not a plausible suggestion.

It is therefore argued that a direct government attack on industrialisation becomes inevitable. This brings us to the exponents of the "heavy industry first" argument which is a pattern of investment allocation that is usually followed in East European Communist countries. The policy there has been, in general, to neglect deliberately all sectors other than heavy industry. The share of heavy industry and construction varied from 38 per cent in the Soviet Union to 49 per cent in Roumania for the period 1950-58. On the other hand, investment in light industry varied from 5 per cent in Hungary to 9 per cent in East Germany and that of agriculture from 10 per cent in East Germany to 21 per cent in Bulgaria. Allocation to transport and communications reached 15 per cent in Russia and

(1) See the First Five-Year Plan, 1963-67, p.126

(2) Average annual rate of growth for period 1954-58 was 3.7 per cent; for period 1959-62 was 3.3 per cent. These are calculated from the figures given in the First Five-Year Plan, pp.14 and 108.

in most cases were not over 10 per cent [(1)]. The characteristic pattern here is the high proportion of investments in Heavy industry and Construction and the low proportion devoted to light industry. This pattern of allocation was based on the relative importance of industries for achieving a high rate of economic growth. It was for this reason that lowest priority followed in ascending order by agriculture, consumer-goods industries and the sectors producing capital goods [(2)].

If their capital-output ratios seem to be lower than in non-communist countries the main reason should lie entirely with the distribution of investment resources. It can be observed that the low share of non-productive investment was a factor reducing the overall ICOR. Also another factor was the low share of consumer sector in total investments.

The above mentioned two opposing arguments on investment strategy have their own drawbacks and weaknesses since they represent extreme thesis. It is a well known fact that excessive investments in social overhead facilities may lead to a slower rate of growth and also to inflationary pressures, the control of which might be quite difficult. On the other hand overinvestments in "heavy industries" alone might not solve the economic problems of a country and might cause imbalances of sectors troubled with extreme idle capacity.

Thus, in my thinking a balanced growth between physical infrastructure and directly productive activities appears to be a satisfactory solution. An accurate assessment of the growth in both sectors and timely adjustments in the planning and implementation of the individual projects concerned should be the rule. It must be noted that a projection of the future demand for transport, power and other basic economic facilities should first be made on the projected or planned growth of the directly productive activities. Of course, this in turn will call for a fully fledged input-output table which could maintain internal consistency of the plan and thus avoid bottlenecks among various sectors. That, as shall be explained below, was what the First plan had not done.

However, all this does not mean that there should not be great emphasis on heavy industry which may be essential to change the structure

(1) See UN, World Economic Survey, 1959, pp.119-20; and also Holzman, F.D., The Soviet Kuznets Combine: a study of Investment Criteria and Industrialisation policies, QJE, August, 1957.

(2) UN World Economic Survey, 1959, p.119

of the economy. It can be argued that if the main issue is the rapidity in the future rate of growth of output, heavy industry is the right answer to economic development. A desire for rapid growth of the economy in the long-run requires a heavy emphasis on the capacity creating investment in the present period. If the emphasis in the present period is on the consumer-goods industries no doubt it may increase current output for consumption, but it will definitely slow down the rapidity of the future rate of growth of production by way of insufficiently increasing the future productive capacity of the economy. Thus there is a very fundamental choice to be made at this stage.

The classical method of "go-slow" development, that is first to develop the consumer goods industries and then to develop the capital-goods industries involves a very long period to develop the economy. The economic development of Great Britain is a classical example. Such a sluggish process of development can be "reversed" by plan development of heavy industries in the present period along with some development of consumer goods industries. By this process the history of a hundred years' economic development can be compressed into a few decades of planned development. This is what most developing countries need today; the efficiency of planning in these countries lies in discovering a smooth method of such compressed development.

The choice of developing heavy industries has also to be faced from another angle. If the underdeveloped countries do not produce their own machine tools and equipment they have to import them from developed countries. Turkey's First Plan indicated that 44 per cent of import content was in capital goods. This is a high ratio and the more the domestic development expenditure increases the greater will be the import requirement. In the final analysis, this increasing demand for imported capital goods has to be met by domestic exports. Aid, loans and grants might mitigate the short-run pressure on the balance of payments, but the long-run payment liability has to be practically faced. The question here is to what extent can the exports be increased? For most developing countries, including Turkey, the prospects of export expansion are very limited as their exports are increasing relatively slowly. Turkey too is not an exception to this phenomenon. Thus, the only sensible way out for Turkey is to plan for import substitution, especially for capital goods (in fields where it has favourable factor endowments)[1]

See next page for footnote

Thus, the emphasis laid on heavy industry in the First Plan was a promising step for a structural change in Turkey. As was noted elsewhere 50 per cent of the manufacturing value added was planned to derive from the heavy industries (a rise from 38 per cent to 50 per cent). Accordingly 81 per cent of total manufacturing investments was devoted to capital goods industries.

The projection of heavy industry was a step forward, but the implementation results of the First Plan have been quite disappointing. These industries were mainly undertaken by the state economic enterprises (SEE) while the private sector, despite all necessary measures provided, did not participate as was expected. The latter sector placed the usual emphasis on housing investments which constituted 45 per cent of the private investments.

Therefore, unless the private sector does come forward and shift their resources from housing to heavy industry, a structural change in the economy may not take place for a long time. This, of course, calls for more radical and effective measures on the part of the government. The problem as it remains, is to channel private resources from excessive emphasis on the profitable investments with quick returns such as real estate, import and other speculative activities to more productive fields which could supply the economy with basic input requirements such as metals, machinery, transport equipment, paper, fertilisers, etc.[1]

Footnote (1) from previous page

The heavy industry strategy at the beginning would raise the capital-output ratio and be more import-intensive, but in the long run these would lower capital-output ratio as well as reduce dependence on imports. Light-industry approach will perhaps increase rapidly the savings/income ratio because income at first under this strategy will be higher, but in the long run this strategy has to be modified in the direction of higher capital-output ratio or else import dependence would be a stronger constraint on future growth.

(1) See the First Five-Year Plan, 1963-67, p.41

(a) <u>On the Planning Methodology and Sectoral Allocation</u>

The Turkish First Five-Year Plan will be analysed here with respect to the planning methodology that was adopted in the formulation of the Plan. This includes the macro-model, sectoral programming; an appraisal of investment projects and their selection. The latter problem will be the subject-matter of Part III, which will include examination of two separate public investment projects. Because the final stage of planning, that is the economic evaluation of projects, will to a great extent depend upon the planning procedure adopted, I feel it is useful to shed some light on the issues involved in the planning technique.

There is some evidence to show that the SPO has pursued the "method of successive approximation" or, in other words, "planning in stages"(1). Such a planning method includes the following three stages: a) macro-economic stage, b) sectoral stage, and c) project appraisal stage.

In the macro-stage, magnitudes such as aggregate income, consumption, savings, investment, exports and imports and the inter-relation among them were studied. For this purpose the planning process started with the collection of a number of figures for the period 1950-62. The aim here was to draw up a growth model and the various development policies that are appropriate for such a model. The macro-growth model was formed, on the basis of several technical studies conducted on the above magnitudes. At this stage the SPO, of course, faced a tremendous lack of statistical data which made drawing up a plan very difficult. Consequently, this led to over-simplification in the process of planning.

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(1) The "method of successive approximation" can be explained as follows: In the <u>first</u> stage, a macro-economic study of the overall economy in terms of the general process of production and investment will be made. The aim of this stage is to determine in a provisional way the rate of savings and the general index of production. The <u>second</u> stage includes the task of specifying production targets for a number of sectors over a relatively long period. The <u>third</u> stage may go deeper and give more details for a shorter period providing figures for a larger number of smaller sectors. The <u>fourth</u> stage consists of filling out the plan with individual projects. In other words, this stage calls for the appraisal of investment projects and their inclusion into the plan according to a set of investment criteria. In the course of following this procedure it will be necessary from time to time to revise the earlier stages. The figures derived from the second stage may be used by the planners to revise some of the co-efficients used in the first stage and to reconstruct accordingly. With a fixed interval of time,

(note continued on page 60

Key figures for the national income, investment, consumption, balance pf payments for the plan period 1963-67 were chosen. This choice, however, called for an estimation of capital-output ratio which was found to be 2.6 for the period since 1950. Given a very high population growth of 3 per cent and government desire to achieve a higher per capita income in order to "catch up" with other countries, a rate of growth of 7 per cent was chosen to be the first target. By simple Harrod-Domar model, this meant an investment volume of 18 per cent of national income was necessary. Foreign aid obtainable being 4% of national income this meant that domestic savings should be increased to 14 per cent from 12 per cent in the pre-plan period.

The growth model applied in the first plan was a single-sector model. This was because, the problems confronted when the plan was designed did not require a more detailed formulation. Consequently, the first plan was drawn up according to the model taken from a UN handbook on programming technique.(1). The model which was used can be expressed in the following formula:

$$G = ks\ (1 - td) + ks'\ (t' + td) + kb$$

where the first, second and third terms on the right hand side of the equation represent the share of private savings, public savings and foreign savings in the rate of growth respectively.(2) This shows that

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(continuation of footnote from p.59):

new data will be available and this may lead to a further revision. This demands a system of continuous evaluation of projects, the functional coefficients and the implication of accepted policies and other sets of data. For more details, see J.Tinbergen, Mathematical models of Economic Growth, p.9

(1) Programming techniques for economic development,with special reference to Asia and the Far East, UN Economic Commission for Asia and the Far East, Bangkok, 1960.

(2) The variables and equations on which the macro-growth model was based are:

Definitional equations:

$Y' = Cg + Cp + Ip + Ig + E - M$
$Y' = Y + Ti$
$Y = Yp + Rg + Td$
$Yg = Sg + Cg$
$Yg = Ti + Td + Rg$
$Yp = Cp + Sp$
$B = M - E$
$Sp = Sg + B = Ig + Ip$

Behavioural equations:

$S = (Yp - Cp)/Yp$
$t^d = T^d/Y$
$Ti = T^i/Y$
$rg = Rg/Y$

$M = M/y$
$I = Ig/\ (Cg + Ig)$
$S' = (Yg - Cg)/\ Yg$
$I = Ip\ (t) + Ig\ (t)$
$k = Y(t+1) - Y(t)$

(Footnote (2) continued on page 61)

The key co-efficients are k and s which are difficult to control by the planners.

The second stage consisted of specifying production targets for a number of sectors over a five-year period 1963-67. The stage was partly based upon an input-output model and partly on partial sector analysis. To be more accurate, three separate studies were carried out by the SPO at the sectoral stage: (a) the input-output table for 1959; (b) partial sectoral analysis; (c) the study of ad Hoc committees.

During the interim period leading to the first plan, the problem was basically to set up balanced sectoral programmes so as to avoid serious bottlenecks and over-production in certain sectors. Prior to the formulation of the plan the most serious bottlenecks occurred in sectors such as cement, iron-steel and machine tools, and overproduction in textiles and transport.(1)

Therefore, the main task of the state planning organisation (SPO) was to prepare an input-output table by adopting the Leontief model which, at present, has a wide application in many countries. The input-output analyses were carried out according to a 15 by 15 input-output table where the data of 1952 were used and later evaluated according to 1959 buyers' prices.(2) The input-output model was worked out under the supervision of Professor J. Tinbergen who was then appointed as the chief adviser to the state planning organisation. Following his advice some of the columns and rows were left empty till the end of the work. The economy was originally

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(Footnote (2) continued from p.60):
See Y. Küçük, The Macro-Model of the Plan, in "Planning in Turkey" Middle-Eastern Technical University, Publication No.9, Ankara, 1967, pp. 84-85.

(1) See Y. Küçük, Sectoral Programming in the Plan in "Planning in Turkey", op. cit., p.98

(2) The input-output model that was prepared for the First Plan took 1959 as the base year because 1958 was an abnormal year to take as a base since a severe inflation developed and reached its peak that year. The inflation which developed resulted in a 65 per cent devaluation. Similarly 1960 was not a suitable year because of an extraordinary political event, a military take-over. Thus, planners decided to take 1959 as the base year as it was a relatively more stable year.

divided into twenty sectors and was later reduced to fifteen sectors. The choice of sectors was partly based on their past and present, and partly on their future importance for the Turkish economy.(1) The inter-industry flows were gross of competing imports and net of complementary imports. The flows were also evaluated on buyers' prices in 1959 from the point of view of trade margins and on the basis of sellers' prices from the point of view of transportation margins.

The production projections were made according to the increase in final demand which would stem from a 7 per cent rate of growth in the national income. The final demand was divided into 7 groups which were competing imports, exports, private consumption, public consumption, private investment, public investment and changes in stocks.(2) The input-output table was then filled according to Tinbergen's suggestions by deciding *a priori* which cells were to be filled and which were to be left empty. The first thing to decide was what the inputs of a specific sector could be and then values were given accordingly. In fact in some sectors the data were about the allocation of the product while in other sectors it concerned the structure of inputs. This, of course, has made the task of balancing more difficult than expected. Also, most of the data available were given in quantity terms without any monetary values attached to them. This implied that these quantities had to be expressed in money values based on the retail prices prevailing in a specific city.(3)

There are, however, many shortcomings in the inter-industry table prepared by the SPO.

(i) The main simplification was the assumption of a considerable number of zero co-efficients. In fact, the flows of goods were assumed to consist of the main supplies to each industry only; "construction" having its inputs, building materials only; "textiles" their raw materials - cotton or wool only; "food" industries, inputs from agriculture only. A ll these

(1) See J. Tinbergen, Methodological Background of the Plan, in "Planning in Turkey", Middle East Technical University, ed. by S.Ilkin and E.Inanc, Faculty of Administrative Sciences, Publication No.9, Ankara, 1967, pp.71-2

(2) The data for these aggregates were obtained by the SPO and particularly through *ad hoc* committees created for that purpose.

(3) This was the reason for the assertion that the input-output table was based on buyers' prices.

imply that entries into the table were based on the main supplies while the inclusion of all other inputs was ignored. The figures for inputs, therefore cannot be said to represent accurate flows of goods among various sectors.

(ii) One of the assumptions used in designing the input-output table was that "a sector performs by itself the commercial and transportation services for the goods it produces" (1) Yet if one looks at the 15th row of the table, which is the transportation sector, we notice that it is one of the most crowded rows. This means that the assumption was later abandoned and subsequently transportation was distributed among sectors without making the necessary initial adjustment in the data collected. Consequently, the activities of some sectors such as energy, transportation and trade which supply their products to almost all sectors were simply assumed to develop in relationship with total national income(2). This is a logical assumption, but it appears to neglect the other determinants of these intermediate activities which supply inputs to other sectors (i.e. these activities would also be a function of demand and technology).

(iii) There was a substantial lack of consumption data which has rendered a more sceptical value to the input-output table. In the final demand analysis the filling of the columns was not very difficult except for the private consumption. Due to the shortage of data private consumption table was left to the last and calculated as a residual (3). There were no family budget surveys available and even time series data on consumption lacked precision and accuracy. Finally, private consumption was estimated on the basis of the income elasticity of consumer demand in the last 10 years. The income elasticity of demand was also compared to income elasticities of other countries with a similar per capita income.

But the time series data collected were, so scarce as family budget data and the ones applied in elasticity estimation were not fully reliable

(1) Colloquium on the Technical Aspect of Turkey's Long Term Plan. SPO, (mimeo), Ankara, 1962. (see Y. Kücük's sectoral program, p.99)

(2) See J. Tinbergen, Methodological Background of the Plan in "Planning in Turkey", op. cit., p.73

(3) Public Consumption, however, was taken as the demand on sectors arising from general and annexed budget expenditures.

Moreover, borrowing income elasticities for private consumption from other developing countries could be very misleading if attention is not given to distribution of income in both countries. This point brings in the controversy about borrowing such coefficients during the planning process.

(iv) The input-output model applied in the First Plan took various shapes before it was concluded. For instance the Table was reduced in size and important sectors like ownership of dwellings, hotels, restaurants; places of recreation; commercial, professional and other services were left out (1). However, public services and imports, which were excluded initially from the inter-industry analysis, were later included in the calculation of the final demand. This, surely, seems to be incompatible with the input-output model which is supposed to be an overall equilibrium model.

As a result of these above-mentioned shortcomings, the input-output table as it was finalized did not even satisfy the planners and experts who participated in it.

In the second study (Partial Sector Analysis) sectoral planners have tried to make demand projections. for the plan period 1963-67 and for the year 1975 estimating first, the existing capacity and later the additional capacity to be created to meet the prospective demand in the soecific sector.

For the demand forecasts trend equations were widely used and it was felt that the concept of elasticity was the most suitable technique to apply in demand projection. In the estimation of elasticities either per capita income or GNP was taken as the independent variable according to the nature of the dependent variable (2). In determining production targets of the sectors, final, inter-industry and foreign demand were taken into account, Similarly, regional demand was taken into consideration especially in sectors like electricity, power, and transport and communications (3)

(1) For details on this point, see Y. Küçük, Sectoral Programming in the Plan, in "Planning in Turkey", op. cit., p.100

(2) See Y. Küçük, Sectoral Programming in the Plan, in "Planning in Turkey", op. cit., pp.100-101.

(3) When the First Plan was prepared the idea of distinguishing domestic from international industries had not yet come up and most Plan figures were based on demand estimates for home sales and for exports. But for some sectors, production capacity was taken as the basis for future activity, i.e. agriculture.

Sector analysis was quite a useful study in showing the existing capacity of the sector and the rate of utilised capacity; the main causes of underutilisation of capacity in each sector; benefits stemming from the sector programmes in terms of value added, foreign exchange earnings (or savings) and employment effects. The additional capacity to be generated was calculated in order to meet the future demand which the present capacity was not able to meet. The optimum capacity of production reached in this way was broken down by plan years to meet the demand of each year and to achieve consistency between demand and production.

Besides the two studies above-mentioned the SPO had established "ad-hoc committees" to study various sectors of the economy. These committees were of the kind seen in India(1) and their task was to estimate and assess the existing conditions in each sector and clarify the additional benefits that may derive from a full-intra- and inter-sectoral coordination.

In the final analysis, the problems of determining the production targets of sectors for the 1963-67 Plan period appears to be solved on the basis of those three separate studies we have mentioned above. There is, however, some evidence which suggests that the input-output table of 1959 was not fully applied in determining production targets, despite the fact that it was the most important study undertaken by the SPO. The actual procedure followed by the SPO can be explained as follows. For the input-output model, final demand needed estimation and therefore it was divided into 7 aggregate sectors as mentioned earlier. The most difficult part was the determination of private consumption and changes in inventories. But for the former, income elasticities were used to calculate private consumption which were based on time series data (electricity estimation was based on the relationship between per capita consumption and per capita disposable income). The <u>second</u> difficulty faced in the input-output table was the changes in stocks. This, too, was overcome simply by assuming that there would be no changes in inventories during the Plan period (Static Input-Output Table).

The problem then was the determination of production going into inter-industry transactions. Here, the planners had no alternative but to use the proportions (technical coefficients) entered in the 1959 Input-Output table or borrow these coefficients from developing countries with similar economic structure. Of course, inter-industry flows were also

(1) Turkish planners were sent to India to study the work of various <u>ad hoc</u> committees. The idea of forming such committees was used in Turkey later on.

based on the estimated growth of each sector in order to avoid bottlenecks of basic goods during the Plan period.

The production targets for various sectors were determined as presented in Table 11. As can be seen from the Table, the rates of growth of sectors were determined separately by the input-output model and the relevant sectoral analyses. The sectoral growth rates appear to differ considerably according to the type of analysis chosen. As the Table indicates, the bases for the planned growth rates were the "partial sector analysis". Despite the fact that the Plan claims to have used

TABLE 11 Growth Rates by Sectors in the Plan Period 1963-67

Sector	Growth Rate by Type of Analysis		Planned rate of Growth (1)
	Input-Output Model	Sector Analysis	
Agriculture	5.8	6.3	4.7
Industry	8.5	10.3	11.4
Mining	11.1	7.6	8.7
Manufacturing	8.3	10.4	11.5
Power	7.8	13.0	12.8
Construction	10.3	9.5	10.4
Transportation	7.7	10.3	9.6
Average	7.4	8.1	7.7

Source: Notes on the Colloquium on the Technical Aspects of Turkey's Long-Term Plan 1962 (mimeo), Ankara 1962, pp.30-45; also Y.Kücük, op. cit., p.103, 104.

(1) Growth rates in the Plan are added to the Table to provide comparison.

input-output analysis for the plan targets; many planners are of the opposite opinion and they generally suggest that the inter-industry table has not had any practical value (1).

Besides, the determinations of sectoral growth rates, investments too, are determined here. After determining sectoral production targets and capacity requirements, the next problem was to work out sectoral distribution

(1) Dr. Y. Kücük, former head of Long-Term Planning Department strongly holds this type of opininn. See his article mentioned earlier.

of investments. In the planning theory, sectoral capital-output ratio (adjusted according to lags and idle capacity in the specific sector) has become the yardstick for the formulation of investment programmes. But, with Turkish planning experience, determination of investment allocation was done in a very curious way as can be read in the following quotation:

"The capital-output ratio has been used in both an active and a passive form in the Plan. To determine the Five-Year investment requirements, the capital-output ratio of the last 10 years was applied to the increase in the Gross National Product. The sectoral distribution of investments was made on the basis of Projects and Programs and sector reports; the capital-output ratio in this case is the result of weighing investments against the expected increase in output in the various sectors"(1)

It follows that, instead of determining sectoral investments through sectoral capital-output ratios, the planners had done the opposite by determining capital-output ratio after sectoral investments and increase in output were worked out. In other words, the capital-output ratio concept used in the Plan was rather a passive one, which really does not bear much importance(2). However, there is more evidence to suggest that, besides capital-output ratio, the following factors were also taken into account in the sectoral distribution of investments(3)

(a) present idle capacity in the sector;

(b) life of investment projects;

(c) the requirements of operational capital;

(d) the requirements of non-productive capital;

(e) pre-determined rate of growth for each sector.

Despite the assertion of the SPO, that the above-mentioned factors were taken into account, Turkey in fact has followed "departmental approach" in its planning design and investment allocation. It appears this is the usual trend in many of the less developed countries undertaking development plans as M.D.Dosser has shown in his article(4). He has pointed out that in a great number of less developed countries most of the decisions on

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(1) See the First Five-Year Plan 1963-67, SPO, Ankara, 1963, p.126

(2) Incremental capital-output ratios of the major sectors are presented in the Appendix to this chapter.

(3) A special typed document obtained from the Department of Economic Planning of the SPO, Ankara, 1968.

(4) Dosser, D.M., The Formulation of Development Plans in the British Colonies, <u>Economic Journal</u>, 1959, June, p.260

development plans in general and on the question of investment allocation are influenced by the bargaining strengths of pre-conceived ideal and pressure groups. To quote:(1)

"A third factor mentioned earlier which influences the allocation between different investment projects, whether "social" or "productive", is the bargaining strength of existing interests, usually in the shape of departments of governments or semi-public corporation. Thus if an agricultural department is already strong, a greater proportion than otherwise is likely to be devoted to agriculture whether or not that sector is relatively under- or over-developed".

Similarly, in Turkey, as a result of partial sector analysis, sectoral investment programmes were, in the final analysis, less determined according to an economic device, but more according to the strength of bargaining power between the SPO and the relevant government departments. In actual fact, prior to the formulation of the plan, investment agencies were asked to prepare and submit investment programmes for the Plan period 1963-67. Not surprisingly, there was a clash of opinions between planners, and the officials of the relevant government departments in respect to the size and composition of the Investment Programmes. This meant that the government officials tried to obtain as large investment funds as possible without giving due attention to the inter-relation and consistency in various sectors. While the planners have aimed at channelling investments into productive fields, the government agencies seemed very eager to invest in their own fields irrespective of their consistency. Needless to say the departmental approach when applied did not secure the best allocation of investment resources and, in the end, the ability to secure political support appeared to be more important than the economic arguments that were put forward by the planners.

Concluding Remarks

It is very encouraging to see that the Turkish planners have resorted to an input-output model in their programming technique in the First Plan. Despite the fact that it has not been fully applied, it has been a useful step in the right direction.

Input-output table is a way of arranging the national accounts which focuses attention on productive relations. The distinctive features

(1) Ibid, p.260

of this model are: first, it deals exclusively with production and the problem is essentially technological, second is its devotion to empirical investigation and third, is its emphasis on general equilibrium phenomena. Most important, an input-output model seeks to take account of the interdependence of production plans and activities of many industries which constitute the overall economy. The interdependence results from the fact that each industry uses as its raw materials the products of other industries. The basic problem then is to see what is left for final demand(consumption, investment, exports etc.) and how much of each output will be used up in the course of productive activities to obtain net output.

The input-output model has the following advantages over other methods:

(i) The calculation of the production targets for the various productive sectors is the most straightforward utilisation of the inter-industry model. Having projected the final demand on any specific part of it, it can be easy to calculate production targets required to fulfil the demand. By this method one is also able to calculate the direct and indirect requirements from all the sectors at the same time to satisfy the final demand projected. This means that if we break down the final demand into its various components, i.e. exports, consumption. investment (leave changes in stocks aside), we can arrive at the production requirements for each by using the inverse of the matrix.(1)

(ii) Thus, by enabling us to calculate direct and indirect requirements to meet a final bill of goods we are able to discover bottlenecks and excess capacities. This avoids waste of resources.

(iii) Interdependence becomes more clear and the extent of dependence of the economy on a certain industry as well as the dependence of that industry on the prospects of others can be seen. The inter-industry relations make it possible to discover the key leading sectors of the economy and the weight they have on the growth of the economy. Needless to add that inter-industry analyses are the best sectoral model that can be used when consistency studies are prepared.

(iv) An input-output model can be used usefully in predicting future production if usable demand estimates are obtained. Also, more modestly, it

(1) Inverse of the matrix for investment, consumption and exports would be as follows:

$$X_I = (1-a)^{-} \ YI$$
$$X_c = (1-a)^{-} \ YC$$
$$X_E = (1-a)^{-} \ YE$$

can provide a detailed structure of national income accounting.

No doubt the 1959 input-output table applied in the Turkish Five-Year Plan reflects structural interdependence among sectors, but this was probably incomplete because of lack of data. As we mentioned elsewhere the 1959 input-output table was based on figures compiled in a very short period and in some cases input-doefficients were borrowed from other developing countries. Moreover, the selection of sectors for the table was determined according to the availability of data rather than upon the importance of these sectors in the edonomy. Further, there were a large number of simplified assumptions involved in the inter-industry model. Some of these assumptions are implicit in such a model and some were applied in the 1959 table. Therefore, those two sets of assumptions which are not realistic give rise to certain doubts about the applicability of an input-output model. First assumption implicit in the model is that in any productive process inputs are employed in rigidly fixed proportions and that inputs expand in proportion to the level of output. An input-output model also assumes that each output is produced by only one technique. Third, such a table assumes the stability of the technological coefficients.(1)

Probably the most important charge against an Input-Output table is the fact that technological coefficients are not stable and there are three main factors that affect this coefficient. These are: (a) technological change, (b) change in relative prices and (c) in production of scale. All these factors would be felt when a country is experiencing a rapid economic transformation.

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(1) The Leontief production function is as follows:

$$X_j = f_j\ (X_{1j}\ ,\ X_{2j},\ X_{3j}\ldots.\ \ Xnj,\ M_j,\ V_j)$$

and the usual way of calculating the technological coefficients from an input-output table is:

$$A_{ij} = \frac{X_{ij}}{X_j}$$

Basically, input-output analysis is a set of simultaneous linear equations in which the unknowns are the level of output of various branches of industry, and in which the parameters are to be estimated from the information contained in the input-output table.

Therefore when inter-industry analyses are studied, the basic assumptions must be kept in mind and revised according to the availability of data. These assumptions must not be overlooked since they may give rise to misleading projections of productive targets.

In the First Plan, planners faced with unreliable data and inappropriate methods of analysis, have tended to choose basically "partial sector analysis" because the Input-Output table was unsatisfactory. Thus, the plan formulation was based largely on trend equations or some regression analyses with one or two explanatory variables of which the levels of significance were not tested adequately. Despite the fact that "regression coefficients" were improved by the suggestions of some experts, they would tend to be less useful if there were to be a change in the composition of product-mix.

By using "partial sector analysis" agriculture was given a 6.8 per cent rate of growth and industry 10.5 per cent for the plan period. Later these targets were revised when it was realised that agriculture could not possibly attain this rate of growth. Thus its rate was reduced to 4.7 per cent and industry increased to 11.4 per cent. If the input-output model had been used for the determination of production targets, such an implicating error could have been avoided.

The comparison between the sectoral targets based on an input-output table and the actual realised targets during the plan period would seem to justify the superiority of the input-output method. As Table 12 indicates, Agriculture, on the basis of the input-output table of 1959 was to have a 5.8 per cent rate of growth while industry and transport 8.5 per cent and 7.7 per cent respectively. These figures seem to be very near to the realized rates of growth of these sectors. Thus projections based on an input-output table appeared to be more realistic and attainable than the ones based on "sector analysis".

Table 12 - Forecasted, planned and realized growth rates(1962-67)

Sector	Input-output	Plan	Realized
Agriculture	5.8	4.7	3.0
Industry	8.5	11.4	8.8
Construction	10.3	10.5	8.0
Transportation	7.7	9.6	7.5

Source: From Table 11. The third column from the SPO income study group.

It is true that there are serious charges against an input-output model; but all these shortcomings do not reduce the significance and the use of the input-output table in the sectoral programming. The usefulness of constructing an input-output table for a developed economy has more or less ceased to be a point of argument. But the practicability of constructing such a table for an underdeveloped country is still a highly debatable subject (1). In my thinking, however, these defects are basically of statistical and administrative nature and do not cause an unsurmountable problem for the future use of an inter-industry model. For instance, Turkey, with more data and information coming in, constructed another input-output table (1963) for the programming of the Second Five-Year Plan (1968-1972). The preparation of the 1963 input-output table was much easier due to more incoming data and the light of past experience.

One can conclude that, as Professor J. Tinbergen pointed out (2), the input-output table of 1959 was at least very significant in pointing out the inter-industry relations and emphasising the strategic industries. After all it is not the number of the entries which are important, but the significance of the entries themselves. Furthermore, construction of such a Table in Turkey helped the SPO to discover the gaps and inconsistencies in the available data.

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(1) The major objections to this method in developing countries are: (i) high opportunity cost of collecting and processing the necessary data; (ii) the complete lack of statistics of any kind; (iii) lack of personnel capable of constructing such a table; iv the use of the table is limited because of lack of interdependence between sectors; (v) the assumption of the rigidity of technological coefficients.

(2) "In this way, although a much simpler system of equations is obtained than for the more complete input-output tables, it remains possible to keep track of the more important inter-relations between sectors." See J. Tinbergen, Methodological Background of the Plan, op. cit., p.73

APPENDIX I

Table 1 - passive Incremental Capital-Output Ratios in Various Sectors, 1963-67

	Production targets		Gross Investment	Incremental capital output ratio	
	1963	1967	(1963-67)	(ICOR)	$\Delta K / \Delta Y$
Agriculture	36,470.0	43,560.0	10,548.4		1.48
Mining & quarrying	2,583.9	3,577.4	3,233.0		3.25
Manufacturing	20,867.1	31,462.1	10,089.2		0.95
Energy	729.1	1,187.7	5,134.0		11.19
Transportation and communications	3,744.9	5,340.2	8,159.4		5.11
Average (ICOR)					4.39

Notes: 1) Incremental capital-output ratio or marginal capital-output ratio is computed by dividing the addition to the capital stock by the increase in the output in that sector.

2) The (ICOR) computed is in terms of gross values since investment and production of the various sectors are given in gross terms. For the computation of net (ICOR), depreciation must be deducted from the gross investment in each sector.

(e) Implementation Results of the First Five-Year Plan

In this section, I shall be dealing with the implementation results of the First Plan, particularly in relation to the overall rate of growth, domestic savings and total investment. Since the actual results are available only for the first four years of the plan implementation, the analysis below will be confined only to this period.

Rate of Growth During 1962-66 period, the actual increase in the GNP was, on average, 6.5 per cent per annum as compared to the plan target of 7 per cent. This simple average rate is the arithmetic average of the first 4 years (See Table 13). But for a more accurate rate, the compound rate of growth formula should be applied. Since the actual realised figures for GNP in 1962 and 1966 were 61.8 billion TL and 79.5 billion TL. respectively, the compound rate of growth for this period will be:

$$P_n = Po\ (1 + r)^n$$

$$\log Po = \log 61.8$$

$$= 1.7910$$

$$\log P_n = \log 79.5$$

$$= 1.9004$$

then:

$$\log P_n = \log Po + n.\ \log\ (1 + r)$$

$$\log\ (1 + r) = \frac{\log Pn - \log Po)}{4}$$

$$\log\ (1 + r) = \frac{0.1094}{4} = .02735$$

$$1 + r = 1.064$$

$$r = 1.064 - 1$$

$$r = .064$$

$$r = 6.4 \text{ per cent}$$

In other words, the GNP rose by 17.7 billion TL. over the first 4 years of the plan period. As compared to the plan target of 40 per cent increase, the increase in GNP (from 61.9 billion TL. to 79.5 billion TL.) represents a rate of increase of 28.5 per cent; with 1967 result yet to come, it is difficult to tell if this rate can be achieved.

The actual annual rate of growth over this period varied between 4.6 per cent and 8.8 per cent. In 1963 the actual rate of growth in GNP exceeded the target which was foreseen in the plan. The 7.7 per cent rate of growth in this year was due to the extremely substantial growth in agriculture which attained a 7.6 per cent growth rate (as compared to 4.2 per cent plan target). The substantial increase in agriculture was not, however, due to intensive farming practices, but to an excellent harvest and weather conditions.

Table 13 - Plan and Actual Gross National Product, 1962-66

Billion TL (at 1965 prices)

Years	Plan Targets	Annual Rate of Growth %	Index (1962=100)	Actual Realisation	Actual Annual Rate of Growth %	Realisation Ratio %	Index (1962=100)
1962	62,497	-	100	61,882	-	99	100
1963	66,871	7.0	106.9	66,648	7.7	99	107.7
1964	71,553	7.0	114.4	69,910	4.9	97	113.0
1965	76,562	7.0	122.5	73,127	4.6	95	118.2
1966	81,921	7.0	131.0	79,536	8.8	97	128.5
Average increase		7.0			6.5	97	

Source: It is based on the figures given in Table 1, in "Kalkinma plani, 2ci Bes Yil, 1968-72, Ankara, 1967, p.2

While agriculture achieved an exceptionally high rate of growth in the First Year, the other sectors, particularly industry, lagged behind the plan target. It was foreseen in the plan that the non-agricultural output would rise annually by 9 per cent with manufacturing and energy growing by 13 per cent. But the implementation result in 1963 showed that only 7.5 per cent was achieved which was much below the plan target.(1)

Industry by itself (comprising also mining and public utilities) achieved an 8 per cent rate of growth in 1963. It is said in the Second Five-Year plan that the slowdown which occurred in industry was the result of the deflationary measures taken to prevent inflation which resulted in a considerable fall in the general level of demand. This, in turn, caused a lower utilization of capacity and a considerable drop in industrial output.(2)

(1) See OECD, Turkey, 1966, Paris, Feb. 1966, p.27

(2) See Kalkinma plani, 2ci Beş Yil 1968-1972, SPO, Ankara, 1967, p.4

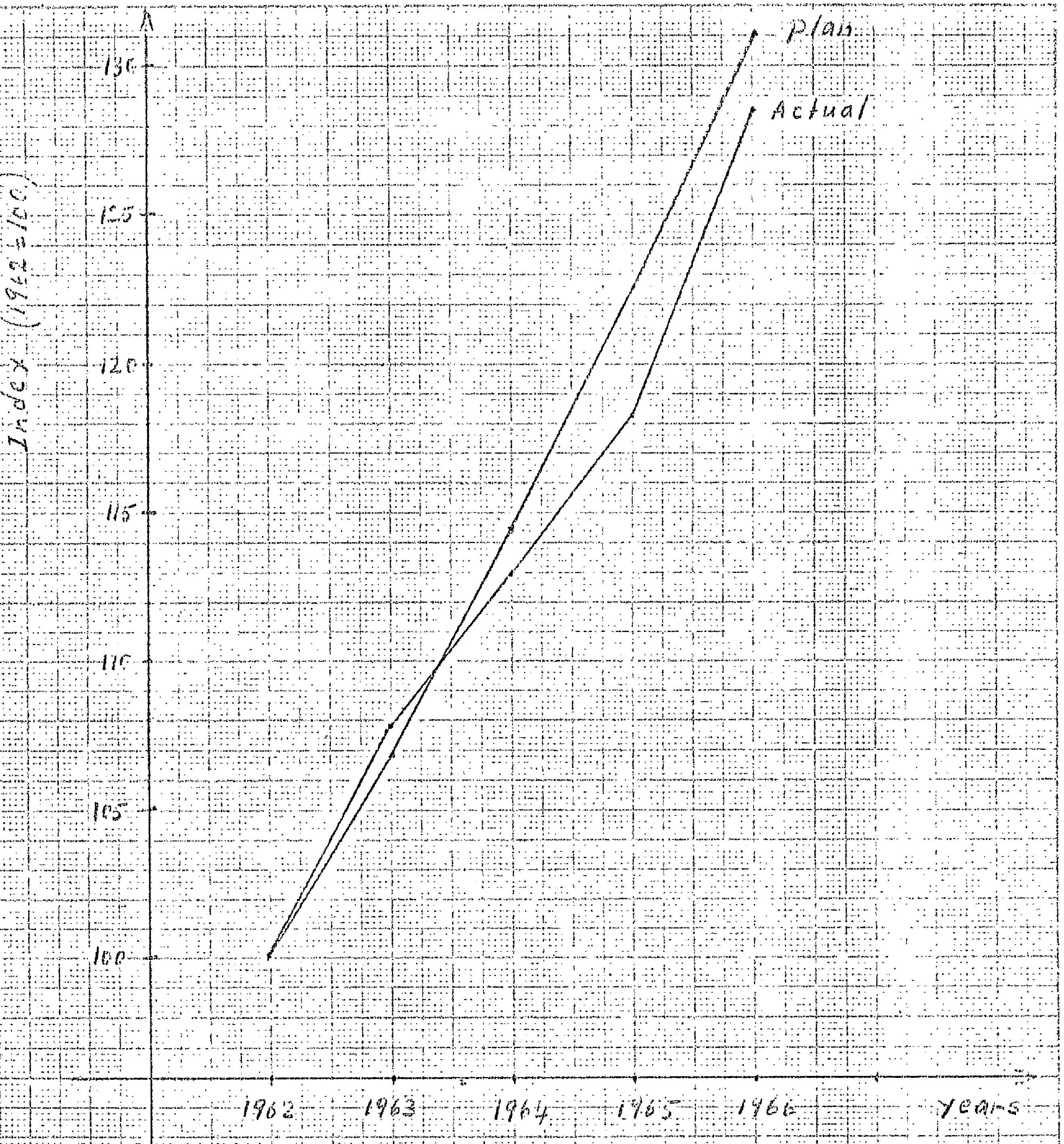

FIGURE 1 – Index of Rate of Growth: planned and Actual

The other reason, as we shall see later, was the retardation which occurred in the execution of public investments, particularly in those projects which are undertaken by the SEE. In fact, public investment in 1963 reached the level of 5.5 billion TL. as compared to the plan target of 6.6 billion TL. Whereas private investments in the same year exceeded the plan target by achieving 5.3 billion TL. against its plan target of 4.3 billion TL.(1)

The rate of growth in 1964 and 1965 was considerably below the plan target of 7 per cent, being 4.9 per cent and 4.6 per cent respectively. This extremely sharp drop in the overall rate of growth was due to the fact that agricultural output in 1964 dropped to its 1963 level; and later in 1965 indicated a negative rate of growth of -3.3 per cent. Moreover, there was a notable slow down in private business and investments (due to the Cyprus problem) which can be considered to have played some part in this performance.

As Table 13 indicates 1966 was the most successful year of the plan period, realising a rate of growth of 8.8 per cent. Again, here the overall economic growth was heavily dependent on the agricultural sector, where the latter maintained an 8.6 per cent rate of growth.

Actual Domestic Savings

Looking at the realised figures for GNP and domestic savings, one can readily calculate the average and marginal rate of domestic savings. As can be seen from Table 14, average domestic savings increased from 9.5 per cent to 16.1 per cent of GNP during the period 1962-66. This represents, on average, 13.4 per cent of GNP. From the same figures again, marginal rate of domestic savings can be computed. Average marginal rate of domestic savings can be found to be 41.3 per cent (for the 5 year period) as compared with the 26.5 per cent of marginal propensity to save based on plan projections.(1) The interesting conclusion that can be inferred from this, is that the Development Plan had been financed mainly by domestic savings. This appears to be in line with the First Plan objectives.

Total domestic savings that were realised over the five-year period (1962-66) accorded a rise of 117 per cent amounting to 47.8 billion TL. against against the 49.9 billion TL. projected in the Plan. This represents

(1) Ibid., p.3

(2) This rate of marginal saving is for the overall economy including both public and private sectors.

a rate of implementation of 95 per cent which might be considered an extreme accomplishment.

Table 14 - Actual Average and Marginal Domestic Savings (1962-66) Billion TL. (1965 prices)

Years	GNP	Total Investments.	Current Account Deficit	Domestic Savings	Average Savings $\frac{DS}{GNP}$	Marginal Savings $\frac{\Delta DS}{\Delta GNP} \times 100$
1962	61,882.8	8,157.6	-2,178.0	5,979.6	9.5	-
1963	66,648.8	10,837.7	2,709.0	8,129.7	12.1	45.0
1964	69,910.3	10,828.1	0,954.0	9,874.1	14.0	51.5
1965	73,127.1	11,950.3	0,693.0	11,257.3	15.3	43.7
1966	79,536.7	14,313.3	1,476.0	12,837.3	16.1	25.0
		Average Domestic Savings			13.4	41.3

Source: It is compiled from the figures given in Table 7, in the Second Five-Year Plan 1968-72, SPO, Ankara, 1967, p.4. Average and marginal rate of saving figures are mine.

The realised and planned total investment and domestic savings are presented in Table 15. The high rate of implementation in domestic savings means that, domestic savings were augmented by additional taxes (direct and indirect), public revenue from the State Economic Enterprises (SEE) and partly by deficit financing.(1) In fact total government revenue increased from 11.1 billion TL to 19.4 billion TL. during the period 1962-66, representing a 75 per cent increase. The highest increase in the government revenue occurred in the funds from the SEE and in the total tax revenue. For instance, the SEE revenue rose almost 4 times its 1962 level, and tax revenue increased by 74 per cent over the plan period. The share of the latter in the total revenue had also shown a considerable increase, rising from 58 per cent in 1963 to 64 per cent in 1966.(2) This was a notable increase, despite the fact that the Plan target was not attained.(2)

(1) The additional increase in the tax revenue was due mainly to newly introduced indirect taxes, i.e. travelling tax, import stamp duty. Previous tax rates were also increased. In the case of Direct taxes, too, new taxes were introduced, i.e. agricultural income tax and motor car tax. For the above figures see, SPO, Kalkinma Plani, 2ci Bes Yil 1968-1972, Ankara, July 1967, pp.5-6

(2) Ibid, p.5, Table - 8

Table 15 - Realised Total Investment and Domestic Savings
Billion TL. (1965 prices)

Years	Total Investment			Domestic Savings		
	Plan (a)	Actual	Realisation Ratio	Plan (a)	Actual	Realisation Ratio
1962	10.1	8.1	80	7.6	5.9	77.6
1963	11.3	10.8	95	8.5	8.1	95.2
1964	12.7	10.8	85	9.7	9.8	101
1965	13.9	11.9	85	11.3	11.2	99
1966	15.4	14.3	92	12.8	12.8	100
Total	63.4	55.9	88	49.9	47.8	95.7

Note: It is arranged from the figures given in Table 7, in the Second Five-Year Plan 1968-72; and the figures given in the First Five-Year Plan. (a) Plan targets for total investment and domestic savings are originally based on 1961 prices. Therefore, these figures have to be converted into 1965 prices in order to compare them with the realized figures which are based on 1965 prices. For this purpose, the price increase over 1961-65 period is worked out to be 19 per cent. I have accordingly calculated the planned investment and domestic savings.

Realised Total Investments:

Total investment allocated to economic development in the period 1963-66 did not reach the corresponding plan targets. As compared to the Plan target of 52.1 billion TL. total investment which was undertaken during the same period stood at 47.9 billion TL. (See Table 16). This indicates an implementation ratio of 91 per cent(1). In other words, total investment rose from 10.8 billion TL to 14.3 billion TL. over the 4 year period.

As corresponding to the low rates of growth in 1964 and 1965, the rates of implementation of total investments in both years were relatively low (87 per cent). This may explain the close relationship between the rate of growth in the economy and total capital outlay undertaken in the same period.

During the First five-years (1962-66) of plan implementation, total investment as a percentage of GNP had fluctuated between 13 per cent and 18 per cent. Taking the whole period, it can be observed that, on average, 15.8 per cent of GNP was allocated to capital formation which was considerably below the average expected in the Five-Year Projection (18 per

(1) Taking 1962 as a base year, total investment rose by 75 per cent, increasing from 8.1 billion TL in 1962 to 14.3 billion TL. in 1966 (See Table 15).

cent of GNP)[1].

Table 16 - Total Investment - Plan Targets and Actual Realisation, 1963-66 Billion TL. (1965 prices)

Years	Plan Targets	Actual	Realisation Ratio %	Index (1962 = 100)
1963	10.9	10.8	99.1	131.7
1964	12.4	10.8	87.1	131.7
1965	13.8	12.0	87.0	146.3
1966 (temp.)	15.0	14.3	95.3	174.4
Total	52.1	47.9	91.9	

Source: Kalinma plani, Zci Bes Yil 1968-72, SPO, Ankara, 1967, p.3

A brief summary of the performance of public and private sectors might be useful. The distribution of total investments during 1963-66 period, between public and private sectors are presented in Table 17.

As can be seen from the Table, while private investment exceeded the plan targets throughout the period, public investment lagged considerably behind the plan targets. The implementation ratio in the former was over 100 per cent and in the latter 81 per cent.

As a result, the share of private investments in the total investment outran considerably the plan projection where it was to remain around 40 per cent. But actual implementation results shown in Table 17, indicates that private investments constituted 49 per cent of the total investment outlay in 1963, though this dropped later to 42.9 per cent in 1966.

It follows that, contrary to the Plan projection the private sector had played a greater role than was expected. In actual fact in the First Plan it was planned that the private investments would rise by 11 per cent per annum constituting 8 per cent of GNP at the end of the Plan

TABLE 17 (SEE OVER)

(1) Total investment as percentage of GNP was 13.2 per cent in 1962; 16.3 per cent in 1963; 15.5 per cent in 1964; 16.3 per cent in 1965 and 18.0 per cent in 1966.

Table 17 - Distribution of Investments between public and private sectors, 1963-66 Billion TL. (1965 prices)

Years	Private Sector			Public Sector			Share of Private Investment	
	Plan target	Actual	Realisation ratio (1)	Plan target	Actual	Realisation ratio (1)	Plan	Actual
1963	4.3	5.3	123	6.6	5.5	.83	39.4	49.1
1964	4.9	5.0	104	7.6	5.8	.76	38.7	46.3
1965	5.4	5.5	102	8.4	6.5	.77	39.1	45.8
1966 (temp.)	6.0	6.4	106	8.9	7.9	.88	40.0	42.9

Source: Kalkinma Plan, Zci Bes Yil 1968-72, SPO, Ankara, 1967, p.3

(1) Realisation rates are added to the Table by me

period.(1)

First, though the projection of private investment was a common sense estimate(2), it turned out to be a realistic and an attainable one. If one excludes 1964, the annual rate of growth of private investment reached 10 per cent in 1965 and 16 per cent in 1966(3). The rather high rate of implementation in the private investment points to the fact that the planners had underestimated the potential which existed in the private sector. This, as often argued, was because the planners based their estimates of private investment on the period 1960-62 which were years of recession in the private sector.

Second, though the attainment of the planned private investments was quite desirable, this does not mean much unless it is in conformity with the pattern of allocation envisaged in the plan. Unfortunately, this is what the private sector had not accomplished, despite many fiscal and monetary measures. For instance, the share of housing investments in the total private investment was 43.2 per cent in 1963 and it rose to 46.0 per cent in 1965, while the share of manufacturing investments in total dropped

(1) See First Five-Year Plan, 1963-67 SPO, Ankara, p.108

(2) An estimate was made to find the volume of private investment in the plan. This was based on past data. But this was difficult since past investment series did not reveal a specific trend. In other words, the volume and distribution of private investment in past years was largely influenced by inflation, foreign trade restriction and the political situation. The final estimate was based on 1960-62 period. See FFYP 1963-67, p.109

(3) They are calculated from Table 17.

from 36.4 per cent to 23.9 per cent over the same period.(1)

The breakdown of private investment by sectors is not available for the whole period, but the implementation results given in 1966 annual programme can be useful in showing the private sector performance in dwellings and manufacturing.

Table 18 - Investments in Dwellings (1963 and 1964)
In million TL (1961 prices)

	1963		1964	
	Plan Target	Actual	Plan Target	Actual
Public	343.8	274.8	222.2	183.6
Private	1756.9	2024.4	1915.7	1896.9
Total	2100.7	2299.2	2137.9	2080.5

Source: 1966 Annual programme, SPO, Ankara, 1965, p.532

It can be seen that private investment in housing in 1963 exceeded its plan target by 15 per cent, while investment in 1964 was quite close to the plan target. But the building permits issued in 1965(2), indicated that construction activity was growing faster than the plan had envisaged.

Despite the fact that rates for building tax were revised and building tax exemptions were partly abolished and loans from the Real Estate and Credit Bank were limited to the construction of utility houses, the expected change in the composition of private investment did not take place according to the Plan Projections.(3)

The measures taken to channel private funds into manufacturing rather

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(1) See SPO, Kalkinma Plani, Zci Bes Yil 1968-72, Ankara, 1967, pp.3-4. The rather high share of manufacturing investment in the total private investment was due to the investment allocated to the Eregli Iron-Steel Plant which is half-undertaken by the private sector.

(2) Öngüt, I., The Private Sector in the Five-Year Plan, in "Planning in Turkey" Middle Eastern Technical University, op. cit., pp.160-161

(3) The reduction in residential investment was to be achieved by measures such as: a) eliminating tax exemptions, b) imposing higher building taxes, c) limiting credits to utility housing. The present 10-year tax holiday for new buildings which makes investment in this field particularly attractive was reduced in 1964 and was maintained only for new hotels and cheap dwellings. Also the specialised Mortgage Bank, Emlak, ve Kredi Bankasi, in 1966 provided loans for non-luxury apartments up to 40,000 TL which carry a 2-year grace period, a 20 year amortization and a 6.5 per cent interest rate, exceedingly low by Turkey's standards. See OECD, Turkey, 1966, Paris, p.4041; OECD, Turkey, 1963, Paris, p.40.

than house-building, including measures such as: more favourable credit facilities and tax reductions to the entrepreneurs who invest in the required fields. Both accelerated depreciation allowances and a scheme to exempt certain proportions of reinvested funds from income and corporation taxes were approved under the 1963 Income Tax bill (1).

The persistence of the private sector in housing activities can be connected to the following reasons:

a) productive investment requires entrepreneurship but building a house does not; b) the amount of capital available for building a house or apartment is generally insufficient to undertake a large-scale industrial project; c) residential investment provides quick and high returns, while industrial projects require longer gestation periods and longer pay-off periods; d) industrial projects depend heavily on imported capital-goods and raw materials; but housing investment can easily be carried out since the domestic market provides all necessary ingredients, i.e. steel, iron, cement, etc.

The composition of private investment in manufacturing industry can provide a better picture on the direction of private investment. But the statistical data here are available only for years 1963 and 1964.

Table 19 - Private Investment in the Manufacturing Industry (Total for 1963 and 1964) in Million TL.

Type of Industry	Programme (1963 + 1964)	Actual (1963 + 1964)	Realisation Ratio %
1. Consumption Goods	292.2	650.8	217
2. Intermediary Goods	1930.8	1989.4	103
3. Investment Goods	531.0	302.4	57
Total	2761.0	2942.6	107

Source: 1966 Annual Programme, SPO, Ankara, 1965, pp.174-177; also I. Öngüt, op. cit., p.160

First, it can be seen that the realised private investment in Manufacturing industry exceeded the programmed targets by 7 per cent in the first two years of the Plan period.

Second, the above achievement becomes less significant if we look at the composition of actual investments in Manufacturing. Private investment in consumer goods industries (i.e. textile, clothing, food processing)

(1) OECD, Turkey, Paris, 1963, p.40.

by far exceeded the programmed target, while these investments in capital-goods (machinery and equipment, chemicals) fell substantially below the planned target (57 per cent rate of implementation). Its investment allocation to intermediary goods industry, however, was more or less in line with the plan projection.

Third, it can be concluded that, too large a proportion of non-residential fixed private investment was concentrated in traditional fields where profits were substantial but where at present excessive capacity exists, i.e. particularly textiles and clothing. The priorities specified in the first plan, however, included petro-chemicals, rubber, basic metals, machinery and transport equipment and wood products. But, as can be seen, new ventures of this kind did not attract the private sector.

Fourth, it can be deduced from above, that the policy measures(1) which were put into effect during the plan implementation were not sufficient or effective for such a transformation of resources from unproductive to productive fields in the long run. Consequently, there were serious arguments on the unfavourable performance of the private sector for not conforming to plan objectives. It was strongly argued that the indirect controls were not sufficient to speed up such a shift in private resources, and thus a system of investment licensing should be introduced to bring the private investments toward plan objectives.

On the other hand, public investments did not accord a substantial achievement; its rate of implementation fell below the plan target considerably. Average implementation rate for the four-year period (1963-66) was 81 per cent. In other words, total public investment reached the level of 25.7 billion TL. as compared to the plan target of 31.5 billion TL. over the same period.

The distribution of public investments by government agencies are not given in the second plan, and therefore the table presented by No. Olcen,(2) is the only one available.

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(1) Measures to encourage private investment to heavy industries, included: accelerated depreciation for industrial activities, investment allowances for selected fields. A system of tax incentives was adopted in Turkey by which investors in selected fields which took advantage of preferential rates of terms of payment for import taxes on investment goods as well as of tax relief for profits to be derived from such specified investments.

(2) N.. Olcen, A Follow-up Study: the Implementation of the Investments foreseen in the first Five-Year Plan, in "Planning in Turkey", Middle Eastern Technical University, ed. by S. Ilkin. Publication No.9, June 1967, p.282, Table 2.

The percentage of public investments undertaken by the General Budget dropped from 32.2 per cent in 1963 to 23.3 per cent in 1965; whereas the percentage share by the SEE in total, rose from, over the same period, 37.1 per cent to 42.3 per cent. The highest share of the SEE in total public investment, occurred in 1964 (46.5 per cent of the total). The subsequent drop in the percentage share of the SEE was due to the increased investments in Annexed Budgets and Revolving Funds, (see Table 20).

Table 20 Public Investments by Type of Budgets - percentage

Type of Budget	1963		1964		1965	
	Percentage distribution of Investments	Realisation Ratio	Percentage distribution of investment	Realisation ratio	Percentage distribution of investment	Realisation ratio
General Budget	32.1	0.87	26.6	0.84	23.3	0.82
Annexed Budget	25.6	1.02	23.0	0.86	30.5	0.79
Revolving Fund	5.1	0.91	3.9	0.86	3.8	0.85
SEE	37.1	0.87	46.5	0.67	42.3	0.73
Total Investment	100.0		100.0		100.0	
Average Realisation ratio		0.91		0.78		0.77

Source: N. Ölcen, a Follow-up Study; the Implementation of the Investments foreseen in the FFYDP in "Planning in Turkey" op. cit., p.282 TABLE 2.

As a whole, the share of industrial investments by the SEE had increased substantially between 1963 and 1965. But since industrial projects have larger gestation periods and are more dependent on foreign credits, the investment realisation ratio for the SEE was much lower than others (varying between 87 per cent and 67 per cent). Other reasons for this will be explained fully in the subsequent sections.

However, the implementation rates in General Budget and Revolving Fund had been quite considerable.

Sectoral distribution of public investments and their realisation ratios are also interesting in showing that the public investments in productive sectors (i.e., manufacturing and energy) were not up to the plan forecast and they did not maintain a high rate of implementation.

The following conclusion can be drawn from the sectoral distribution of public investments;(1) i) Taking the first three years of the Plan

(1) In view of the Table presented by N. Ölcen, op. cit., p.289

(1963-65), we notice that public investments devoted to primary sectors rose from 16 per cent to 21 per cent (i.e. agriculture); and secondary sector rose from 28.7 per cent to 37.5 per cent. Public investment on tertiary sector,(1) on the other hand, dropped from 55.3 per cent to 41.5 per cent over the same period. But, the resources released from the tertiary sector were absorbed by the increases in the current expenditure of the government due to collective bargaining expenditure, construction of large and luxurious general directorate-office building etc.(2)

ii) The lowest rate of implementation, occurred in manufacturing, energy and transport sectors, where the implementation rate on 1965 was 55 per cent, 76 per cent and 78 per cent respectively. The industrial project's implementation rate had lagged behind the average rate, due to many complicated factors; among those the most important reasons were the considerable delay in project preparation and delays in obtaining the necessary foreign resources. It would be safe to argue that the bad performance of the public sector, particularly in the manufacturing sector could be cited as one of the major reasons why the overall rate of growth in 1964 and 1965 did not attain its planned target.(3)

iii) In the sphere of public sector, the highest realisation ratio was attained by agriculture and mining (85 per cent and 94 per cent respectively). This performance in the above fields can be ascribed to the financial resources which were basically provided domestically. Also, projects in these fields were already prepared and ready for implementation.

The principal reasons for the retardation in the public industrial projects are of a financial, administrative and legal nature. The most important ones however, can be listed as follows:(4)

a) There was a considerable hesitation in taking decisions by the government agencies, particularly by the SEE. The Law No.440

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(1) Tertiary sector includes transport, tourism, housing, education, health and other services. For these figures see Ibid, Table 3, p.283.

(2) See N. Olcen, Ibid, p.285

(3) In 1964, the implementation rates in manufacturing and energy were 60 per cent and 76 per cent respectively. Ibid, Table 3, p.283.

(4) On this point see N. Ölcen, op.cit., pp.287-289; also see SPO, Kalkinma plani, 2ci Bes Yil 1968-72, July 1967, pp.4-5.

was enacted in order to give administrators of the SEE power to take decisions on their own in relation to price regulation, preparation of projects, investment proposals and choice of firms; thus dispensing with the approval of the concerned Ministers. But, unfortunately the SEE administrators refrained from acting on their own initiative and preferred to obtain written approval from the related Ministry, even in matters of minor importance. The fear of taking responsibility, of course, led to great loss of time in decision-taking and implementation of investment projects.

b) It must also be noted that at the beginning of the plan period, there was not a sufficient number of Projects to consider and undertake. For instance in 1962 and 1963, it was said that most of industrial projects did not even exist in idea form.(1) Nor was there any proposal for constituting a realistic alternative to those proposed. Thus, to carry out Project research and implementation simultaneously had proved to be impractical and difficult; this consequently led to serious bottlenecks.

c) A good number of government agencies prior to the First Plan was involved only in production and managerial activities and did not have the experience to undertake large projects. But these agencies were forced to become investment agencies at short notice without giving any consideration to their ability in terms of technical and economic experts. (For instance, SEKA, The General Directorate of Cellulose and Paper Factories, the PTT are cases in question). At short notice, these agencies were handed the task of preparing and executing industrial projects each probably to the value of 300 million TL. To set up the necessary organisation, of course, took some time which caused delay in the execution of projects.(2)

d) More importantly, there was a considerable delay in external finance as well as domestic credits, over the plan period. The foreign credits promised by the Consortium (OECD) did not arrive in due time; and there was confusion on the part of government agencies on questions such as where, and how to apply for both external and internal credits.

Besides, foreign credit organisations did not specify how,

(1) A private interview with Cemil Cinar, a planner at the SPO, Ankara, February 1969; also an interview with B. Bender Lioplu, a planner on paper industry, at the SPO, February 1969, Ankara.

(2) N. Ölcen, op. cit., p.288

with what documenta and under what conditions such applications should be made. This, of course, caused further delays in the implementation of projects.(1)

Again, as N. Ölcen had shown us in his study, the foreign-exchange requirements of industrial projects were strongly correlated with the size of the projects (2). For instance, his findings showed that in 1965, foreign exchange requirements of investment projects costing between 15 - 50 million TL., were, on the average, 15 per cent of the cost; while for projects costing between 50 - 100 million TL., this ratio rose to 30 per cent(3).

The above figures may indicate that big industrial projects depended heavily on foreign-exchange sources which did not come at the right time.

e) There was not (and still so) a sufficient number of organised firms in the construction sector that could undertake the execution of large-scale industrial projects. The construction sector is not well developed and has difficulty in obtaining the machinery and equipment it requires. According to Law No. 2490, "The State is obliged to award the construction to the lowest bidder". But, in practice, it is always possible for a second bidder to undertake the construction by proposing a 15 per cent reduction in the price offered by the lowest bidder. This, of course, creates legal conflicts and compensation to the first bidder, eventually lead to considerable loss of time.(4)

f) Another factor, though less important, was the 3 month lag between the fiscal year and the programme year. Annual programmes in Turkey become effective in January, while the administrators of the General Bedget and Annexed Budgets were forced to wait till the parliamentary approval in March before they could make the necessary expenditure disbursements for new projects. This shortcoming is still apparent.

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(1) In 1965, for instance, 12 large scale industrial projects required almost 1169 million TL. worth of external funds which represented 55 per cent of their total cost. But the amount of foreign exchange that could be obtained for these projects during years 1964 and 1965.programmes was only 236 million TL. This, of course, represented a 20 per cent rate of realization. This supports the fact that shortage of foreign credits was one of the important factors in retarding the implementation of public projects. See N. Ölcen, op. cit., p.292

(2) N. Ölcen, p.282

(3) N. Ölcen, op. cit., p.283

(4) The Law No.2490 was supposed to be amended so as to avoid these problems, but there is no indication of this being done.

g) Finally, there are reasons to believe that investment programmes are not prepared realistically. The general assumption for the completion of such projects is 3 years; this may seem quite an optimistic timespan for a gestation period. Four or five years would be a better assumption to take. In short, there is a tendency in Turkey to underestimate the duration of programmes.

It can also be added there was not an effective system of implementation of investment programmes during the First Plan period.

Conclusion

1. Despite the remarkably high rate of growth in 1963 and 1966, the overall rate of growth set out in the First Plan was not achieved in the first four years of the plan implementation.

2. It must be noted that the yearly fluctuation which occurred in agricultural output has been one of the major factors in causing the unsteady growth in the economy. The economic growth, as it was in the past, has been mainly determined by the performance of agriculture and the latter, in turn, by weather conditions.

This, in other words, shows that investment allocation to irrigation and fertilizers did not offset the dependence of agriculture on climatic conditions. With the irrigation scheme requiring a long gestation period, perhaps it was not possible to see the effect of irrigation works within the first 4 years of the plan implementation.

3. The overall rate of growth is also closely related to the growth rate in industry. But, industry as a whole, as was mentioned earlier, did not record a satisfactory growth to attain its planned output target. This was mostly due to delays in the provision of external finance and to the lack of fully prepared public investment projects. In addition to these, the government investment agencies did not have the necessary experience for undertaking such large-scale projects.

Projects preparation in the public sector has been one of the main factors holding back the progress of investment. Therefore, a considerable effort is needed to accelerate the preparation of sound and feasible investment projects. Also, aid-giving countries should, for their part, be asked to provide their external credits promptly without causing notable delays in project financing.

4. From the implementation results, it follows that the private sector, though it exceeded its planned target, did not conform to the plan

objectives laid down. Private sector, contrary to the planners' forecast, had confined almost half of its resources to traditional activities i.e. luxurious housing. Its participation in the manufacturing industry was also in the wrong direction where most of its non-housing investment was devoted to traditional consumer-goods industries instead of heavy industries, (i.e. textile and clothing, food).

The problem of private productive investment remains one of capital and entrepreneurs. Directing savings towards productive investment remains difficult and finding willing investors capable of managing new industries even harder.

This may implicate two alternatives: a) either the policy measures adopted during the plan did not play an effective role to make the private sector direct its resources to productive fields; thus more effective and constructive measures of a fiscal and monetary kind would be needed to achieve the desired pattern(1); or b) more government participation in the field of heavy industry should be decided upon; with a reluctant private sector in the sphere of capital-goods industries, it is logical to argue that a predominant role should be given to the State Economic Enterprises (SEE) in this field.

5) Domestic savings in the same period showed a higher realisation ratio than total investments. Accordingly, marginal rate of saving recorded a much more remarkable rise than was expected in the plan. Thus, one of the major objectives of the First Five-Year Plan, which was to draw most of the finance from domestic savings, was therefore accomplished.

Perhaps the most important aspect of the development in the first 4 years of the plan period was the rapidly rising proportion of public investment financed out of domestic sources (from 52 per cent of the total in 1962 to 56 per cent in 1963, 73 per cent in 1964 and 74 per cent in 1965)(2).

Irrespective of divergencies with the plan figures this trend is of the utmost significance for the future.

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(1) If indirect measures do not bring a desirable solution to the problem, a system of investment licencing can be introduced to bring the private sector into conformity with the plan objectives or a more general suggestion would be to provide a broader capital market. But, the creation of a capital market is a long-term process and may require the formation of large joint-stock corporations as an effective mechanism for attracting small money holdings. It may be argued, stimulation of a capital-market may be more useful in the long-run than the short-term tax incentives.

(2) See OECD, Turkey. Paris, 1966, pp.33-35

6) The pattern of investment allocation among various sectors might be one of the reasons why the target rate of growth was not achieved. The composition of investment as projected in the First Plan was directed toward social overhead capital (SOC) investments rather than directly productive investments.

From the plan implementation, we notice that allocation to SOC sectors was more than the planned target. For instance, investment in SOC sectors represented 60.6 per cent of the total investment outlay as compared with its planned target of 58 per cent. Directly productive investments, on the other hand fell below the projected target, constituting 39 per cent of the total investment, as compared with the plan projection of 41.7 per cent.(1)

This may partly explain why the overall rate of growth has not been maintained.

However, the divergence of investment allocation to SOC vs. DPI from the plan projection, does not seem to be substantial; thus the capital-output ratio of 2.6:1 that was projected by the SPO appears to be attained. (See Table 21). Incremental capital-output ratio that is realised during the first four years of the plan implementation was 2.5:1 (see Table 21).

Table 21 - Realised Incremental Capital-Output Ratio for the period 1963-66. Billion TL (1965 prices)

Years	Y	r	ΔI	$\Delta I / Y \times 100$	(ICOR) α
1963	66.6	7.7	10.8		
1964	69.9	4.9	10.8		
1965	73.1	4.6	12.0	16.5 per cent	2.5
1966	79.5	8.8	14.3		
Total	$\Sigma Y = 289.1$	$\Sigma \frac{26.0}{4} = 6.5$	$\Sigma I = 47.9$		

Note 1) The figures for GNP and investment are taken from Table 1, SPO "Kalkinma Plani," Z6i Bes Yil, 1968-72, Ankara, July 1967, p.2

2) Incremental capital-output ratio is simply calculated from the Harrod-Domar growth formula:

$$g = \frac{s}{\alpha}$$

$$6.5 = \frac{16.5}{\alpha}$$

$$\alpha = \frac{16.5}{6.5}$$

$$\alpha = 2.5$$

(for footnote 1 see next page

p. 91 - paragraph 1 (line 4), should read:

... The maintenance of a considerably low capital-output ratio can be attributed, mainly to the existence of unutilised capacity in the SOC investments in the pre-plan period. Otherwise, the concentration of investment on SOC sectors might have caused a considerably higher capital-output ratio.

As compared with the Plan's capital-output ratio of 2.6:1, this seems to be a reasonable accomplishment. But with 1967 figure yet to come, this ratio may be expected to exceed the original projection in the plan. The maintenance of a considerably low capital-output ratio can be attributed, mainly, to the existence of unutilised capacity in the SOC investments both in the past and present, Otherwise, the concentration of investment on SOC sectors might have caused a considerably higher capital-output ratio.

7) The rate of growth of National Income in any economy depends first on the size of total investment; second, on the composition of an investment programme.

The size and composition of a programme are interrelated, not only directly, in that the total programme obviously consists of the sum of individual projects, but also indirectly in that the size will depend on the composition through the effect of the composition on growth, on taxable capacity, on export earnings and on incentives in the private sector(1). This puts the burden of programming upon the analysis of individual projects.

Given the total investment and sectoral allocation, the problem becomes selecting the best alternative in a particular sector. Thus, we enter into the problem of selecting investment projects by applying theoretical investment criteria. This problem will be dealt with in part III, where I shall make two case studies.

(Footnote (1) from page 90)

SOC Investment includes energy, transport, housing, education, health, tourism and services. Directly productive sectors include agriculture, mining and manufacturing. The above figures are calculated from table 6, in the "Kalkinma Plani", Zci Bes Yil, SPO, Ankara, July 1967, p.4

(1) W.F. Stolper, Investment Criteria from a Planning Standpoint, in "Planning without Facts", p.144. It can be said that the size of a programme is a function not only of foreign and domestic savings but of its own composition.

PART II

A CRITICAL SURVEY OF GENERAL INVESTMENT CRITERIA

CHAPTER 3

PRICE MECHANISM AND THE CRITERION OF COMMERCIAL PROFITABILITY

1- Introduction: In recent years most of the developing countries have set up development programmes with the belief that the government in the process of resource allocation can speed up the rate of economic growth. This conviction is based upon the fact that investment decisions determined merely by the free-market forces are insufficient to provide an optimum allocation of resources for rapid economic growth. It is widely recognized now that the market mechanism, for reasons we shall explain below, is not operating properly; or as is often argued, even if it is, a perfect competitive market it would still not produce the best results for economic development.

In the following sections it is my intention to shed some light on the major defects of market mechanism as an appropriate instrument for resource allocation. It is not my purpose in this chapter to examine every aspect of market mechanism or enter the heated discussion of market mechanism vs. central planning doctrines. Instead, I am here merely concerned with the inadequacy of price mechanism in mixed economies as far as investment decisions are concerned.(1)

Before I take up this point it may be useful to see the basic assumptions on which the free-market mechanism depends and which can make actual costs measure social cost and actual receipts measure social benefits.

First, price mechanism operates under the assumption of full employment of resources and perfect competition in all product and factor markets. At full employment condition and in a perfect competitive state,(2) marginal product of labour would be equal to the wages paid; marginal productivity of capital will be equal to its opportunity cost.(3) Under static perfect competition market prices of factors and commodities can be

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(1) The writings on this issue are quite extensive and it might require a larger space than I intend to devote to it here.

(2) No monopoly position to influence prices.

(3) Under full employment and perfect competition the opportunity cost of a commodity, which is the value of the factors used to produce it in their best alternative pattern, is equal to its market value.

used to represent the intrinsic values of these factors. But perfect competitive conditions are not fulfilled in real life due to dynamic changes.

Second, perfect competition requires a large number of firms to be producing each commodity so that each is too small to affect its price. In other words the aim of this large number of firms is to maximize profits without having any influence on prices and wages.

Perfect competition model assumes away monopolistic and oligopolistic tendencies which can influence prices and outputs in such a way as to cause divergencies between social and private productivity. The commercial profitability can serve the national interest so long as perfect competition is not violated by such tendencies.

Third, it is the assumption of the perfect competition that changes in production or demand to be marginal. In other words, perfect competition works perfectly under the condition of small changes and perfect divisibility. As will be discussed later, indivisibilities should not exist in production, demand or supply of capital for a perfectly functioning market economy.(1)

If there were perfect divisibility of all factors there would be many more firms and smaller firms, but each would be producing in the optimum manner the factors it employs being combined in the optimum proportions. There would then be constant returns to scale and perfect competition. But so long as these indivisibilities exist it becomes impossible for the same factors to be combined in the same pattern to make the same product on any scale that might be chosen.

Fourth, in the perfectly competitive model (when full employment exists) external economies or diseconomies are assumed away. According to this model, each individual receives the full value of his contribution to production and each pays the full cost of the commodities he consumes. Likewise for firms. But, it will be shown below that, as distinct from the perfect model external economies and diseconomies are always present.

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(1) Indivisibility in general may be found in the factor input, in the product or in the method of production. For an excellent account of indivisibilities see Lerner, Abba p. , The Economics of Control, Principles of Welfare Economics. The Macmillan Company, New York, 1946, p.174 (esp. Chapters 15 and 16)

Fifth, another assumption embodied in the market competitive model is the consumer sovereignty by which it is implied that consumption is the end of an economic activity and thus everything can be valued in terms of an immediate or ultimate contribution to this end. But this is not always true.

Finally, for a perfect competition to prevail there must be a dissemination of knowledge about the techniques of production and also a quick response to changes in knowledge. In other words, businessmen must not be slow to respond to technological change or opportunities.(1)

But it will be shown later that the lack of spread of knowledge of new techniques may create tendencies to monopoly or oligopoly.

The questions which may arise here are two. First, national income may be maximized by the working of the mechanism of supply and demand under the conditions of a perfect competitive model. It can be argued then that, if the conditions of a perfect competition model are satisfied, the commercial profitability would be an appropriate guide in all economic decision-making, public or private. Here, expenditures will closely measure social costs and receipts closely measure social benefits.

But the conditions of perfect competition do not prevail in the real world and therefore, market prices are not competitive to reflect social cost and benefits.

The second problem is that market imperfections prevail everywhere in developed and less developed economies; but the markets of the latter countries are more imperfect than those of developed countries. For one thing in developing countries there is a larger divergence of social from private marginal product than in advanced countries.

Before explaining the main reasons why social cost-benefit analysis is more desirable in developing economies and why the private profitability criterion is not a satisfactory device for investment decisions, it seems appropriate to see various forms of commercial profitability criterion.

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(1) If "dynamic changes" can be foreknown for a sufficient time before they take place or they take place according to a law generally known so that their course can be predicted as far into the future, then the perfect competition may be sustained. In other words if everything moved in a uniform way, the future would be completely known in the present and competition would certainly adjust things to the ideal state where all prices would equal costs. See Knight, Frank, H., Risk, Uncertainty and Profit, Houghton.Mifflin Comp., New York, 1921, pp.34-37.

II - FORMS OF COMMERCIAL PROFITABILITY CRITERION

In practice the commercial profitability rule is often applied in various forms. Most of the private enterprises operate on a rate of return (internal rate of return, annual accounting rate of return) on pay-back (recoupment period) period principle. Better and more efficient ones, however, operate on the basis of the present value method (sometimes named as discounted cash flow).

a) One measure of profitability is the internal rate of return that is the "yield" of the project. By definition this is the rate of discount which makes the present value pv of the project zero.

Internal rate of return rule can be expressed as follows:(1)

$$pv\ (o)_r = -I + \sum_{t=o}^{\infty} \frac{1}{(1+r)^t}\ Bt = 0$$

where I is initial capital cost, B_t is net benefits, r rate of discount which makes the pv of the project equal zero, and t is the lifespan of the project.

Internal rate of return here is defined as r which satisfies the above equation. It must be noted that B_t is merely the difference between incomes derived from the project and operating costs for the project $(R_p - D_p)$.

This criterion tells us to rank projects according to the highest r or, after setting the minimum value for $\bar{r}$ (cut-off rate), a private investor would undertake all projects for which $r \geqslant \bar{r}$ (2)

b) The other criterion which is often used by the firms is the pay-off period method. This is defined as the number of years T that it takes for a stream of <u>net benefits</u> $\sum_{t=o}^{t} B_t$ to make up for the initial

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(1) For this formula, see A. K. Sen and S. A. Marglin, Lectures on Social Cost-Benefit Analysis for Industrial Project Formulation and Evaluation. United Nations Industrial Development Organization, United Nations. June 1967, Chapter IV, p.62

(2) The advantages and disadvantages of this rule will be discussed in Chapter 8.

capital-outlay of a project.(1) If it is used the investor would rank projects according to quickest pay-off or undertake projects which do not exceed maximum recoupment period $\bar{T}$. So firms will undertake projects for $T < \bar{T}$.

c) Relatively good firms use the present value (or discounted cash flow) method. As far as project evaluation is concerned, for every year all expected expenditures on goods and services for the project (including capital expenditures) and all expected receipts from the project are recorded. For each year, the subtraction of the former from the latter shows how much cash the firm gains or loses as a result of the project (interest and dividend payments are normally excluded from the concept of cash flow). Also from the firm's point of view, direct taxes should be subtracted to arrive at "cash flow".(2)

The next step is to discount future cash flows back to the present. For this purpose a rate of discount is selected. This rate is usually market rate of interest or some average form of it. In general, any future receipt or expenditure is multiplied by the present worth factor "pwf", which stems from the formula of $\frac{Rt}{(1+i)^t}$, where i is percentage rate of discount and t is number of years.

Finally, by process of discounting, expenditures and receipts which occur at different times are revalued to make them comparable to present expenditures. Investment projects here will be ranked according to the benefit-cost ratios or discounted net benefits.

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(1) This measure of profitability is easy to apply and easy to understand, but it has many disadvantages. For example, net benefits after pay-off period are not taken into account; choice of unique $\bar{T}$ is not appropriate when projects compared have different life times, and different time patterns of inputs and outputs.

Though in principle it is very inferior, it is still widely used by firms. For more details, see A. K. Sen and Stephen A. Marglin, Lectures on Social Cost-Benefit Analysis for Industrial Project Formulation and Evaluation. U.N. Industrial Development Organization, June 1967. pp.61-62.

(2) But, as will be indicated later, from the social point of view this is not so. Cash flow for the society will be "pre tax cash flow".

The formula for the present discounted return is often written as follows:[1]

$$B = \sum_{p=o}^{p=n} \frac{Rp - Dp}{(1+i)^p} - I$$

where the symbol $\sum_{p=o}^{p=n}$ indicating all terms of the form $\frac{Rp - Dp}{(1+i)^p}$ arė being added for all values of p from o to n, life of the project; Dp is operating cost and I is the initial investment made in year 0.

It should be noted that in all these above mentioned private profitability forms market prices are often used without introducing any correction for the market price of outputs and inputs involved. The discount rate which is applied is the market rate of interest which does not convey any relevance to the intrinsic value of capital cost. Finally, none of these rules attempts to take into account the external or indirect benefits stemming from individual projects.

This may bring us back to the reasons why the commercial profitability criterion is not a convenient device to allocate investment resources. Basically, the argument against private investment rules is due to many imperfections which exist in the economy of an underdeveloped country. It should be remembered however, that some of these imperfections are also valid for developed economies, though to a lesser extent.

III - DEVELOPING COUNTRIES AND DEPARTURE FROM COMMERCIAL PROFITABILITY

I. It can be readily exphasized that actual prices in markets of developing countries are very much worse reflectors of social cost and benefits than in the case of developed countries. The main reasons for such a strong divergence of sócial from private benefits and costs include in general wage-rate overvaluation despite a large pocket of unemployment, very imperfect capital markets, monopolistic tendencies, external effects which

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(1) For the derivation of the formula see, Little, I.M.D. and Mirrlees, J.A., Social Cost-Benefit Analysis, Manual of Industrial Project Analysis in Developing Countries, Vol.I. Methodology and Case Studies, OECD, Development Centre Studies. Paris, 1968. p.116.

are not reflected in the price of outputs sold and inputs purchased by an industry, domestic currency overvaluation, protection provided to the domestic industry in the form of import quotas and tariffs, inflationary conditions prevailing in these countries, etc.

1) The price mechanism (theory of competition) requires that the marginal product of labour[1] be equal to the wage rate paid. But as is well observed in many developing countries peasant agriculture predominates with a large pocket of unemployment or underemployment. It is a common phenomenon in peasant agriculture for a worker to consume more than his marginal product. This implies that even without new investment total output would rise if men were shifted from peasant agriculture to industrial employment.

The unemployment (or underemployment) in rural areas as well as urban areas may cause actual money wage costs to exceed considerably the true social value of labour.[2] If unemployment benefits are provided people would be openly or wholly unemployed which is against conditions required to make wages reflect the real social cost of employing a worker.[3]

In so far as the market wage rate does not reflect its true social cost (marginal productivity of labour) the labour cost needs to be adjusted downward to obtain the opportunity cost of employing one extra labourer.

2) Capital markets in underdeveloped countries are not well organised and there is a large discrepancy between the capital cost in organised and disorganised capital markets. In other words capital cost does not represent an equilibrium rate of interest which would be prevailing under a free and competitive capital market.[4] The degree of variation in

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(1) The extra output which results from the employment of an extra labourer.

(2) Because of immobile labour there will be irregularities in the returns to labour in different uses. Then market wage rate may not represent the opportunity cost of labour.

(3) In addition to this minimum wage, legislation may also result in a divergence between actual and social wage rates.

(4) This is due to lack of access to capital markets as well as to immobility of capital with a consequent result of irregularities in the returns to capital in alternative uses.

interest rates is not solely the measure of differential risks. Other factors such as government intervention, ignorance and monopoly elements may operate in the supply of capital which widen the range of rates from low to extremely high beyond what is rational.(1)

Moreover, increasing returns to scale in financial institutions appear to be one reason for lack of competition, imperfection in the dissemination of knowledge another.(2) Undertakings which require large capital funds are in reality open only to a handful of potential entrepreneurs, a condition which is quite contrary to a competitive model. The private alternatives become monopoly or oligopoly with the resulting divergence between commercial profits and social gains.

Because capital may be more valuable to the country than the official interest rate would suggest it is necessary in project evaluation to introduce an upward correction for interest rates.

3) Perfect competition requires a large number of firms to be producing each commodity so that each is too small to affect its price. But many industries are characterized by "increasing returns", that is by a technology which permits the cost per unit of output to fall markedly with the scale of output. Electric energy, steel industries and transport are cases in question. The existence of increasing returns favours large scale enterprises both from the social and the private point of view. There can be so few firms that each can have an influence on the price at which it can sell its output. This is, of course, contrary to the conditions of perfect competition.

Consequently the assumption of large numbers of firms tends to be violated and the tendency is stronger in developing countries because of the relatively small size of markets. The tendency to monopoly or oligopoly can influence prices in such a way as to cause large divergencies between social and private productivity.

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(1) See Little, I.M.D., Social Benefit-Cost Analysis. OECD Manual of Industrial Project Analysis in Developing Countries, Vol.II. Paris 1969. p.34; also see Rosenstein-Rodan, P.N., Programming in Theory and in Italian Practice in "Investment Criteria and Economic Growth", 1964, pp.19-20. He states: "Here again the free working of the price system increases the degree of monopoly and the capital market appears to be governed by institutional or traditional rationing quotas", p.19.

(2) See Sen, A.K., Marglin, S.A., Lectures on Social Cost Benefit Analysis. For Industrial Project Formulation and Evaluation. U.N. Industrial Development Organisation, June 1967, p.8.

Under monopolistic or oligopolistic conditions, the decision of an individual firm affects the economic wellbeing of agents other than the firm itself and the benefits and costs remain outside the scope of the commercial profitability rule.

4) An important way in which technology reduces the efficacy of perfect competition is in the existence of external economies or diseconomies. In the perfectly competitive model (with full employment) external economies are assumed away. But in reality external economies or diseconomies present themselves in various forms, i.e. smoke nuisance. For instance, discomfort caused to the population does not enter into the calculus of commercial profits because the individual firm is not in general obliged to compensate for the damage. But these dis-benefits ought to be taken into account in the calculation of social benefits.(1)

It is also very common to have "large projects" i.e. a Hydro dam - which can have significant repercussions on profits elsewhere in the economy. For instance, investment in one sector may have a considerable effect upon the profitability of investment in another sector via increased demand or reduced costs.(2)

By definition external economies are benefits which accrue to the whole community or to some members of it in a way that does not bring a direct return to the investor who undertakes the initial investment.(3) Private profitability rule does not take into account the net benefits arising from external economies and economic interdependencies. Since these benefits (or disbenefits) are not or cannot be reflected in the price obtainable for the output of the industry or in the price it pays for its inputs, profitability measure should take into account the resulting increase in the profitability in other sectors.(4) Otherwise, commercial profitability of the project

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(1) They are sometimes indirectly reflected in the Zoning Law regulating industrial location.

(2) This has been called by Scitovsky a "dynamic external" economy. See, Scitovsky, T., Two Concepts of External Economies. JPE, August 1954, Vol.LXII, p. 143-51: and Fleming, M., External Economies and the Doctrine of Balanced Growth. E.J., 1955, Vol.LXV, pp. 241-256.

(3) This is due to institutional framework which does not permit him to charge a price for the by-product benefits the investment made by him brings. See Fleming, M. ibid. pp 255-56 ; T. Scitovsky. Ibid. pp. 143-44 .

(4) In practice there is a small possibility of estimating all kinds of external benefits, but a rational benefit-cost analysis should attempt to estimate at least the measurable effects.

itself cannot be regsrded as a good measure of net social benefit.

It should also be noted that external economies or diseconomies are closely bound up with the increasing returns and public goods. It can be said in general that most public goods and increasing returns conditions lead to some kind of external economies.

5) Public-goods may be another problem of why perfect competition conditions are not sustained. In economists' terms, "public-goods" are goods that have the property that they are consumed jointly by everybody without the consumption of one person interfering with the consumption by another(1) (i.e. transport, health, education, defence).

By definition "public-goods" are purely technical and it does not always imply that they should be in the public sector. But it is clear that public-goods cannot be produced under the conditions of perfect competition. It may follow then that private profitability does not reflect the national interest.

For example, the construction of a bridge should be valued not on the basis of actual profitability, but on the basis of what its profitability would be in the hypothetical case which also includes the "consumer's surplus". that would accrue to the users of public utility. In other words, as Scitovsky has pointed out the test of social desirability is whether the sum of profit and consumers' surplus is positive.(2) Thus the latter might be greater than the cost and consequently a case can be made for constructing a bridge despite the commercial losses. Such an undertaking would be rejected on the basis of private profitability criterion which may be contrary to the interest of society.

The general advantages (external benefits) which may derive from such public utilities should be taken into account for a proper assessment of their profitability. If toll is charged for crossing the bridge there may be some profit, but the important factor in public utilities is not what the private profit will be, but what the over-all benefits are.

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(1) It must however be noted that this character of public-goods may have some exceptions. For instance, a bridge, until it has been crowded is a public-good; then it becomes private-good since one man's crossing delays the crossing of another man.

(2) See, Scitovsky, T. Two Concepts of External Economies (Reprint) in "Readings in Welfare Economics", p.247. It does not matter whether consumers' surplus accrues to persons or represent external economies to firms; see also Lerner, Abba, P. The Economics of Control. The Macmillan Comp. New York, 1946, Chapter 16.

6) Generally speaking the foreign-exchange in less developed countries is managed by the government in such a way that it does not represent its equilibrium rate.(1) In other words, at official exchange rates the demand for foreign exchange exceeds the supply of foreign exchange.

If the exchange rate is unchanged despite inflation, domestic prices get out of line with world prices. Consequently lira price of an import is less than the real cost to the economy. Similarly, the lira price of an export is less than the benefits to the economy. In so far as currency is not devalued in order to remedy the position the demand for foreign-exchange for imports will outrun the supply and the government becomes forced to restrict imports further. Surely, this causes further gaps between the market prices of goods and the real cost of producing them.(2)

Therefore, foreign-exchange rate requires an upward correction whilst assessing the economic value of an investment project.

Many developing countries follow a protection policy over their domestic industry. This may be a deliberate influence on the price mechanism to make it operate in a manner more donducive to society's benefit than would be a laisser-faire commercial policy.

The domestic industry is usually encouraged and protected by tariffs and import quotas. Consequently the domestic price of the output is kept above the import price. When an industry exports it finds that the very system which protects it in its domestic market-place puts it at a disadvantage in export markets. Protection, like currency overvaluation, implies that the lira price obtainable for an export underestimates the social value of that export.(3)

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(1)Some economists may argue that in this case an underdeveloped country should change the exchange rate accordingly. But such a policy cannot be easily followed since its consequences are quite harmful to foreign trade. To put the foreign-exchange rate at equilibrium rate implies indirectly a devaluation with all its defects. This kind of policy may create a very unstable balance of payments position. This is partly why lowering foreign exchange becomes an inevitable policy.

(2)For this point see, Little, I.M.D. & Mirrlees, J.A., Social Cost-Benefit Analysis. OECD Manual of Industrial Project Analysis in Developing Countries. Vol. II, Paris 1969, p.32.

(3)Ibid, p.35

Another reason why the relative gap between domestic and world prices is largely divergent between industries is the extensive use of import quotas. A less developed economy runs into a balance of payments problem. The deficit is then brought under control by restricting imports and the least essential goods will be heavily restricted. Consequently there will be a growth of domestic industry greatly supported by protective quotas which may bear little relation to the long-term comparative advantage of the country.

7) It can further be argued that underdeveloped countries are more prone to inflationary conditions than developed and this situation may cause a divergence between private profit and social profit.

An economic policy of a rapid growth often results in a constant tendency for demand to exceed supply. This can be more apparent in some sectors where there is an inelasticity of supply (i.e. agriculture) which may cause sectoral price rises which by transmitting themselves across to other sectors can force the authorities to increase total money demand if the recession is to be eliminated.[1]

If inflation develops in a uniform way so that relative prices are not changed, it could then be maintained that prices cannot be a poor measure of real costs and benefits. But surely this is not so. With inflationary conditions prevailing the governments are often led to adopt price controls in some selected areas where they can be operated. A result of such conditions would be that activity in the selected fields will be relatively unattractive and unprofitable without regard to the benefit of such activities.

So far I have concentrated on the imperfections of the price mechanism which stem from the departures from market static assumptions. Many factors we have mentioned earlier may provide a rigid market structure, monopoly positions, immobile labour and capital and consequently large inequalities in the returns to labour and capital in different uses.[2]

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[1] Little, I.M.D., Mirrlees, J.A., Social Cost-Benefit Analysis, Manual of Industrial Project Analysis in Developing Countries. OECD Development Centre Studies, Vol.II, Paris 1969, pp.32-33.

[2] Information in developing countries is less widely available in respect to alternative production techniques, factor supplies, consumer and producer demands. In addition there is no free access to some kinds of occupations because/

The case for price mechanism however becomes even less convincing if it is taken into consideration that the price theory is to a large extent static while reality is dynamic. The dynamic factors which are not foreseeable by the price system may be considered an important reason for the inadequacy of free market mechanism. The effects of change in less developed countries may cause more uncertainty than in developed countries. For example, building one or two plants may double production of a given commodity where they could perhaps represent a marginal increase in a more industrialised country. The importance of these effects in investment decisions is the imperfect forecast of future demands and of commodity and factor costs.(1) Factor costs may change substantially over time as a consequence of economic growth. Thus an advantage based on cheap labour may prove quite limited in the future. Productivity change in factor inputs is also an important factor and investment decision should be taken within the perspective of changes over time.(2) As is often argued, a productive process itself may have considerable effects on the experience and skill of labour and savings effect. These are all indirect effects of expanding a certain production line. But the fact that improvements in factor supply or reinvestible surplus are not reflected in the market mechanism may indicate bias against a given production line (i.e. manufacturing).

In addition the effect of one investment on the profitability of another (by increased demand or reduced costs)(3) which is called in theory "dynamic external economy" is not taken into account by the market mechanism. Whereas imputation of these economies to the originating investment may

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(contd.) of social and institutional factors. Further, access to factor markets (i.e. capital, labour, natural resources) is often unequal. See Chenery, H.B. Development Policies and Programs, U.N. Bulletin for Latin America, March 1958. p. 53.

(1) Chenery, H.B. Development Policies and Programmes. UN Bulletin for Latin America, March 1958, p.53.

(2) Chenery, H.B. Comparative Advantage and Development Policy in "Surveys of Economic Theory, Growth and Development", The Royal Economic Society. A.E.AS. Vol.II. Macmillan, St. Martin's Press, New York 1965. pp.129-130.

(3) Cost reductions may arise from economies of scale, productivity increases or new technology. A reduction of cost in a production line serving another production line will alter also the other production line and may increase demand for the products of the first production line. In other words, this is an interrelation between two different demand functions and between production and demand functions.
See Dr. L. Sirc, Lecture Notes on "International Economics", Handout III, p.4.

seriously alter the profitability calculations of that investment. Finally, it can safely be argued that complementarities among sectors and projects are not given due attention in the application of market mechanism and its investment rules. For instance, it may be the case that a group of investment projects will only be profitable when they are all considered together and then it may be feasible to carry out alternative combinations of investments.

For this reason a case can be made for an overall programming which can permit simultaneous appraisal of a group of investments by following its own planners' social investment criteria. In other words "uncoordinated investment plans are likely to be made at different points of time and the mere difference in timing causes them to be based on less information than would be available if the same investment decisions were coordinated and taken simultaneously".(1)

It can be maintained that coordinated and simultaneous planning gives rise to less uncertainty than would market mechanism.(2) Overall programming however, may provide better access to required information necessary for long-term forecasts of output and demand.(3) Besides complementarity of demand will reduce the risk of not finding a market, if coordinated investment-decision is implemented. Reducing such interdependence risks may eventually increase the incentive to invest.(4) On the other hand, the result of uncertainty is that risks to private investors in some sectors

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(1) See Scitovsky, T. Two Concepts of External Economies: A Reply in "Papers on Welfare and Growth", George Allen & Unwin Ltd., London 1964. p.83.

(2) It is true in reality entrepreneurs and central planners are faced with the same uncertainty; it is also true that under dynamic conditions nothing can be said for certain. Uncertainty can be in reference to (1) how demand will develop, (2) what course technology will take, and (3) what supplies of factor inputs will be forthcoming. As always argued future developments can be predicted on the basis of past developments, but this is not enough since uncertainty is referred to the future and not to the past. See Dr. Sirc, L., Lecture Notes on "International Economics" Handout III, p.1.

(3) See Rosenstein-Rodan, P.N., Programming in Theory and Practice, in "Investment Criteria and Growth", M.I.T. (Reprint) in Meier's "Leading Issues in Development Economics". O.U.P. New York 1964, pp.416-418; and Rosenstein-Rodan, P.N., Problems of Industrialisation of Eastern and South Eastern Europe. E.J., June-Sept. 1943 (Reprint) in "Meier's Leading Issues in Development Economics", pp.434-435.

(4) Ibid, p.436.

may be increased and investment resources may be allocated to less productive uses. Finally, it can be said that the case for the coordination of inter-related investment decisions is more relevant to underdeveloped countries where uncertainty is more acute. Internalization of external economies may raise the marginal efficiency of capital and consequently lead to investment in larger productive units than would be built under price mechanism.

From the above considerations it follows that direct intervention by the government in investment decisions becomes necessary to promote investments in new production lines where dynamic factors are particularly important and where the risk to private investors may be much larger than with some form of government coordination of investment plans.[1]

So long as market imperfections are prevailing in an economy private profitability should then be replaced by social investment criteria which may allocate resources more accurately and efficiently.

A final consideration for inadequacy of market mechanism is often related to the distribution of wealth and deficiency of savings.

It is sometimes argued that it is unreasonable to expect private enterprise to take consumers' gain into account, but a public enterprise ought to. Governments cannot be indifferent to who receives the benefits of public economic activity. The essential goal of economic policy in most developing countries is the eradication of extreme inequalities and it is therefore appropriate that greater weight be attached to benefits received by the poor rather than to benefits received by the rich.

Commercial profitability is however inadequate for public investment decisions for two basic reasons; first commercial profitability fails to take into account benefits and costs to economic agents other than the

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[1] I am not proposing here that in every field of the economy the government should step in: there are a number of policies the government can take to offset market defects without resorting to an overall economic programme, i.e. control of monopoly, removal of obstacles to entry and institutional measures etc. But government intervention becomes necessary in large-scale undertakings and social overhead facilities, i.e. electric power, transport etc., which depend largely on an evaluation of future production patterns and where economies of scale are significant.

enterprise and second, the distribution of these benefits and costs.[(1)]

But the dilemma here is that inequality in the distribution of income promotes savings and helps future generations. It is therefore argued that market mechanism by creating such inequalities may contribute more to economic development. But the government in an underdeveloped country can make the conflict less acute by increasing public savings via increased taxation, taking the form of savings of the rich - but there is a limit to this and the dilemma remains.

In the perfectly competitive model the most desirable distribution of income is assumed to be achieved by means of taxes and subsidies that do not distort decisions.[(2)] But no government has yet found a way to levy taxes and give subsidies that does not affect economic-decision making. Many governments seem to be reluctant to apply lump-sum transfers even if they are feasible (because of political opposition).

Nevertheless without the lump-sum transfers commercial profitability is not a proper criterion for the social desirability of public investment even in an economic system that is otherwise perfectly competitive.[(3)] There may be a case where "the government may wish to sacrifice the size of the economic pie to achieve a better slicing; and this would require it to depart from the criterion of commercial profitability".[(4)]

In fact commercial profitability is an inadequate rule for the government not only because the absence of lump-sum transfers obliges the government to follow redistributive goals through its choice of investments.

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(1) As Chenery has pointed out market mechanism does not provide in reality a favourable tendency to reduce inequality in income distribution among economic classes or geographical areas. Instead it is now widely accepted that it has tended to operate in the opposite direction particularly in less developed countries. See Chenery, H.B., Devdlopment Policies and Programs., op.cit., p.53

(2) The private profitability can be a good measure of net social benefit if the tax system and other measures can provide equality to the extent that is socially desirable.

(3) See Sen, A.K., Marglin, S.A., Lectures on Social Cost-Benefit Analysis For Industrial Project Formulation and Evaluation. United Nations Industrial Development Organization. U.N. June 1967, p.3

(4) Ibid, p.3.

Commercial profitability is an inappropriate device also because perfect competition is a mere description of economists' ideal model which is quite distinct from the actual conditions in which investment decisions are taken, especially in developing countries. Hence the income produced by an investment is not necessarily maximized when private profit is maximized.

Deficiency of savings is also argued to be another reason why the government should depart from the commercial profitability criterion. Investment projects have different effects on consumption and savings. For instance, two projects may have the same net profit, but a different effect on the amount of extra consumption and savings.

If the government in developing countries feels more savings and less consumption is in the interest of the society, there may then be a conflict. As we have noted earlier, a competitive model depends on consumers' sovereignty.

The point here is that savings can be transformed into investment and investment can provide extra consumption for a sacrifice of present consumption. The government may place relatively higher value on the consumption of people in the distant future than do private individuals. By and large this implies that the rate at which the society ought to discount the future may differ from the rate at which a private firm can borrow. If the discount rate is taken lower than the market rate, this means that future consumption will be more valuable than is indicated by aggregate choices of individuals. If the public saved more, interest rates would be lower. In other words, the government considers present savings to be more valuable than present consumption. There is then a conflict; one between present consumption and increase in savings (hence an increase in the rate of national income).

The government has powers to increase savings by increased taxation, but the government does not use it or there is no scope to increase it in economies which exist on subsistence level.

It is therefore argued by some economists(1) that the government in developing countries should depart from the usual commercial profitability

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(1)W. Galenson and H. Leibenstein suggest that investment decisions should be taken on the basis of projects' reinvestible surplus or savings effect. To this end they propose to invest in industry in urban areas as against investments in rural areas with little or no reinvestible surplus. See Galenson, W. and Leibenstein, H., Investment Criteria, Productivity and Economic Development. QJE, August 1955, Vol.69, No.1, pp.350-353 criterion and give preference to projects with the greater contribution to reinvestible surplus (or savings).

IV. Conclusion

In the presence of perfect competition commercial profits do reflect all the gains and losses produced by an enterprise. But a perfect competitive model does not exist as we have explained earlier;[1] there are at least three sets of assumptions which are not appropriate to developing countries. These are technological obstacles which are reflected in increasing returns, public goods and external economies, imperfections in capital markets and finally imperfections in the dissemination of knowledge and in response to knowledge.

These and other market distortions we discussed above may produce a structure of prices which does not ensure the best available guide to resource allocation in a number of sectors. This is so because factors of production are not used in the proportion they are available: labour is not fully employed and natural resources tend to be inefficiently utilized due to lack of complementarity among different industries. Consequently, private profits appear to differ substantially from social benefits.

As we mentioned above, private profitability which is based on actual market prices ceases to be a satisfactory device for the allocation of investment resources and for the assessment of social benefits and social costs of investment projects.

Can the commercial profitability criterion guide government investment decisions? The answer is probably not. The basic difference is that the benefits accrued to other economic agents (individuals or firms) are of interest to the private firm only as a means to its own profits, the provision of benefits to others is important to the government as an end in itself.[2]

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(1) As T. Balogh has pointed out: "There is no inherent tendency in this system (market system) either to equalisation of factor remuneration (including interest) or to the elimination of monopolistic profit margins. Nor are production and prices sensitively adjusted to slight changes in demand in a way consistent with the assumption of perfect competition". See T. Balogh, Economic Policy and the Price System. U.N. Economic Bulletin for Latin America, March 1961. Vol.VI, No.1, p.53.

(2) It is sometimes argued that externalities may exist as much for private as for public investments. But as a principle these effects are not taken into consideration in private profitability criteria nor are they compatible with maximizing private profits.

Moreover, the government cannot be indifferent to indirect benefits and costs nor can remain indifferent to who receives the benefits of public economic activity.(1)

Thus it becomes necessary for the government to depart from the commercial profitability criterion in appraising its own projects and resort to some other set of criteria which can satisfy all these requirements.(2)

Social cost-benefit analysis (or social present value) can be considered to be the best substitute to commercial profitability in both economies (developed and underdeveloped), but probably still more in developing countries. The reason for that is the fact that developing countries are farther removed from the competitive assumptions than are most advanced countries.

It must be noted that social benefit-cost criterion may take exactly the same form as profitability analysis. In fact profitability analysis by entrepreneurs is a private cost-benefit analysis. But one can cite the following differences between the two types of analysis.

(i) For a firm receipts are identical to benefits and expenditures are identical to costs. But expenditures and receipts to the firm may differ from cost and benefits to society. Therefore, it becomes necessary to value inputs and outputs at different prices from those actually paid by or received by the firm. In other words it will be necessary to apply "shadow" or "accounting" prices. Accounting prices will be usually required for wage rates, foreign-exchange rates and capital costs (interest rates).(3)

(ii) Second, there may be some benefits and costs resulting from the project which do not appear as inputs or outputs of the firm, and do not

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(1) In other words commercial profitability criterion may choose those investment projects which, though profitable from the private firm's point of view, may not be acceptable from the national economy's point of view. A private firm can and the government cannot ignore the effect of a project on national income, balance of payments, employment and distribution of income.

(2) Public investment criteria include those such as capital-output ratio, capital-employment ratio, balance of payments effect and social marginal productivity rules. More broadly it includes social cost-benefit analysis too. These will be dealt with in Chapters 4 and 5.

(3) Shadow prices should be chosen so as to reflect better the real costs of inputs to society and the real benefits of the outputs than do actual prices.

vary with these inputs or outputs. Such costs or benefits have to be separately added or subtracted for every year of operation.

(iii) The rate at which benefits and costs need to be discounted may be different in social benefit-cost analysis. It may also be necessary to separate certain kinds of benefits and costs because it seems desirable to discount them at different rates.

(iv) When private decisions are guided by commercial profits, profits are defined as the difference between revenues (benefits to the enterprise) and costs. But direct taxes have to be deducted from the figure for expenditures less receipts of the firm to find the final benefit derived. But this is not a cost to society and must be added back to obtain social benefit.(1)

It can be seen that once such adjustments are made to the benefits and costs which accrue in the project's life and to the rate at which they are discounted, the procedures followed are then the same. Thus the present value (pv) of the project becomes its present social value and the internal rate of return becomes the social yield.

To summarise, the following conclusions can be drawn:

1. The private profitability criterion as it stands is widely challenged as an allocational device and if it is to be used it must be corrected by adopting shadow or accounting prices.

2. Or for public investment decisions it needs to be replaced by some other set of criteria, i.e. probably by social marginal productivity rule or social benefit-cost criterion.

3. In order to obtain the equilibrium price capital and foreign-exchange rate need an upward correction while labour cost needs a downward correction. Shadow prices should therefore correspond more closely to the realities of economic scarcity and the strength of economic needs than to guesses as to what future prices would be.(2)

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(1) See Little, I.M.D. & Mirrlees, J.A., Social Cost-Benefit Analysis, Manual of Industrial Project Analysis in Developing Countries, Vol.II, Paris 1969, pp.18-20

(2) Not all distortions in price mechanism can be adequately dealt with by using accounting prices in project appraisal. Some distortions can be remedied by policies which lead to proper correspondence of prices and costs and benefits.

4. It is now widely accepted by many economists that the future needs of society tend to be provided inadequately by free market operation. This has therefore, led many less developed countriws to prepare development plans and programmes in order to apply their social profitability criteria to investment projects and also to modify consumers' power over the pattern of production so as to pursue an optimum path of growth. In other words a planning agency's welfare function may be assumed to be a socially desirable substitute for that of consumers' sovereignty. Of course, it should be noted that the planning agency's welfare function does not always correspond to a socially acceptable welfare function. It can even be argued that a "bad" plan may not reflect society's welfare function more than the free market mechanism would do. But, on the other hand, it can be maintained that a "good" plan which is based on coordinated investment decisions and undertaken simultaneously may provide a better chance for sustained economic growth as well as more desirable social welfare.(1)

Besides the private investors' foresight and anticipation of the future is very imperfect (especially in developing countries) so that the individual investor's risk may be higher than that confronting an over-all investment programme. A failure in forecasting(2) future demands and factor costs of commodities is likely to result in a waste of capital not just to the investor but also the national economy(3), whereas perfect forecasting of the above factors may be quite important in the production of commodities for use by other sectors and for investment which involves a long planning and construction period.(4)

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(1) Though not all these development plans have always been successful in practice, it can be argued that government intervention in the form of comprehensive planning can be essential to speed up economic growth by allocating investment resources by social investment criteria rather than private profitability. Besides, the requirements of the future have to be looked at not from the individual's point of view, but from the point of view of society.

It should be added however, that conceptually welfare function is not easy to define and any definition of it is liable to subjective value judgements. I am well aware of the long controversy on this point and I do not intend to go into the details of such an unsettled problem.

(2) Because of lack of information and expertise the private sector of the economy finds it rather difficult to forecast accurately the future rates of return.

(3) See Rosenstein-Rodan, P.N., Programming in Theory and in Italian Practice, op.cit., p.417.

(4) See Chenery, H.B., Development Policies and Programmes. U.N. Bulletin for Latin America, March 1958, p.53

CHAPTER 4

A CRITICAL SURVEY OF PUBLIC INVESTMENT CRITERIA: CAPITAL-OUTPUT RATIO

1- Introduction: As we discussed in the previous chapter under imperfections which exist in the market, prices cease to be a satisfactory device for the distribution of investment funds and for the assessment of social costs and benefits of investment projects. It was also indicated that the dispersal of single investment decisions based on maximization of commercial profits as the only criterion may lead to a non-optimum investment combination.

When investment projects are evaluated from the society or general economy point of view, investment criteria take different forms than the private criteria discussed earlier. A government in developing countries ought to value investments in terms of their effects on national income, employment, balance of payments and distribution of income. It becomes essential to appraise projects on the basis of their contribution to these major economic objectives. So public investment decisions should be based on social profitability criteria as was discussed earlier, and not on commercial profitability criteria.

A wide range of investment criteria have been developed from the general economy point of view.(1) In the earlier studies of investment criteria private profitability was substituted by partial project evaluation measures such as capital-output ratios, capital-labour ratios and balance of payments effect criterion.

This chapter will therefore be confined to the discussion of capital-output ratio or capital turnover rate criterion. Employment effect and balance of payments effect criteria however, will be very briefly dealt with in an appendix at the end of this chapter. Social marginal productivity (smp) and social benefit-cost criterion will be discussed in Chapter 5.

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(1) For a good summary of Public Investment Choice Criteria, see UN - Choice and Phasing of Public Sector Projects, in UN Economic Bulletin for Asia and the Far East, Vol.XVII, No.2, Sept. 1966, pp.16-29. Micro-economic criteria include the factor-intensity criterion, the social marginal productivity criterion, the marginal per capita reinvestment criterion and the marginal growth contribution criterion.

11- CAPITAL-OUTPUT RATIO: (or Capital Turnover Rate)

This concept is used in the theory of growth(1) as a tool to determine the total capital requirements to achieve a certain rate of growth of income. The capital-output ratio in the early writings of investment criteria was also used to a lesser extent as a device to assign priorities to various investment projects. Its former use is now broadly accepted but its latter use as an allocational device has been challenged extensively.

The capital-output ratio is defined as the quantity of capital required to produce one unit of output.(2) It is a coefficient which represents the reciprocal value of capital productivity coefficient. According to this kind of measurement, capital-output ratio (or capital-intensity) will be the total capital required by the project per unit of value added or gross annual value produced. The ratio of total capital and gross annual production value is the reciprocal value from which the capital turnover rate is measured; and the ratio of total capital to annual value added is the reciprocal value of the product-capital ratio and is known as the "capital coefficient".

Capital-output ratio can simply be shown as:

$\phi = \frac{K}{O}$ where K is capital investment and O is gross or net annual value produced.

According to this rule, developing countries should choose projects with the lowest capital-output ratio.(3) This implies that capital which is

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(1)The Harrod-Domar theory of growth relates a country's rate of growth of income to its savings-income ratio and marginal capital-output ratio. $g = \frac{s}{c}$ where g stands for growth of income, s for savings-income ratio and c for the marginal capital-output ratio. See AER, March 1947, p.34.

(2)Of course, capital-output ratio can be used for the overall economy, for a sector or for an individual project. The principle of capital-output ratio however, remains the same.

Incremental capital-output ratio (ICOR) for the whole economy is the value of the addition to capital (net investment) divided by the addition to income (net national income).

(3)The rate of capital turnover (which is reciprocal of capital-output ratio) is the ratio between the enterprise's gross annual production value and capital and is an attempt to measure capital productivity, not in terms of profits but in gross production value.

a scarce factor in such economies should provide maximum addition to income.

III. DEFINITION OF OUTPUT AND CAPITAL

Because numerator and denominator of capital-output ratio may be defined in various ways the implications of resorting to one or another concept need to be borne in mind.

Let us take first, output. Output, which is taken here to mean value added (VA) can be calculated in two different ways. It can be taken in terms of gross or net; and it may be defined in terms of value or physical quantity.

Value added (VA) can be first found by taking the difference between the sales value of output (goods or services) created by the investment and the expenditure on purchases of raw materials from third parties. Or secondly, it can be taken as the sum of factor incomes such as salaries, wages, rents, interests and profits.[1]

Value added resulting from an investment can be taken as net or gross. For gross value added to the above sum indirect taxes and depreciation need to be added. Whereas for net value added (NVA) the last two items ought to be excluded from the above sum.[2]

Total investment, on the other hand, includes imported machinery (excluding customs duties), wages paid to skilled and unskilled labour, payments to various national materials and equipment, customs duties, indirect taxes on raw materials, land etc.[3] This is investment from private firm's point of view. But in social valuation of investment customs duties and indirect taxes on raw materials are excluded and do not enter the concept of social investment. The only difference between pricing at market values and

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(1) See UN - Manual on Economic Development Projects. United Nations, New York, 1958, p.222. Profits are taken here to mean "pre-tax" profits.

(2) Net value added can simply be shown as in the following equation:
$NVA = Ct + Pr - (X_p + D_p + it)$ where
Ct denotes total cost, Pr profits, Xp input purchased from third parties, Dp depreciation and it indirect taxes.

(3) But capital like in value added needs to be valued on the basis of social prices rather than market prices. See UN - Manual on Economic Development Projects, op.cit., p.222.

at social cost will derive from indirect taxes paid on "purchases from the third parties", as these taxes are omitted from the social cost estimates.(1)

Because the net investment is derived from gross invetment minus depreciation, which is based on accounting concept, it may be doubtful if this figure can give the true value of the increments to the stock of productive capital. The doubt here stems from the fact that depreciation is calculated on the basis of an accounting concept rather than actual depletion of the stock of capital.

The question which may arise is whether to take ICOR gross or net of depreciation. No doubt the selection of either will produce different results and choices. This might be illustrated clearly if we take the following example.

Let us take two projects A and B each costing $100, but A with a life of 20 years and B with 4 years. Also suppose that straight-line cost is the agreed depreciation charge on both of them.

	Project A	Project B
Capital Cost ($)	100	100
Gross yield ($)	40	55
Annual Depreciation ($)	5	25
Net yield ($)	35	30
Life of projects	20	4
Gross ICOR	2.5	1.81
Net ICOR	2.85	3.33

It is clear that the gross incremental capital-output ratio favours project B, while net incremental capital-output ratio favours project A.

Now one may ask which concept of output one ought to take into account when computing the coefficient. This depends on whether the structure of capital is to remain stable or whether changes in the economy are to occur.(2)

(1) Ibid, p.223. Further, unskilled labour needs to be valued on social prices. J. Tinbergen defines capital as "the sum total of market value of the equipment and machinery and stocks and the depreciation funds accumulated". See Tinbergen, J., The Design of Development. Baltimore, 1966. p.70

(2) See C. Kindleberger, Economic Development. McGraw-Hill Book Comp. London, New York, 1965. p.88

Net output will be the choice if there is stability in the economy. This is because in this case depreciation is not needed to shift capital to other sectors. If capital is to be shifted to other sectors - in the course of change - it may be desirable to deal with the gross concept of production.

There is also a lag problem confronting the calculation of ICOR, since this year's investment does not coincide with this year's output. This of course, makes the comparison between input and output very difficult. For instance, inputs in period t may lead to output in period t+1, and again investment in period t+1 brings output in period t+2 and so on (i.e. some investments need many years to yield their product - Hydro Dam, irrigation).

The relation between inputs and outputs in reality may show an even larger variety of lags than it is expected to do. The rate of output may be constant or may vary; it may begin immediately or start after a lag. Then the imputation of a given output to a given input becomes necessary. In such a case, it is common practice to apply present value formula for the measurement of income streams in the future and compare it with the capital cost of a given investment project.(1)

IV. Can capital-output Ratio be used as a Device to Assign Investment Priorities?

Capital-output ratio was first suggested as an investment criterion by Polak(2) and Buchanan.(3) J. J. Polak was the first to consider the balance of payments problems arising from large-scale post-war reconstruction programmes and their implications for the composition of the investment programme. Polak

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(1) If there is a lag and variability in outputs the PV formula becomes:

$$PV = \frac{V_1}{(1+r)} + \frac{V_2}{(1+r)^2} + \dots\dots + \frac{V_u}{(1+r)^u}$$

The PV of the nearer outputs is higher than that of those outputs occurring in distant future because they are heavily discounted.

(2) Polak, J.J., Balance of Payments Problems of Countries Re-constructing with the Aid of Foreign Loan, QJE, Feb. 1943, pp.208-240.

(3) Buchanan, N.S., International Investment and Domestic Welfare. New York. 1955.

has stated that "given the magnitude of capital investment .... it is desirable from the point of view of foreign-exchange to maximize output and thus the rate of turnover, and also to minimize the capital required in order to keep the service of the foreign debt down".(1)

What is suggested here is that the criterion of efficiency will be "maximization of output per unit of invéstment". The recommended type of investment projects would then include those requiring the least amount of capital. Since he is mainly concerned about the balance of payments effects of investment projects he has also proposed that investment projects which fall within producing commodities for exports should receive higher priority. All projects are classified on the basis of their final product; then the ultimate choice depends upon the contribution of each project to the balance of payments compared to its initial capital.

N. S. Buchanan was also in agreement with Polak when he states that: "If investment funds are limited, the wise policy in the absence of special considerations, would be to undertake first those investments having a high value of annual product relative to the investment necessary to bring them into existence".(2)

If we follow the capital-output ratio as an allocational device, projects are to be ranked according to minimum requirement of capital per unit of discounted net output.(3) This, in other words, means that projects with the highest capital-turnover rate will qualify for selection. As can easily be inferred capital-output ratio and capital turnover rate are reciprocal values of each other.(4) Therefore, maximizing the latter is tantamount to minimizing the value of the former. It follows that those projects with the lowest cost of capital per unit of discounted net output (value added) are to be selected until the capital available has been exhausted.

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(1) See Polak, J.J., op.cit., pp.218-219

(2) Buchanan, N.S., International Investment and Domestic Welfare. New York. 1955. p.24

(3) See Dosser, D.M., General Investment Criteria for Less-Developed Countries: A Post-Mortem. Scottish Journal of Political Economy, June 1962. p.87

(4) To avoid confusion it should be mentioned that capital-output ratio is the ratio between total capital and gross annual production value which logically the reciprocal value of capital turnover rate. Gross annual production here implies gross value added which comprises market value of production plus profit so the numerator in the ratio is quite distinct from annual profit concept. Gross annual production can be shown as:
GAP = total cost + profits.

IV. Appraisal of Capital-Output Ratio

There is no strong theoretical justification for the capital-output ratio being used as an instrument to determine priorities among investment projects.

(i) First of all, capital-output (or capital-turnover rate) cannot be considered as a rule for maximizing future output. The main goal in Development policy is not maximizing output at a point of time, but rather a maximum rate of growth over time. Even if we assume that capital-output ratio would maximize the present value of output this does not mean that the rule is correct for attaining this maximum over time. Let us take an example to illustrate this point.

Suppose that there are two projects, A and B each costing $100, and A with an investment life of 4 years and B 20 years.

	Project A $	Project B $
Initial Investment	100	100
Annual Output	40	20
Life	4	20
Annual straight-line Depreciation	25	5
Total output over Investment Life	160	400
Capital-output Ratio	2.5	5.0

As can be seen from the Table above, the total output for project A is $160 and for B $400. On the other hand, the capital-output ratios are 2.5 and 5.0 respectively. Since annual output net of depreciation is $15 in each project this may raise the question of which project is contributing more to the national output.

In order to compare these projects it is necessary to calculate the PV of each project's income streams through their investment life. If the market rate of interest is 5 per cent the PV of projects A and B will be $142 and $249 respectively.(1)

(1) As was pointed out before, the market rate of interest is likely to understate the social cost of delayed increases in output. Hence it may be appropriate to apply imputed rate of interest instead of market rate of interest.

Now, in the light of this result the choice will naturally be in favour of B rather than A, even though the capital-output ratio in the former is higher than in the latter. Therefore, one may conclude that capital-output ratio, as illustrated by the above example, cannot be an appropriate guide for assigning priorities to investment projects. Clearly, when capital-output ratio is used the contributions of projects to national income over a period are neglected.(1)

(ii) Another weakness of this criterion is the fact that this rule may not maximize the value of total output. This is because maximizing the productivity of capital by itself is not a sufficient requirement for maximum total output. If the economic policy objective is maximizing total output not only the productivity of scarcest factor (capital) but the productivity of abundant factors as well must be maximized. To see this point let us consider an example:

Divide total output into two parts and let the first part be O_1, assuming this part of O is to be produced by workers L (in optimal combination of capital). The other part of output, say O_2 and this is to be produced by the rest of the labour force, L_2, with little or no capital.

It is quite obvious that $\frac{O_1}{L_1} + \frac{O_2}{L_2}$ will always exceed $\frac{O_1}{L_1}$, as long as capital assumed to be a scarce factor relative to labour.(2) Total output means output of any factor multiplied by the number of units of that factor, but this does not necessarily mean that maximizing the productivity of that factor alone would lead to maximum total output.

(iii) This criterion assumes that capital is the only scarce factor in the economy and other factors like labour and natural resources have no opportunity costs. In other words capital-output ratio is valid if capital is the only scarce factor in the system or other inputs are so plentiful

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(1) Capital-output ratio does not take into account the lifespan of projects, whereas long-life projects can be more advantageous. For instance, in long-life projects depreciation/gross capital ratio is considerably low which means that the project will continue to create output for a long period without requiring large replacements.

(2) See B. Higgins, Economic Development: Problems, Principles and Policies. New York 1959. p.634.

relative to capital that the latter is the dominant element in determining cost differences.(1)

However, this system would not characterise all less developed countries because capital there is not always the scarcest factor. In fact capital in some developing countries may be less of a bottleneck than unskilled labour, immobile labour or social barriers.(2) In such cases, capital-output ratio would not include all underdeveloped countries but excludes those where capital is not the scarcest factor.

Even if this is a matter of scarcity of one factor and abundance of another why not include developed countries which experience large pools of unemployed labour in serious depression periods.(3) Besides if labour and natural resources may have a significant opportunity cost, as being above zero, capital-output ratio ceases to be a meaningful device. It may be argued that abundant factors cannot be treated as free goods having zero prices.

(iv) Capital-output ratio does not take into account the indirect benefits an investment project might give rise to. Yet some large projects which require a large capital-outlay may result in a considerable degree of external economies. For instance, projects such as transport or hydro-dams may be rejected on the basis of their high capital-output ratios, whereas these same projects' indirect benefits provided to other sectors or projects can be extremely high. Then selection of investments on the basis of capital-output ratios will be against social overhead projects. Therefore, it will be necessary to take into account the concomitant expansion in other sectors and include them in the denominator of the coefficient so as to compare with the value of capital invested.

(v) Capital-output ratio (or capital turnover rate) is based on the explicit assumption that market prices of goods and services will reflect the

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(1) See Chenery, H.B., Comparative Advantage and Development Policy, AER 51/1961, Vol.51, No.1, p.27

(2) See D. M. Dosser, General Investment Criteria For Less-Developed Countries: A Post-Mortem, Scottish Journal of Political Economy, June 1962, p.87

(3) See Dosser, D.M., Ibid, p.88.

social cost of these goods. But, as I have argued in Chapter 3, market prices of inputs and outputs may not coincide with social prices.

VI. CONCLUDING REMARKS

In aggregate terms, capital-output ratio is widely accepted as a useful tool to determine total capital requirements needed to achieve a certain rate of growth. In many development plans, it is also partly applied at sectoral level to allocate investment resources to various sectors. But it can be a misleading device to select investment projects as it is the simplest approach developed for this purpose. Main points can be summed up as follows:

1. The capital-output ratio is valid if capital is the only scarce factor in the system and other inputs are abundant relative to capital.

2. It is an unsatisfactory device to maximize the value of future output and to attain this maximum over time.

3. It is a misleading device to assign priorities for investment projects. It is a rule which will always discriminate against social overhead capital projects.

4. Some disadvantages of this criterion can be corrected by taking value added on net basis, by including indirect benefits resulting from the investment (backward and forward effects), and by applying shadow prices instead of market prices.(1)

5. But still if the lifespan of projects are different and if value added is not constant throughout its life period, it must then be replaced by a superior investment criterion, i.e. social marginal productivity.

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(1) It is for this reason that A. E. Kahn and H. B. Chenery have argued that the social differs from the private point of view and that priorities should be assigned on the basis of social productivity of capital - contributions to the national income. See A. E. Kahn, Investment Criteria in Development Programmes, QJE, 1951, p.39; Chenery, H.B., The Application of Investment Criteria, QJE 1953, vol.67, pp. 80-82

Appendix A: Employment Effect Criterion (Capital-Labour Ratio)

Another factor-scarcity criterion suggested by the economists in the post-war period is the capital-labour ratio. This indicates the ratio between capital invested and the number of workers employed by the investment. Like in the first rule, this criterion tells us how much capital we need to invest in order to employ one man. Maximizing employment of unskilled workers is the main goal of this device.(1)

If we call initial capital K, and number of workers employed E, employment effect criterion becomes:

$$q = \frac{K}{E}$$

Suppose capital investment is \$200.000 and the number of unskilled workers employed as a result of the investment is 200; then capital-employment ratio will be:

$$q = \frac{\$200.000}{\$200} = \$1.000$$

This fugure simply implies that we ought to invest \$1.000 in order to employ one man. As is the case with the capital-output ratio, according to this rule underdeveloped countries need select those projects with the lowest capital-employment ratio. Putting it differently, they will select projects which create the highest employment per unit of capital.

This may be relevant to developing countries with a high level of unemployment and where the single objective function is to promote employment.

In the application of this criterion, capital needs to be valued at social prices instead of market prices. Therefore, as was mentioned

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(1) In other words this factor-intensity thesis asserts that capital-labour ratio is the right criterion, if national income in the current time period is to be maximized. Acceptance of this logic leads to the application of minimum capital-labour ratios in public sectors and project selection. This criterion is sometimes called "factor proportions thesis", see Choice and Phasing of Public Sector Projects, UN, Economic Bulletin for Asia and the Far East, vol.XVII, No.2, Sept. 1966, p.16

earlier, customs duties and all other indirect taxes should not enter as costs in social valuation of investment. These items do not constitute cost from society's point of view. Also wages paid during the construction of the investment project should be valued on social prices. When these corrections are carried out, the numerator of the ratio will be reduced considerably and this, of course, will increase "employment coefficient" of the project.(1). Second, it is also a common practice in developing countries to include only unskilled workers in the denominator of the coefficient (E). This is not all. An investment project may create indirect employment in other sectors or fields. Thus, "multiplier effect" can be quite important and this ought to be estimated by using input-output tables. Otherwise, the nearest "forward and backward" employment effects may be roughly estimated. The principle here is that: if an investment project provides additional employment in other fields due to the existence of unutilized capacity the employment in the latter ought to be attributed to the original project.

To sum up:

a) where there is a serious problem of unemployment, projects with the highest "employment coefficient" (or with the lowest K/L) will be selected as far as this objective is socially desirable. This rule accordingly will lead to maximum employment by using the given amount of capital.

But it can be argued that maximization of employment does not really mean that output will also be maximized. As Galenson and Leibenstein have shown, labour-intensive technique does not often result in maximum national output because productivity per worker is very low which in turn leaves only a small reinvestible surplus to be directed to capital formation.(2)

b) By its nature this criterion will favour investments which lead to labour-intensive industries. But some industries by their nature require

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(1) In that case K/L ratio will be smaller which in turn implies an increase in employment per unit of capital.

(2) See W.Galenson & Leibenstein, H., Investment Criteria, Productivity and Economic Development, QJE, August 1955, Vol.LXIX, p.351-3. Their line of argument is entirely opposite to the employment absorption criterion. They have argued that over a longer period the capital-intensive method, through its favourable effects on savings and capital accumulation, may bring about a greater expansion in output and employment than would be possible under labour-intensive technique, although initially the latter creates greater employment and possible also a larger total output.

advanced technology with extremely high capital-intensity. Then the employment coefficient may not be valid for this category of projects. Since labour and capital are not good substitutes for each other the technology needs to be imported from abroad. So long as underdeveloped countries cannot provide their own technology the applicability of this criterion becomes very limited.

It can be concluded that this factor-intensity criterion is the most conservative criterion to adopt since it suggests that the less-developed the country the lower should be its capital-labour ratio (K/L) which in turn implies the less sophisticated should be its industrial structure.(1)

II - BALANCE OF PAYMENTS EFFECT CRITERION

This criterion starts from the basic assumption that what limits investment level is the scarcity of foreign-exchange. Therefore, those projects which have the highest net positive effect on the balance of payments should receive priority in resource allocation.

The balance of payments effect criterion can be simply expressed as "foreign-exchange product - to input ratio".(2)

$$\beta = \frac{\sum_{i=1}^{n} \frac{F_t}{(1+r)^t}}{\sum_{i=1}^{n} \frac{f_t}{(1+r)^t} + I_f}$$

where F denotes positive contribution of the project due to foreign-exchange earnings (or savings), f denotes negative contribution due to foreign exchange expenditure, If foreign exchange component of capital investment, n life span of the project and r discount rate.

As can be seen this is a ratio between pv of positive foreign exchange effect and pv of negative foreign exchange effects plus the foreign-exchange component of capital. According to this rule, investment projects are ranked and selected by the foreign exchange product-input ratio where the

(1) See, Choice and Phasing of Public Sector Projects, UN - Economic Bulletin for Asia and the Far East, vol.XVII, No.2, Sept. 1966, p.18

(2) UN Manual on Economic Development Projects. New York, 1958, pp.230-231.

preference will be given to projects with the highest ratio.

It should be noted that most investment projects will have positive and negative effects on the balance of payments. Positive effects are defined as those foreign-exchange earnings due to increasing exports or to import substitution created by the project. Negative effects comprise foreign-exchange spending during the construction and operation of the project. Net effect is then the difference between the positive and negative foreign-exchange effects.

But investment projects may often have some indirect effects on the balance of payments which can be in various forms. These effects which are cited below should be brought into analysis.

a) It may sometimes happen that the establishment of an industry (or its expansion) may induce increasing output in others and the latter industries may be forced in turn to increase their additional spending on foreign-exchange as a result of the rise in their output. For instance, a steel and iron project may lead to an increase in demand for coal as raw material and the corresponding rise in the output of the coal industry may involve additional foreign-exchange spending.

b) An import substitution industry may possible induce an expansion in transport and distribution services. The expansion in the latter sectors to meet the requirements may in turn involve extra foreign-currency or investment in a particular industry may have negative effects on exports. For instance, investment in a textile and clothing project can reduce foreign-exchange earnings through exports by using the previously exported raw materials as their inputs.

c) An investment in a particular industry may give rise to indirect foreign-exchange earnings. For example mine ores (i.e. chrome or copper) may benefit from increasing exports stimulated by the availability of energy or transport facilities. Provision of energy supply may induce an expansion in the output of the mining industry whose products can be ultimately exported.

It follows that a more complicated version of this criterion should take into account both direct and indirect effects on the balance of payments.(1)

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(1)For a more complex version of this criterion, see Chenery, H.B., The Application of Investment Criteria, QJE, 1953, Vol.67.pp.87-91.

Both of these criteria mentioned above are partial evaluation methods that attempt to achieve a single rather than multiple objectives. Each criterion by itself can lead to misallocation of investment resources and may not attain the maximum contribution to national income. Both are simple and have a limited degree of applicability in investment planning.[1] They can be quite misleading by themselves and should be replaced by a better criteria which can take into account total effects of a project on the overall economy. The SMP criterion therefore has been introduced so as to incorporate all these effects in one model and this will be the subject-matter of the next chapter.

In order to avert confusion, it should be noted that none of these criteria are of direct concern to private entrepreneurs who have funds to invest in the industrial fields. For them the criterion of choice for production methods is normally the maximum profit rate on the capital to be invested. Under this criterion the choice will be determined by the relative technical efficiency of the alternative methods and the relative prices of the factors of production to be used.

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[1] Balance of payments criterion can be useful in checking and determining the size of total investment. See Chenery, H.B., Ibid, p.88.

CHAPTER 5

SOCIAL MARGINAL PRODUCTIVITY (SMP)

I. Introduction: The capital-output ratio as it was discussed earlier has not stood up for long as an investment criterion. Its validity has been challenged because it is based on the assumption that inputs other than capital have no opportunity cost and also because it may fail to maximize output overtime. Consequently capital-output (or capital turnover rule) has been shown to be a misleading criterion for assigning priorities to investment projects.

The point that social and market values do not automatically nor always coincide under free workings of the market system has led to its re-evaluation by welfare theorists and finally to the formulation of an alternative thesis, SMP.

This chapter will be divided into two parts; the first part being devoted to the presentatioh and critical assessment of the social marginal productivity and the second part to social benefit-cost criterion which is more comprehensive and widely used in the investment allocation technique. The relationship between these two criteria will also be explained. It will be the main purpose of this chapter to demonstrate the fact that the SMP and social cost-benefit criteria are the most appropriate rules for resource allocation in developing countries.

This criterion takes it origin from the traditional economic analysis which advocates the adoption of the "marginal" principle in allocating investment resources. The rule is that an efficient allocation can be achieved by equating the marginal productivity of any resource, including capital in its various uses.(1)

This criterion considers capital (including foreign exchange) as one of the main obstacles to rapid economic growth in underdeveloped countries.

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(1) The neo-classical rule endorses the view that capital like all other resources should be allocated between and within different sectors of the economy. that returns from or net productivity of, the last or marginal unit employed in each of the different uses shall be as nearly as possible equal. See A. P. Lerner, On the Marginal Product of Capital and the Marginal Efficiency of Investment, J.P.E., February 1953, p.1

It attempts to solve the problem of how these countries can make the best use of the capital available to them. The question is: what type of investment projects should be selected, large scale or small scale projects, rural or urban projects, projects in agriculture or industry, etc.

First let us take private marginal productivity (PMP). If we discount the stream of future benefits R_p and the stream of future costs of the factors C_p then it may be written:

$$PMP = \frac{R_p - C_p}{K}$$

where K is the capital stock. The private marginal productivity of capital (PMP) is the rate of return on the last unit (say the last £100) of capital invested to the entrepreneur who makes the investment.

According to the private marginal productivity rule[(1)] investment projects would be selected as long as PMP is greater than the rate of interest i. Thus,

$$\frac{R_p - C_p}{K} > i$$

But it must be noted that this criterion rests upon the assumption that there is perfect competition in output and factor markets and that there are no external economies or diseconomies.[(2)] Yet as I have explained elsewhere there are numerous distorting factors in the market and allowance should be made for such imperfections, i.e. taxes, subsidies, tariffs and external economies. If there is a divergence between market prices and social prices, it becomes necessary to switch to the social marginal productivity criterion which takes into account all these factors.[(3)]

[(1)] In Investment Criteria literature this is sometimes called the "capital turnover rate" which is mentioned in Chapter 4.

[(2)] For the imperfections of the market system, see Chapter 3.

[(3)] It should be noted that such social evaluation of investments is normally relevant to public investments. This kind of exercise, of course, requires a planning agency which conducts social evaluation of projects as reflecting social benefits and costs. Private projects, on the other hand, can be brought into social evaluation indirectly by manipulating prices in factor markets.

II. EXPOSITION OF SOCIAL MARGINAL PRODUCTIVITY

The use of social marginal productivity has been proposed by A. E. Kahn,(1) H. B. Chenery,(2) J. Tinbergen,(3) R. Nurkse(4) and others.(5) A. E. Kahn has been the first to object to the rule of capital turnover and has stated that: "the correct criterion for obtaining the maximum return from limited resources is marginal productivity or from the point of view of society as a whole, social marginal productivity (SMP), taking into account the total net contribution of the marginal unit to national product, and not merely that portion of the contribution (or of its costs) which may accrue to the private investor".

Because the productivity criteria are usually applied to investment projects rather than to single units of capital they are "marginal" in the sense that a project normally constitutes a small fraction of the total capital invested in a given year. Therefore the marginal concept ought to be considered in this sense.

The best presentation of the SMP criterion has been made by Professor H. B. Chenery(6) who provides us with a formula in which he allows for artificial elements in the price system (i.e. tariffs, subsidies etc.) and provides an evaluation of labour and foreign-exchange at opportunity cost

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(1) Kahn, A.E., Investment Criteria in Development Programmes, QJE, 1951,pp.39-61

(2) Chenery, H.B., The Application of Investment Criteria, QJE, Volume LXII, 1953, pp.79-85.

(3) Tinbergen, J., The Relevance of Theoretical Criteria in the Selection of Investment Plans in "Investment Criteria and Economic Growth", C.I.S., M.I.T. 1964. p.3. Tinbergen has stated that "The priority figures generally will have to be the ratio of net results to total costs, all taken at accounting prices". His criterion differs in the following respects from the alternative used by the private investor: a) by the application of accounting prices, b) by the consideration of indirect and secondary costs and returns, c) by relating results to total costs and not only to the costs of capital invested. But where capital is the only scarce factor the priority figure will have to be the ratio of net results defined as the difference between total returns and total cost-to the cost of capital invested.

(4) Nurkse, R., Problems of Capital Formation in Underdeveloped Countries. 8th impression, Oxford, B. Blackwell, 1962, p.136-7.

(5) Holzman, F.D., The Soviet Ural-Kuznetsk Combine: A Study in Investment Criteria and Industrialization Policies, QJE, Vol.71, 1957. pp.368-405.

(6) See Chenery, H.B., The Application of Investment Criteria, QJE, Vol.67, 1953, pp.76-96.

rather than at market prices. He has also taken into account the benefits provided to other sectors in the form of external economies.[1]

Chenery has developed a measure of social productivity in terms of a social welfare function[2] which would take into account several aspects or dimensions of the effect of an investment on a country's economy. For instance, an investment project will affect the national income, the balance of payments, employment and the distribution of income. For practical use it is necessary to reduce all these effects to a common measure. If the social welfare function is denoted as U and the corresponding variables as Y, B, D... then we can write:[3]

$$U = U(Y, B, D..) \qquad (1)$$

where

U = index of social welfare,

Y = effect on national income,

B = total net effect on the balance of payments,

D = effect on distribution of income.

The increment in U corresponding to a given increment in capital can be written as:

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(1) The difficulties encountered in the statistical computation of "welfare" contributions of a particular project will be raised in the section related to the theoretical appraisal of the SMP.

(2) As I have pointed out in the preceding chapters, social welfare function is not an easy concept to define in general terms nor is it true that planners can always reflect the true social welfare function of a society. Though this is still a debated point, one can safely argue that a project's contribution to the major objectives of an economic plan may constitute a rough approximation to a desirable pattern of social welfare.

(3) The employment effect of an investment project can also be included in the welfare function: $U = U(Y, B, D, W..)$. Here employment includes the manpower used in the operation of a certain project and is represented by the annual wage flow, W. $\frac{dY}{dW}$ then becomes the marginal rate of substitution between income and wages. In other words, the ratio indicates the number of units of output which the planner is willing to sacrifice in order to obtain a unit increase in wages (employment).

$$\Delta U = \frac{du}{dy}\ \Delta Y + \frac{du}{dB}\ \Delta B + \frac{du}{dD}\ \Delta D + \ldots \qquad (2)$$

If U is measured in national income units and divided by $\frac{du}{dy} = 1$. we obtain:

$$\Delta U = \Delta Y + \frac{dY}{dB}\ \Delta B + \underset{(1)}{\frac{dY}{dD}}\ \Delta D + \ldots \qquad (3)$$

In case we ignore D and call Du the social marginal productivity and r the marginal rate of substitution between Y and B $(\frac{dY}{dB} = r)$,[2] then equation (3) becomes:

$$SMP = \Delta U = \Delta Y + r.\Delta B \qquad (4)$$

The social marginal productivity formula that is adjusted to allow for the distortions in the market economy can be written as follows:

$$SMP = \underset{(a)}{\frac{V}{K}} - \underset{(b)}{\frac{C}{K}} + \underset{(c)}{r.\frac{B}{K}} \qquad (5)$$

or

$$^{(3)}SMP = \frac{X + E - Mi}{K} - \frac{L + Md + O}{K} + \frac{r}{K}\ (aB_1 + B_2) \qquad (6)$$

where

$\frac{V}{K}$ = value added domestically per unit of investment (rate of turnover)[4]

$\frac{C}{K}$ = the total operating cost per unit of investment excluding imported materials

$\frac{Br}{K}$ = balance of payments premium per unit of investment

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(1) Since $\frac{dY}{dD}$ would represent a social and political value, judgement is assumed away from the formula.

(2) r indicates the amount of increase in national income which would be equivalent to an improvement of one unit in the balance of payments.

(3) If we want to separate direct and indirect benefits the SMP can also be presented as: $SMP = \frac{X - (Mi + L + Md + O)}{K} + \frac{E}{K} + \frac{Br}{K}$

(4) This definition does not however, coincide exactly with what has been termed the "capital turnover rate". V represents the projects total production value, socially priced and including external economies but excluding imported materials. It should be taken as the total domestic value added in the project plus the total backward and domestic values added.

For a clear understanding it may be necessary to give the details of the above formula.

I. Social Value Added; $V = X + E - Mi$

where

X = is increased market value of output (taxes, subsidies, tariffs are eliminated)

E = is the value added to production due to external economies

Mi = is the cost of imported materials

II. The Value of Total Operating Cost; $C = L + Md + O$

where

L = is labour cost

Md = is the cost of domestic materials

O = is the overhead cost (all other costs including replacement of capital)

III. Balance of Payments Effect per Unit of Investment:

$Br = r\,(a\,B_1 + B_2)$

where

r = measures the average overvaluation of the national currency at the existing rate of exchange(1)

a = the cost of combined amortization and interest rate of current borrowing

B_1 = the effect of installation of investment on the balance of payments

B_2 = the effect of operation of investment on the balance of payments

B = total balance of payment effect.

IV. Initial Investment K: is increment of capital which includes domestic and foreign-exchange components. It is basically fixed capital cost.

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(1) Arithmetically r is obtained by subtracting the official from the real rate of exchange and dividing the difference by the official rate. Hence when there is equilibrium in the balance of payments ($r = 1$) the real rate of exchange becomes double that of the official. For more details on this point, see UN - Manual on Economic Development Projects. N. York, 1958. pp.227

Equation (5) may also be written by combining the terms (a) and (b):

$$SMP = \underset{a}{\left(\frac{V}{K}\right)}\underset{b}{\left(\frac{V-C}{V}\right)} + \underset{c}{\frac{Br}{K}} \qquad (7)$$

The social marginal productivity, as can be seen from equation (7) becomes equal to the rate of turnover multiplied by the ratio of profits to value added in production plus the balance of payments premium. This equation demonstrates that low capital productivity $(\frac{V}{K})$ in a given project can be offset by a high value $\frac{V-C}{V}$ if the effect on the balance of payments remains constant.

According to this rule investment projects are to be ranked and selected by their SMP and go down the list until the funds available are exhausted. Then any project having a SMP above a given level will qualify for selection.(1) One must however note that the SMP is defined as the "net contribution of a marginal unit (project) to the national product where for more accuracy cost and output should be discounted to the present".(2)

III. ON THE CORRECTION OF MARKET PRICES AND COSTS

As I have pointed out in Chapter 3, it would be necessary to attach a "shadow" or "accounting price"(3) to the product in order to find its social value when ever social profit differs from private profit.

The corrections of market prices and costs will be necessary for the following factors:

First, for social pricing it is necessary to eliminate the effects of tariffs, taxes and subsidies on the market prices and costs.

Second, as was mentioned in Chapter 3, a country's domestic currency is often overvalued. For instance, foreign-exchange may be rationed and

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(1) For ranking it is first necessary to determine the marginal project from the total funds available.

(2) See Kahn, A.E., Investment Criteria in Development Programmes, QJE, Feb. 1951, pp.38-61; H.B. Chenery, Comparative Advantage and Development Policy, in "Surveys of Economic Theory", Growth and Development, Vol.II, St. Martins Press, N. York, 1966, p.134.

(3) A number of market prices, particularly those of the "factors of production" (i.e. capital, foreign-exchange, labour) often diverge from the intrinsic value that would prevail if equilibrium existed on the markets just mentioned. For the reasons why social prices diverge from market prices, see Chapter 3.

sold at a price which does not reflect its social value. Consequently, an overvalued exchange rate may underestimate the cost of imported machinery and equipment. In such cases it would be appropriate to add something to the private cost of projects that use foreign-exchange[1] or to deduct something from the private cost of all projects that save foreign-exchange.

Third, correction will also be needed in regard to unused or unemployed resources. For instance, if investment will make possible the utilization of resources which would not otherwise be used only the social cost of utilizing these resources should be charged rather than the total rent or wages which a producer may pay. The social cost of employing one more worker in any undertaking is the value of what he would have produced in other use of his labour. Therefore, the social cost will be nil if the worker is wholly unemployed and very low if he is greatly underemployed.

Fourth, if an investment project purchases some of its requirements from productive units that are producing under conditions of decreasing costs, a shadow price reflecting only the marginal cost of producing these requirements may provide a better measure of their cost to society than a market price.[2]

Finally, it must be noted that the priority and selection of projects will largely depend on the interest rate applied in discounting the value of future goods and services. Because of short-term fluctuations in the country's balance of payments and imperfections in the capital-market the market rate of interest might not reflect society's rate of time preferences; thus it becomes necessary to compute "shadow" rate of interest in the PV calculations.

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(1) In other words an additional foreign exchange penalty which corresponds to the difference between the social price of foreign-exchange and the official exchange rate should be added to the foreign exchange component of capital investment.

It should be stressed that this kind of correction is of course valid especially for public projects and this has been quite a common practice in project evaluation in many developing countries. India, Ceylon, Turkey... For Indian Case Studies, see A. K. Sen, An Economic Evaluation of the Dungapur Fertilizer Project: A Case Study of Social Benefit-Cost analysis from India, UN Industrial Dev. Org., CID/IPEI June 1967.

(2) From the private firm point of view such an adjustment does not arise at all. But for social evaluation of public projects market prices need to be adjusted so as to reflect the marginal cost of production. This point is more relevant to cases where industrial projects are in question. On this point see, International Labour Review, Some Aspects of Investment Policy in Underdeveloped Countries, I.L.O., Geneva, Jan.-June, 1958, p. 398

It may be concluded that it would be these shadow prices and costs and not the actual market prices and costs that must be taken into account in applying the SMP formula and hence selecting investment projects.

IV. THEORETICAL APPRAISAL AND APPLICATION OF THE SMP.

a) As has been mentioned earlier, the SMP criterion takes into account "the total net contribution of the marginal unit (project) to national product, and not merely that portion of the contribution which may accrue to the private investor". In this respect, it differs from the private profitability criterion in which the policy objective is merely to maximize private profits. However, what is important in project evaluation as taken from the point of view of society is not commercial profits but the value added created by that investment. Value added is taken here to include the sum of factor incomes such as salaries, wages, rents, interest, depreciation and profits.(1)

b) Another characteristic of this criterion is that it aims at maximizing the present value of real national income. But it is argued by some economists(2) that maximizing national product at present may not be the same as maximizing the future rate of growth of per capita income. In other words if the economic goal is maximizing the future rate of growth, the SMP ceases to be an adequate criterion.

Galenson and Leibenstein(3) have argued that it is the future investment stream and not the current investment that is significant for

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(1)This corresponds to gross value added; but for net value added to be calculated depreciation and indirect taxes need to be excluded.

(2)See Galenson, W. and Leibenstein, H., Investment Criteria, Productivity and Economic Development, QJE., August 1955, Vol.LXIX, No.1, pp.349-350.

(3)Galenson and Leibenstein have proposed a reinvestment criterion to replace the SMP. They argue that repercussive effects of the projects which are not considered in the earlier formal analysis, should be taken into account in decision-models. In the criterion they have proposed they attempt to include two main effects of a project. First, if per capita growth of income is the objective function, differential effects of projects on population growth should be included in the criteria. Second, if a government finds it impossible to achieve an optimal level of investment, the capability of projects to generate further capital out of benefits should be considered. Consequently a marginal reinvestment coefficient is introduced as a measure. They have also concluded that these repercussion effects would favour industrial projects in urban areas as opposed to agricultural investments in rural areas.
But G-L do not propose a formal criterion, they merely make their points by taking illustrative examples. See, Ibid., pp. 343-345

long-run development. The SMP does not take into account what happens to the final product during any period, but in fact what happens to the final product determines partly the investment rate in the future.

In the list of criticism raised against the SMP it is also argued that this model is based upon static conditions and if one moves away from these assumptions its validity diminishes considerably. This is because the SMP criterion does not take into account the changes in the nature and quality of the factors of production that may partly be an indirect consequence of the current investment allocation. By this it is meant that the SMP ignores the indirect effect of investment on the expansion of entrepreneurship, the quality of labour: the future savings and thus future rate of investment; future consumption pattern; and finally the rate of population growth which in turn determines per capita income.(1)

Particularly critics argue that the SMP thesis fails to consider a highly significant temporal factor in merely discounting opportunities costs and rates of return to arrive at estimates of projects' social productivities. What this SMP equation omits is a consideration of future uses to which returns to projects will be put. Because returns from a project are divided between profits and wages, it then follows that the magnitude of the national product at some future date will be determined by whether or not projects with relatively high rates of reinvestment have been constructed.(2)

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(1) See H. Leibenstein, Economic Backwardness and Economic Growth, New York, 1957, pp.259-60. It is often argued that maximization of the aggregate output is an inadequate achievement as it does not take into account the individual citizen's welfare position: that is, it fails to enter the population factor into the social welfare function. Putting it differently the G-L thesis points to the "income elasticity of population". If population rises in response to an increase in aggregate output accruing to the labour force, then per capita income may not rise by the same margin as does national income. Thus it is their assertion that a development goal should be viewed in per capita terms.

(2) Though this is a valid point against the formulation of the SMP, the reinvestment coefficient of a public project can be included in a refined version of the SMP or in general social-benefit-cost analysis. For the illustration of this point see A. K. Sen and M. D. Chaudhary, Economic Evaluation of Cement Production at Puttalam and of the Packing Plant Near Colombo: A Case Study of Social Benefit-Cost Analysis from Ceylon, UN Industrial Dev. Organisation, June 1967, pp.12-21.

c) Other objections to the use of the social marginal productivity are in relation to its applicability in actual practice. The questions which arise here are: how to calculate Y, B, D... etc.? What values are to be given $\frac{dY}{dB}$, $\frac{dY}{dD}$ ... etc.? Whether the formula is to be applied between sectors or within each sector? And whether the SMP is to be applied in commodity or services sectors?

Chenery has explained the method of calculating ΔY and ΔB. As I have mentioned earlier, the increase in national income will be estimated by applying a set of corrections (for tariffs, taxes, subsidies, unused resources and external economies) to the businessman's calculations of annual rate of profit.(1)

There is often no general agreement on the issue of introducing such piecemeal corrections or shadow prices for that matter. Some economists(2) have argued that "deducting indirect taxes does not leave the product price at a level corresponding to a non-tax situation". It is suspect whether these adjustments can give a price which is closer to the one which would exist in the absence of taxes and subsidies.

Equally some economists find shadow prices very remote from reality and therefore they distrust them. Of course, shadow prices are unreal in that they are not current prices of goods or factors of production. But as Professor I.M.D. Little has emphasised in his recent book,(3) one can argue

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(1) Chenery, H.B., Application of Investment Criteria, QUE, August, 1953, p.82

(2) Dosser, D.M., General Investment Criteria for Less Developed Countries: A Post-Mortem. Scottish Journal of Political Economy, June 1962, p.88

(3) See Little, I.M.D. & Mirrlees, J.A., Social Cost-Benefit Analysis. Manual of Industrial Project Analysis in Developing Countries, Vol.II. OECD, Development Centre Studies. Paris, 1969, p.37

that no price in project analysis can ever be an actual price for every price assumed in such an analysis necessarily will lie in the future.

The point here, in my opinion, is not that the shadow prices are unreal and should be rejected, but whether such shadow prices can be computed so as to correspond more closely to the realities of economic scarcity.

Further, it can be maintained that the corrections mentioned above might well hold true for some developed countries. For social evaluation of investment projects in the latter countries also, ihdirect taxes, external economies, foreign exchange and idle (or underutilized) resources may require similar adjustments. Hence, as D. Dossen[1] has concluded, such adjustments are not designed especially for less developed economies but they may in some cases be equally relevant to a developed country.

With regard to practical difficulties in market adjustments this is what Chenery has to say: "The margin of error involved in calculations of this sort in underdeveloped countries may lead some readers to doubt the usefulness of the whole operation. In my opinion, however, the obstacles to the achievement of desirable results through free-market forces are so great that they greatly reduce the social value of investment unless an attempt is made to offset them. The method used here is largely an effort to make such corrections for the difference between private and social profitability".[2]

The balance of payments effect, on the other hand, includes both direct and indirect investment effects (i.e. import of machinery for the project, and multiplier effects of investment on income and imports); and also direct and indirect effects on imports of operating the project.

The social marginal productivity rule I have introduced has not considered the effect of an investment on the distribution of output. This parameter $\frac{dY}{d\eta}$ was dropped from the formula because it is a matter of political and social judgement. It is assumed that fiscal and monetary policies in that country can take care of this objective.

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(1) Dosser, D.M., General Investment Criteria for Less-Developed Countries: A Post-Mortem, Scottish J.P.E., June 1962, p.89

(2) Chenery, H.B., The Application of Investment Criteria, QJE, August 1953. p.96 and see Manual on Economic Development Projects, UN, New York 1958, p.229.

(d) In regard to the last question, the nature of the investment programme will have some effect on the application of the SMP criterion. It is generally agreed that large investment in social overheads during the construction period will tend to enlarge the balance of payments deficit while investment in the "commodity" sectors will relatively reduce the deficit. In the short-run the former's adverse effect on the balance of payments is due to its high-import content and its rather small addition to direct real output. In case the SMP is used it may give priority to "commodity" investment projects because these will increase the protection rate and also the real output of the economy.

The SMP may present some problems when we move away from commodity production (i.e. industrial and agricultural projects) into producer services. For instance, if a project is concerned with the establishment of new roads its contribution to the overall economy should include the increased production and marketing of the area which would be created by that very project. The difficulty here is the computations of "external economies" which a particular project may give rise to.

It is the basic assertion of the theory of welfare economics that external economies should be computed when an investment project is evaluated. In order to make social evaluation distinct from private evaluation it is often suggested by welfare economists that "externalities" should be computed so as to determine the "welfare" contribution of investment projects.

But it must be added that it is in the realm of "externalities" that enormous practical difficulties arise when determining the social marginal productivity (SMP) or SPV of a particular project.(1)

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(1) Professor A. Nove in his recent article points to the fact that identification and internalisation of externalities should be examined within the context of institutional arrangements. He implies that the type of ownership of productionor activity will play considerable influence on the investment decision. He goes on to say that different decisions would be reached if two production activities (or services) are owned by a single firm or jointly owned or whether there is cross-subsidisation or whether ownership is heavily fragmented so as to make marketing of externalities impracticable.

He also draws our attention to the limitations involved in internalisation of externalities where he maintains that total internalisation (even at central planning level) is impossible. The cost of internalising may sometimes be larger than not doing so.

For an excellent account of the problems of internalisation of externalities see A. Nove, Internal Economies, E.J., December 1969, Vol.LXXIX, No.316, pp.851-855.

Generally speaking welfare theorists have steered clear of this obstacle by concentrating on pure theory exclusively and their comments on application have dwelt primarily on opportunity costs encountered in allocating factors away from their ordinary market-determined functions for public purposes. Professor H. B. Chenery[1] has applied the SMP criterion particularly in evaluating industrial projects by only introducing "social" or "accounting" prices for factor inputs. His studies which are related to specific industrial projects in Greece, Italy and Turkey have not included any measurement of external benefits. This was probably due to computational difficulties faced in external economies.

An important question which arises here is whether they are likely to be very significant and whether it is sensible to spend much time on enquiries and research which would enable one to make some sort of rough computation. In case there is a suspicion that there may be powerful external effects to an individual project, then the project evaluator should attempt to quantify them however roughly. Otherwise, as Professor I.M.D. Little has stressed very rightly "it may be far more important to spend time improving the ordinary estimates of sales and costs".[2]

Nevertheless, if welfare economists take the position of omitting entirely the question of "externalities" then the SMP thesis may not depart far from the private profitability thesis which it seeks to displace.[3] It may be true that in comparing industrial projects with each other the differences in those external effects may not make a significant difference: but the same cannot be said in the evaluation of social overhead projects (i.e. transport and electric-power plant). These, despite their small direct benefits may be essential for economic development in view of the external economies that follow from them and consequently their effect on other industries.

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(1) See, The Application of Investment Criteria, QJE, August 1953, pp.84-85, and U.N. - Formulating Industrial Development Programs. ECAFE. Bangkok 1961. No.2, pp.41-42.

(2) He also goes on to say that if there are strong external effects which nevertheless defy any plausible quantification the only alternative would be to mention such possibilities in a qualitative manner. See Little, I.M.D. & Mirrlees, J.A., Social Cost-Benefit Analysis. Manual of Industrial Project Analysis, Vol.II. OECD. Development Centre Studies. Paris, 1969. pp.218-219.

(3) UN - Choice and Phasing of Public Sector Projects. UN - Economic Bulletin for Asia and the Far East, Vol.XVII, No.2. Sept. 1966, p.20

The question of "externalities" is a valid criticism of the SMP approach in case the output stream of each industry is considered and valued in isolation, without regard for the repercussions on the sides both of demand and supply that would be expected to follow from the simultaneous growth of other industries. The recent social benefit-cost analyses[1] have shown us that most of the external or indirect benefits can be approximately measured under some reasonable assumptions. Therefore there is no reason why the SMP rule should not benefit from the findings of these studies.

In regard to the general applicability of the SMP Chenery has concluded that this formula can be most successfully applied to "weigh priority of various fields based on the marginal projects in each group falling within the field".[2] This implies that very detailed ranking of projects is not necessary and it may be sufficient if the marginal projects of different sectors are compared for SMP.

V. Conclusion

As is pointed out in the earlier sections, the SMP criterion is based upon the measurement of capital productivity rather than of the input complex. Since capital is the constrained factor the SMP rule attempts to maximize the present value (PV) of real national income. It expresses the benefits of projects in terms of profits and total effects socially priced by means of inclusion of external economies, the omission of indirect taxes, subsidies and the use of social exchange rate and opportunity cost of labour. Before applying the SMP it is necessary to attach a shadow price and cost to the product to find its social value and cost.

If the policy objective is to maximize output at present the SMP becomes the appropriate criterion to apply. But if the objective function is

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(1) For case studies in which external economies are considered see Eckstein, O., Water Resource Development. Cambridge, Mass: Harvard Univ. Press, 1958; Krutilla, J.U., and Eckstein, O., Multiple purpose River Development. Baltimore: John Hopkins Press, 1958; Foster, C.D. and Beesley, M.E., Estimating the Social Benefit of Constructing an Underground Railway in London, Journal of the Royal Statistical Society, Vol.126, Part I, 1963; N. R. Gillhespy, The Tay Road Bridge: A Case Study in Cost-Benefit Analysis. in Scottish Journal of Political Economy, Vol.XV, June 1968, No.2, p.167.

(2) Chenery, H.B., The Application of Investment Criteria, QJE, August 1953, p.95 Chenery also feels that capital turnover criteria (as rule of thumb) are likely to be more useful in choosing among alternatives within a given sector, i.e. in agriculture a choice between roads, irrigation scheme or flood protection.

not the present but the future rate of growth then the SMP should be replaced by either Galenson-Leibenstein's reinvestment surplus criterion or A. K. Sen's time-series criterion.(1)

It would be much better to use this rule between sectors rather than between individual projects in assigning investment priorities. This is because it is easier to compute the cross-elasticities of demand between sectors (i.e. food, clothing, housing) than between different projects within the same sector. The cross-elasticities of demand between different goods within a sector (i.e. food varieties) are very flexible and therefore the projection of future demand within a given sector is very difficult.(2) It must also be added that complementarities between sectors can be more reliably estimated than between alternative individual projects.

Despite the fact that the SMP is much criticized it has wide applicability as a criterion of determining the scale of priorities and choosing appropriate types of technology. When it is applied it is generally recommended to undertake all investment projects which yield a SMP greater than the SMP of the marginal project of the capital budget. With a given budget and a series of public projects ordered in terms of their SMP's we merely choose those at the top of the list, moving toward the projects with lower SMP's until the budget is exhausted.

VI. Social Marginal Productivity and Social Benefit-Cost Analysis.

So far I have concentrated on the social marginal productivity criterion which is applied in the planning of investment budgets. The question one may rightly ask: is whether the SMP and social benefit-cost criterion are closely related?

It must be noted that there is not much difference between the SMP proposed by Chenery and social benefit-cost analysis. The similarities between the two criteria can be cited as follows:-

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(1) See W. Galenson & H. Leibenstein, Investment Criteria, Productivity and Economic Development, QJE, August 1955, vol.LXIX: and A. K. Sen, Some Notes on the Choice of Capital-Intensity in Development Planning, QJE, Nov. 1957, vol.71, No.4, p.568.

(2) See Rosenstein-Rodan, Programming in Theory and in Italian Practice. M.I.T. in "Investment Criteria and Economic Growth", 1964, pp.24-25.

1. The objective function in SMP is to maximize the present value of benefits minus costs, i.e. to maximize the present value of real national income. The objective of the social benefit-cost criterion is also to maximize net present value of benefits per dollar of the constrained funds.

2. In both criteria the critical matter is the limited kind of money which must be allocated optimally and it is to this constrained kind of funds that the two expenditure criteria address themselves.

The maximization in social benefit-cost rule is accomplished by computing the ratios of benefits to constrained funds for each project, ranking projects by these ratios and going down the list to the point where the scarce funds are exhausted. Though ranking here is by ratios, it is not the maximization of the ratio which is the objective but rather the <u>total net gains</u> that are possible, given the constraint.(1)

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(1)The formula for the present discounted return is often written as follows:

$$B = \sum_{t=o}^{t=n} \frac{Bt}{(1+i)^t} - I$$

where the symbol $\sum_{t=o}^{t=n}$ indicating all the terms of the form $\frac{Bt}{(1+i)^t}$ are being added for all values as starting from o to n, life of the project. B_t is not only private profit, but profits plus all other value added items we have mentioned earlier in the chapter (direct and indirect value added resulting from the project). I is the initial investment made in year o. In a more detailed form, annual cost flows Bo, B1.........B_n are reduced to a single figure.

$$B = B_o + \frac{B1}{(1+i)^1} + \frac{B2}{(1+i)^2} + \ldots\ldots\ldots + \frac{B_n}{(1+i)^n}$$

and $$I = I_o + \frac{I_1}{(1+i)} + \frac{I_2}{(1+i)^2} + \ldots\ldots\ldots + \frac{I_n}{(1+i)^n}$$

Then the present-discounted-value of the project becomes:

$$B = -I + \frac{B1}{(1+i)} + \frac{B2}{(1+i)^2} + \ldots\ldots\ldots + \frac{B_n}{(1+i)^n}$$

This method provides us with a tool for comparing different inflows and outflows by expressing them, through the known rate of discount, in terms of a single figure which takes account of total amounts of income and expenditure, the pattern in which they are spread out over time and the life-span of the project.

Similarly the SMP criterion is applied to constrained capital funds as consisting of incremental ratios of present values of benefits minus operating costs divided by the requisite increment of capital.

Thus the technique is similar to the use of incremental benefit-cost ratios, except that the denominator of the SMP formula contains only capital costs. The denominator in social benefit-costs includes initial capital cost plus operating and maintenance costs. This however, does not alter the ranking and selection of projects so long as the objective is <u>net</u> present value.

Let us take an example. Suppose we have a project with an investment outlay of $100, benefits of $150 and with operating costs of $20. For simplicity let us take u=o

a) Benefit-cost ratio according to the SMP rule is:

$$= \frac{B - C}{K} = \frac{150 - 20}{100} = \frac{130}{100} = 1.3$$

b) The benefit-cost ratio according to social benefit-cost rule:

$$= \frac{B}{K + C} = \frac{150}{100 + 20} = \frac{150}{120} = 1.2$$

But, as we know, the right criterion is not to rank projects on the basis of the ratios, but on the actual <u>net</u> contribution to the national income. The net present value (B-I) in both criteria is $30 and therefore they are both identical.

So long as the objective function is the <u>net</u> present value of benefits, both criteria will lead to the same selection.

3. The SMP criterion, as it is in social benefit-cost analysis requires an interest rate to be specified for the computation of the present value of <u>net</u> benefit. Therefore, the SMP criterion differs from the rate of return in the crucial respect that it requires an interest rate.(1) The SMP rule may then be considered as one of the family of present value criteria,

(1) Chenery avoids this issue by confining his criterion to projects within the same field and with very similar capital intensities so that the ranking of projects would be unaffected. But there is no reason why the SMP should not make use of discount rate in computing present values of returns. On this particular point see O. Eckstein, A Survey of the Theory of Public Expenditure, in Pub ic Finances: Needs, Sources, Utilization. NBER, New York: Princeton Univ. Press, Princeton, 1961, p.489

while the rate of return is not.

4. Both criteria attempt to include direct and indirect benefits (external economies - backward and forward effects as well) which may stem from undertaking an investment project. The numerator in both criteria does not differ in this respect. The SMP and social benefit-cost criterion take into account total effects of the project on national income, balance of payments, employment and also benefits accruing to consumers.

5. The SMP and social benefit-cost method make use of corrections or adjustments needed on market prices and costs in order to obtain the intrinsic values of benefits and costs. These corrections, as was stated in the aforementioned sections, are in reference to taxes, subsidies, tariffs, overvaluation of domestic currency, overvaluation of wages and undervaluation of capital cost.

In order to reflect social evaluation of projects both criteria introduce shadow prices and costs during the computations of stream of benefits and capital expenditure.

It can be concluded that both the SMP and social benefit-cost criterion can be equally applied to the design of projects and to project selection with individual projects treated as increments in the determination of a programme. Since they are both identical in principle, in concept and formulation, either of them could lead to the most appropriate selection of projects as far as the objective is to accomplish the maximization of the present value of real national income.

Before I complete this chapter it may seem appropriate to explain why I shall adhere to the social benefit-cost criterion (or SPV) throughout my study and particularly in the case studies in Part III of this thesis.

There has been a strong controversy on the choice of present value vs. internal rate of return(1) rule and their applicability in practice. In this study it is my intention to show that social benefit-cost analysis is the most appropriate method for investment appraisal and selection in underdeveloped countries.

First, present value rule is a concept of discounting technique enabling income and expenditure to be compared over a long span of time.

(1)For internal rate of return rule see Chapters 3 and 8.

This criterion reduces cash flows and expenditures at different periods of time to the present value. The PV approach can given a clear expression of the total net benefits expected from a project and does so in a manner which involves consistent time weighting for all projects. Wheras internal rate of return does not tell us much about the present value of cash flows nor the scale of benefits, the latter method only tells us what is the average rate of return on the capital invested.

Second, the internal rate of return rule is meaningful only under the system of perfect competition in which the capital market contains no rationing and is equated by the interest rate serving as the price. Hirschleifer, who has fully examined the issue, has recently shown that only in exceptional cases (other than perfectly competitive capital markets) does the use of the rate of return criterion result in optimal results.(1) But once the marginal returns inside the budget being planned differ from returns elsewhere in the economy and from the rates being offered to suppliers of capital, the internal rate of return loses any normative significance. The subjective time-preference rate of the planning agency may not coincide with the market rate of interest and thus the rate of return criterion becomes misleading.

Third, the criterion of internal rate of return is enough if a project must be accepted or refused, if its rate of average return is higher than the average rate at which capital can be borrowed on the market to finance it. If internal rate of return is lower than the rate which has to be paid to borrow capital, the project ought not to be carried out.

But when a choice has to be made between a number of incompatible projects (as between more than one alternative version of the same project) the average return criterion is not adequate. For it will not be enough just to see that the different projects would in fact be profitable: there still remains the need to choose the best one. A selection made on the basis of the average return on investment will not be satisfactory because it will take no account of the real cost of the capital invested.

Comparison between two projects can only be valid if financial conditions in which capital can be borrowed and invested are identical in

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(1) See Hirschleifer, On the Theory of Optimal Investment Decision, JPE, August 1958, p.329.

both calculations. But this is not the case when average returns on investment are being compared. Consequently such a comparison cannot be meaningful.

Fourth, as far as mutually exclusive projects are concerned the PV rule can lead us to the right selection by taking into account their absolute benefits, regardless of their respective internal rate of return. But when we have to decide between two mutually exclusive alternatives internal rate of return rule may choose the small project with a high rate of return in preference to a big project with greater absolute benefits. Of course, the latter criterion may lead to wrong choices.

Fifth, rate of return criterion as compared to the PV rule is very difficult to compute and it requires a tedious trial-and-error procedure. Besides, it may sometimes have more than one solution and thus the choice can be difficult to make, i.e. where time stream of net benefits changes its sign from negative to positive and negative again. Present value rule, on the other hand, is free from such complications and provides a simple and straightforward answer.

Finally, as I have mentioned elsewhere, rate of return (internal rate of return) is based on the assumption that market prices and costs are good representatives of social values. But it has been pointed out in Chapter 3 that there are serious distortions in the market and these should be allowed for in investment appraisal.(1) As it stands the rate of return criterion has a limited applicability in the case of developing countries where what matters most is the total effects (socially priced) of the investment on the overall objectives. It can be concluded that there is nothing which internal rate of return does that cannot be done more easily and usually more accurately by the net present value (NPV) method.(2)

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(1) This is distinct from the annual accounting profitability rate which is merely the ratio of profit (gross or net) over the capital investment. Even if social prices and values are used in the computation of internal rate of return still it may not lead to the best selection of projects or enable us to compare mutually exclusive projects. It does not have the advantages of social present value (SPV) rule. For a comparison between present value and internal rate-of-return criterion, see Dryden, Myles M., Capital Budgeting: Treatment of Uncertainty and Investment Criteria. Scottish Journal of Political Economy, Vol.II, 1964, pp. 235-243.

(2) For advantages and disadvantages of various investment criteria, readers are referred to A. K. Sen. and Stephen A. Marglin's article: "Lectures on Social/

All these points do not however mean that rate of return as a rule should be pushed aside; on the contrary, the internal rate of return of compatible projects should always be calculated. The internal rate of return is nothing but a precise definition of "yield" and this can be useful to know beforehand both for public and private evaluation. Moreover, PV computations depend on a proper choice of the rate of discount and this could be determined in the light of the internal rate of return of the marginal project. If only for this reason the internal rate of return should always be calculated.

Both in the SMP and social benefit cost analysis the following guidelines should be observed in the application of present value method:

a) The present value PV of expected earnings and capital expenditures of a project requires a rate of discount which is distinct from the market rate of interest. Perhaps it should reflect the social opportunity cost of capital as well as the planning agency's time preference rate.(1)

b) One may have the problem that the number of projects with a positive PV (at some chosen discount rate) may exceed the investment budget. There are two ways of limiting the number of projects in this case:

(i) by raising the discount rate - this will reduce the number of projects with a positive present value and the rate thus can be raised till the number of such projects is just enough to exhaust the budget;

(ii) without raising the discount rate, select those projects which have the highest present value relative to the investment expenditure (the highest $\frac{B}{I}$).

(contd.) Social Cost-Benefit Analysis for Industrial Project Formulation and Evaluation," in UN - Industrial Development Organization, June 1967, pp. 60-72; also see Little, I.M.D. and Mirrlees, J.A., Social Cost-Benefit Analysis. Manual of Industrial Project Analysis. Methodology and Case Studies, Vol.I, OECD. Paris, 1968, Chapter IV, pp.109-142.

(1) In the choice of discount rate for PV calculations the following factors should be taken into account: 1) the prevailing market rates which may vary with the borrowing or lending terms (amount, duration, etc.), 2) the opportunity cost of capital in the sector out of which the resources are drawn whether by taxation, borrowing or inflation, 3) over-all investment plan, 4) the rate of growth and the rate of technical progress in public sector or enterprise. It must reflect the general policy of the government.

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c) For private benefit-cost analysis, profits are defined as the difference between revenues (benefits to the firm) and costs. But direct taxes have to be subtracted from the figure for expenditures less receipts of the firm to find the ultimate benefit derived. But this is not the cost to society and is rather a transfer benefit to the government and thus must be added back to obtain social benefit.

d) Finally, if two or more projects are to be compared, the period covered by the calculation must be the same for all. Should any of them have a shorter life than the others assumptions must be made as to the use to which the capital available at the end of the shortest project will be put.

If there are two projects, one of which has a lifespan of 5 years and the other of 10 years, it may for instance be assumed that the first project will be renewed in exactly the same form after 5 years. The choice can in such a case be made in the light of explicit assumptions as to this further use of funds. Or alternatively they can be compared by assuming an infinite period of renewal for both projects.

It should be stressed here that the theoretical background introduced in Part II has not covered all aspects of social welfare economics. Theoretical discussions related to the choice of social discount rate (SDR), to the choice of the best formal investment criteria and to the determination of "shadow prices" of factor inputs will be examined in more detail in Part III of this thesis where case studies will be undertaken on public projects.

(contd.) The theoretical arguments on social discount rate will be fully examined in Chapter 8.

PART III

CASE STUDIES ON PUBLIC PROJECT EVALUATION

CASE STUDIES

Introduction

This part consists of two case studies in which the principles of economic evaluation of public investment projects as applied by the relevant government Agency and State Planning Organisation (SPO), will be emphasised. Before proceeding to the Case Studies it should be stressed that several parts of the analysis were not carried out in detail, for various difficulties in finding the right information.

These remarks apply particularly to

a) the factors which lead up to a decision as to the shadow wage rate and shadow foreign exchange rate,

b) the factors which were paramount in the choice of the rate of discount which the planners had adopted.

The values which I have applied to some of these variables are not of course intended as recommendations. Especially in Case Study 2, particular values are given to the discount rates and foreign exchange rate in order to carry out sensitivity analysis. Some of the figures for variables had to be adopted in order to carry the analysis to a proper conclusion. However, it must be pointed out that I did not adopt merely arbitrary values, but rather those which, with my limited knowledge, seemed reasonable.

In Chapter 6, I shall examine the economic evaluation of the Gaycuma paper project which is undertaken by the SEKA, a state economic enterprise. This project will be examined in three steps: first the layout of the original project as presented by the SEKA Report, and second, the same project as evaluated by the State Planning Organisation (SPO). Thirdly, there will be a critical assessment of the economic evaluation system and the investment criterion. the SPO planners have applied for industrial projects. The last two stages will be examined in Chapters 7 and 8.

Chapter 9 is devoted to another Case Study where the KEBAN HYDRO-ELECTRIC project is compared to its alternative Thermal Station. This project is primarily investigated by the E.I.E., which is the Planning and Research Unit of the Ministry of Natural Resources and Energy. Later, I have appraised the evaluation method and investment criteria of the E.I.E. by applying a superior investment criterion, that is social present value rule (or social benefit-cost), which I have defended for various reasons in Part II of this thesis.

Thus, the analyses of both projects, will enable us to throw some light on the shortcomings of the project appraisal technique applied in Turkey by the SPO and other responsible investment agencies.

Finally, it is perhaps worth mentioning that many public investment projects included in the First Plan's Investment Programme did not have reasonable alternatives with which to be compared. The Case Study I, Gaycuma Paper and Cellulose project, is not an exception to this defect, and has to be appraised in isolation from other probable alternatives.

CHAPTER 6

No.1 CASE STUDY OF PAPER AND CELLULOSE PROJECT FOR TURKEY

I. GAYCUMA PAPER AND CELLULOSE PROJECT: AS PRESENTED BY SEKA

(1) Introduction

"The Gaycuma Kraft Paper, Kraft Cellulose and Semi-Chemical Cellulose" project is being built in Zonguldak, North west of Black Sea. The project is to produce kraft cellulose (sulphite), semi-chemical cellulose and kraft paper (for cement and fertilizer bags) by using wood pulp from pine, beech and fir trees as its raw materials. The timber required by the project is to be provided from Bolu and Kastomonu forests which are situated nearby.

The project comprises three separate plants, each corresponding to the type of product to be produced.

Plant I - Kraft Cellulose Plant: it is assigned to the production of unbleached sulphite pulp, its capacity being estimated as 180 tons per day.

Plant II - Semi-chemical Cellulose Plant: it is to produce unbleached semi-chemical pulps (by means of sulphite or NSSC). Its production capacity: 84 tons per day in sulphite or NSSC semi-chemical pulps and 50 tons per day in sulphite pulps.

Plant III - is devoted to the production of Kraft paper and Kraft linen, the capacity being estimated as 180 tons per day.

The project which consists of these three plants, was expected to be completed by December 1969 and start production from 1970 onwards.

The distribution of annual capacity in the three plants is given as follows:

Table I. Annual Capacity by Plants

Tons

Years	1970	1971	1972(1)
I - Kraft Cellulose Plant (Sulphite pulp)	25.000	60.000	60.000
II - Semi-Chemical Plant (semi-chemical cellulose)	11.000	18.000	28.000(3)
III - Paper Plant (kraft paper, kraft liner)	36.000	60.000	60.000(2)

Source: Gaycuma, Kraft Sellülozu, Kraft Kağidi ve Yari-kimyevi (NSSC) Şellüloz Tesisi Projesi, SEKA, Fabrikalari İsletmesi Genel Müdürlüğu, Ocak, 1967, p.4-5

Note: (1) 1972 capacity, represents the full capacity in the three plants.

(2) Out of 60.000 tons of capacity in the Paper plant, Kraft paper constitutes 42.400 tons and Kraft liner 17.600 tons.

(3) Out of which, 18.000 tons of capacity is for newsprint: and 10.000 tons of capacity for card-board. See Ibid, p.12

(4) The annual capacity of the plants is calculated on the basis of 333 working days per year.

(11) TOTAL INVESTMENT: In the SEKA Report, total investment of the Gaycuma Project was given as amounting to 387.0 (1) million T. Liras, out of which 241.6 million T. Liras was in domestic currency and 145.4 million T. Liras was in foreign currency.

Domestic currency component of investment includes expenditure on the site and preparation of the site, water supply, buildings (factory buildings, office buildings and housing scheme etc); domestic machinery and equipment, transport and insurance cost of imported machinery, domestic transport costs, assembly cost, furniture, customs duty and other taxes paid

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(1) Total investment of 387.0 million T. Liras, given in the SEKA Report was an estimate and this figure was later taken to be 385.2 million T.L. in the SPO Project Appraisal Form.

during construction, pre-operating costs, unexpected costs, interest charges on invested capital.[1]

Foreign currency component of the total investment, on the other hand, comprises the (F.O.B.) value of the imported machinery and equipment, payment to the foreign personnel for assembly and others.[2]

The breakdown of total investments numerically is not given in the Report I have had access to; the only breakdown of investment is given for the construction period (See Table 2). As can be seen from the table, investment during construction includes items such as cost of construction (purchase of site and ready buildings excluded), machinery and equipment, and the cost of site outlay and ready buildings required by the project. All these items are given ih terms of domestic and foreign currency. The grand total for construction investment was 28.808 thousand T. Liras in 1966, 76.160 thousand T. Liras in 1967, 90.226 thousand T. Liras in 1968, and 14.908 thousand T. Liras in 1969, and finally 16.502 thousand T. Liras in 1970.[3]

Table 2. Distribution of Investment During Construction, By Years.

Thousand T.L.

Years	1966	1967	1968	1969	1970
I - Construction (excluding site outlay and ready buildings)					
a) Domestic Currency	2.000	20.850	24.512	-	-
b) Foreign Currency	-	-	-	-	-
II - Machinery and Equip.					
a) Domestic Currency	-	37.200	9.200	-	-
b) Foreign Capital	24.881	18.160	56.514	14.908	16.502
III - Total Investment (I & II)					
a) Domestic Currency	2.000	58.050	33.712	-	-
b) Foreign Currency	24.891	18.160	56.514	14.908	16.502

IV/

(1) A very recent document obtained from the SPO - A private typed Report by B. Benderlioglu, planner at the Paper Industry Section of the SPO, Ankara, December 1969, p.2

(2) Ibid, p.2

(3) Though there is no specific information given in the Report, these investment figures might include the cost of building a plant for logging, a plant for paper pulp and pulp towers.

Table 2 (contd.)

Years	1966	1967	1968	1969	1970
IV - Cost of Site and Ready Buildings					
a) Domestic Currency	1.917	-	-	-	-
V - Total Project Investment (III & IV)					
a) Domestic Currency	3.917	58.050	33.712	-	-
b) Foreign Capital	24.891	18.160	56.514	14.905	16.502
Total	28.808	76.160	90.226	14.908	16.502

Source: SEKA Report, op.cit., p.15

111- TOTAL BENEFITS OF THE PROJECT:

Total benefits of the Gaycuma Paper Plant have been classified in various groups and these benefits are being estimated in order to justify its selection. These benefits are partly economical, partly social and partly administrative in character and they can be summarized as follows:(1)

I. Utilisation of Forestry Products: It is strongly stressed in the Seka Report that timber production (pine, beech, fir etc.) of the forestry industry will be expanded so as to meet the raw material requirements of the Gaycuma project. This, in turn, will help substituting the imported kraft paper and kraft liner and thus the saving of foreign exchange.(2)

Further, the establishment of the Gaycuma project will be an inducement to constructive and more efficient forestry management and, together with prevention of forestry damage, this will create an additional benefit to the economy.

II. Economic benefits: In the SEKA Report it is stated that the project will be beneficial to the economy through its contribution to the economy in terms of profitability, foreign-exchange savings, value added to the national income, and employment effect in the region.

In actual fact the choice of the project was decided on the basis of commercial profitability criterion which is often applied by private firms. The effects of the project on the plan objectives, i.e. value added, balance

(1) SEKA, op.cit., p.8

(2) Ibid. p.8

of payments, employment etc. did not play a great part, as we shall observe later.

a) The commercial profitability or more specifically the forms of "Accounting Profitability" which are applied by the SEKA Organisation are presented below (Table 3).

Table 3. Commercial Profitability of the Gaycuma Project.

Percentage

Years	1970	1971	1972
1 - Profit before tax[1] Net Sales Ratio	-	14.06	16.01
2 - Profit After Tax Net Sales Ratio	-	9.14	10.41
3 - Profit Before Tax Total Investment Ratio	-	6.75	8.17

Source: SEKA Report, Gaycuma Kraft sellülozu, Kraft Kagidi ve Yan Kimyevi Sellüloz Tesisi Projesi. Ocak, 1967, p.9

(1) The tax, in the table represents the "corporate tax" which is levied on gross profits. (35 per cent).

As can be seen, accounting profitability of the Gaycuma Project is worked out by calculating different variants of the profitability criterion. These are gross profit/sales ratio; profit after tax/sales ratio; and profit before tax/investment ratio.

The Revenue account of the Project as estimated by SEKA is presented in Table 4. Gross profit is found by deducting annual operating cost from the total annual income in each year. For net profit however, corporate tax is deducted from the gross profit obtained each year. The variations in the annual income and annual operating cost is due to under-utilisation of the capacity in the first two years of the operation. From 1972 onwards, the plant operates at full capacity.

Table 4. Revenue Account of the Gaycuma Project

Thousand T. Liras

Years	1970	1971	1972	1973	1974
Annual Income	97.825	185.707	197.486	197.486	197.486
Annual Operating Cost	98.086	159.591	165.860	164.762	163.586
Gross profit	- 261	26.116	31.626	32.724	33.900
Corporation tax (% 35)	-	9.141	11.069	11.543	11.865
Net profit	- 261	16.975	20.557	21.271	22.035

Source: SEKA Report, Gaycuma project, op.cit., p.25

Total annual income derives only from domestic sales. The project is not expected to export its products since they are mainly for domestic consumption. This is quite natural for an import-substituting plant.

Annual operating cost, on the other hand, includes expenditure on raw and auxiliary materials; charges on fuel and electricity (excluding tax on electricity); selling costs, personnel costs (wages and salaries); replacement and maintenance and other operating costs (i.e. water supply, transport etc.).[1]

b) Foreign Exchange Saving of the Project:

Since the Gaycuma paper and cellulose plants constitute an import substituting industry, great importance was attached to the foreign exchange savings that would derive from producing domestically the paper and cellulose that were previously imported.

It is stressed in the original project draft (SEKA Report) that there was a steady rise in the import prices of kraft paper. For instance, in 1965 the import price of kraft paper per ton was (F.O.B.) \$138.50 and (C.I.F.) \$160 dollars. In 1966 the import price of kraft paper rose to \$160 FOB).[2]

On the assumption that the Cement Industry's import price for kraft paper was (F.O.B.) \$160 per ton the foreign-exchange savings of the project was simply calculated. The estimate here was made by multiplying the above (F.O.B.) import price with the expected domestic production of kraft paper (see Table 5).

Table 5. Foreign Exchange Savings

Years	Kraft paper production (ton)	US \$	T Lira[1]
1970	39.130	6.260.800	56.848.064
1971	65.217	10.434.720	94.747.257
1972	65.217	10.434.720	94.747.257

Source: SEKA Report, pp.9-10

(1) The official exchange rate is 1\$ = 9.0 TL.

(1) SEKA Report, op.cit., p.11

(2) SEKA Report, p.9

It is worth emphasizing that the foreign-exchange savings calculated in the Table was confined only to kraft paper substitution by the project. Foreign exchange savings that might also stem from substitution of semi-chemical cellulose have not been taken into account.(1)

c) VALUE ADDED which would derive from the execution of the project was computed in a very awkward way. The SEKA Report indicates that "value added" is the difference between the annual sales value (A) and the annual input requirements and all kinds of operating expenses (B), the latter being defined to include the value of raw and auxiliary materials, fuel and energy costs (excluding tax on electricity), selling cost; repair and maintenance, administrative and other operating costs.

Taking the above definition of value added, the SEKA Report has given the total value added resulting from the project as follows:(2)

Years	Value Added (T.Lira)
1970	55.973.151
1971	103.700.737
1972	108.265.446

For year 1972, where the plant would work at full capacity the value added was estimated to be:

A - B = 197,485.500 - 89.220.054 TL.
VA = 108.265.446 TL.

The value added, calculated above in the SEKA Report differs from the ultimate figure given in the SPO's Appraisal Form. As we have pointed out earlier, our analysis will be essentially based on the figures given by the SPO and not on the preliminary figures presented in the SEKA Report.

d) Employment Effect:

The manpower requirement of the Gaycuma project was estimated to be 755 people. This figure includes 35 high rank administrators and personnel,

(1) It is pointed out in the SEKA Report that semi-chemical cellulose is ignored because it would require foreign exchange spending in the first years. The above figures do not correspond to the later figures given in the SPO Appraisal Form, which will be examined in Chapter 7.

(2) SEKA Report, p.11

21 technicians, 107 civil servants, 367 foremen and skilled labour, and 225 unskilled labour (see Table 6).

In a very crude way, the employment effect of the Gaycuma project was specified, where it is suggested that the employment of 755 people would mean providing better living conditions for a greater number, say 3755; on the assumption that each family in the region consists of 5 members.(1)

Table 6. Manpower Employed by the Project

Type of Labour	Number	Annual Payment (T.L.)
High level of Administrators and specialised personnel	35	1.008.626
Technicians	21	478.800
Civil Servants	107	1.537.024
Foremen and skilled labour	367	4.773.355
Unskilled labour	225	1.938.805
Total	755	9.735.805

Source: SEKA Report, Gaycuma, kraft sellülozu, Kraft Kapidi ve Yari Kimyevi Sellüloz Tesisi projesi. OCAK, 1967, p.20

IV– A CRITIQUE OF THE SEKA REPORT

The SEKA's evaluation of the Gaycuma project poses many serious questions which make the whole process of evaluation a simple and dangerously misleading one. The shortcomings of their evaluation method will be examined briefly below and a critique of the investment criteria they have adopted will also be made. Since most of the figures quoted above from the SEKA Report were changed when the project reached the SPO for further economic evaluation, it is plausible that we should spend more time on its final evaluation made by the State Planning Organisation (SPO). This will be reserved for Chapter 7.

But it is not possible to by-pass the preliminary evaluation of the project by SEKA without emphasising the weaknesses and crudity thereof,

(1) Ibid. p.20

which may be representative of the practice in almost all similar public investment agencies.

The following section will discuss the SEKA's project appraisal method in respect to (a) location of the paper project; (b) foreign exchange savings from the project; (c) employment effect of the project: (d) value added resulting from the project: and finally, (e) the commercial profitability criterion they have applied.

1. First, the location of the paper project in Gaycuma.

It was stated in the SEKA Report that Gaycuma was chosen as a location for the paper plant for the following reasons: (i) its proximity to the Kastomonu and Bolu forests from which the raw materials are to be obtained; (ii) the availability of water supply (Yenice River); (iii) the availability of electric energy supply in the region; (iv) the availability of adequate transport and communication facilities.(1)

It is a fact that the Gaycuma Plants are not far distant from the forestry industry which exists in Bolu and Kastomonu region, and that these regions could provide the right kind of raw materials for kraft paper and cellulose products. It is the estimate of the SEKA Report that, the Gaycuma project would require annually 104.856 m^3 (solid cubic metres) in pine wood, 112.923 solid cubic metres in firs, and 109.828 solid cubic metres in beech wood.

However, the important element here is the transport costs of these raw materials from the forestry up to the Gaycuma plants. From the figures given by the SPO,(2) I have roughly calculated that annual transport costs of these raw materials will constitute 3.3 per cent of the total operating costs (total annual operating cost being 125.597.000 TL, and transport costs being 4.150.000 TL). From this simple estimate one might conclude that transport costs do not represent a large percentage and this may support the Report's assertion that the location of the project in Gaycuma does not involve significant costs. But this alone is not enough to justify a location for such a large-scale project.

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(1) See SEKA Report, op.cit., p.8

(2) A recent typed document obtained from B. Benderlioglu, a planner at the SPO. Ankara, December 1969.

The remarks that the project is very close to the nearby forests and that there is a sufficient amount of water supply and transport and energy facilities do not provide sufficient support for such a choice.

None of these advantages stated above was quantified economically to make the choice a feasible one; nor, I was told, was there any other alternative proposed against the Gaycuma project. In the absence of any other alternative investment proposal for location, we are not in a position to pursue the argument to its logical conclusion. But it can be pointed out that the choice of location was made very hastily and without any thought of would-be alternatives. At any rate, research on project alternatives in Turkey has not been adequate and this problem remains one of the fundamental weaknesses of the SPO and other public agencies. Thus, this drawback is not typical of the Gaycuma project.

2. Foreign-exchange savings of the project was simply calculated by taking foreign exchange value (F.O.B.) of the kraft paper that was previously imported and now is to be domestically produced. In the estimation of foreign exchange savings, they chose the cement industry's import price for kraft paper as (F.O.B.) $ 160 dollars per ton, and multiplied this with the amount that was substituted by local production.

This may make sense if the Gaycuma plant is producing the kraft paper at import parity. But, from the standpoint of social evaluation of public projects this is not so, since for foreign exchange savings we should find the foreign exchange which corresponds to the difference between the official exchange rate and "accounting" foreign exchange rate. This is necessary, as we shall argue in Chapter 7 that official exchange rate underestimates the "intrinsic" value of the foreign exchange and thus computation on the basis of official exchange rate would lead to overestimation. It appears the SEKA planners have not taken into account this aspect of social evaluation.

Accounting prices for exchange rate was later introduced by the SPO planners during the project's second evaluation: this will be dealt with in Chapter 7.

Moreover, foreign exchange savings were only confined to the substitution of kraft paper: and ohter paper products (semi-chemical cellulose. kraft liner) were not brought into the analysis. For some reason the foreign exchange savings that might stem, in the future, from the substitution of other paper products are not estimated.

Besides, foreign exchange earnings for savings are not always of direct character; some may be indirect savings or dissavings. For instance, the Gaycuma plant by requiring the wood products (i.e. timber) from the forestry industry is indirectly, by consumption, reducing the latter industry's exports of timber, which earns foreign exchange in the foreign market. Again, the execution of the project in question may create external economies to the transport and distribution sectors by inducing an expansion in their activities: and the increase in their activities may, in turn, require more foreign exchange spending.

These kinds of refined analyses have not been carried out by the SEKA planners: nor by the SPO, as we shall see later.

3. The value added of the Gaycuma project has been defined and estimated in a very curious way, where it is stated that value added is the difference between the annual sales value of products minus annual operating cost. This is a wrong definition of the value added and it should instead be defined as the difference between the sales value of the production of the project and the purchases from other enterprises, i.e. raw materials, energy, fuel, transport etc., and is numerically equal to the total value of salaries, wages, rent, interest and profits. It can be net or gross value added, where to obtain the latter indirect taxes, subsidies and depreciation ought to be included.

Apart from the awkward definition of the value added, the SEKA Report did not attempt to include the value added in the benefits side of the project, when it was compared to its initial cost. As we shall see below, the SEKA organisation attempted to base its investment decision primarily on the commercial profitability criterion; the value added created, foreign exchange savings provided and employment generated were considered as of secondary importance. This, of course, stems from the fact that evaluation of the project was carried out from the standpoint of a private firm and not a public enterprise.

4. Employment effect of the Gaycuma project was also carried out with extreme simplicity and, perhaps, without receiving due attention.

The direct employment effect of the project is very minimal as can be seen from the above tables. Total manpower requirement of the project was estimated to be 755 people, out of which 225 are unskilled workers.

It was stressed in the SEKA Report that employment of total 755 would mean, indirectly, providing better living conditions for 3755 people, if each family consisted of 5 members.

This estimate cannot be taken seriously as representing the employment effect of the Gaycuma project. It could probably be considered as a made-up political device to estimate employment effect of the project in Zonguldak Region.

Instead of concentrating on <u>indirect</u> economic employment benefits of the project on other closely-linked sectors, the SEKA experts practically ignored this aspect of the problem. It could be suggested that the execution of the project would have a considerable employment effect in the logging operations in the forestry industry, in transport activities and perhaps in the construction sector due to undertaking a housing scheme for the employees.

Surely the Gaycuma project will induce additional employment in the forestry sector where logging operations would be expanded in order to meet the raw materials requirements of the project. Similarly, the same effect can be extended to the transport sector which would be expanding following the rise in output in the forestry sector.

The relevent question here is to find direct and indirect employment effects resulting from a project. These indirect employment effects may be very important in the case of general unemployment and it is advisable to estimate them in spite of practical and conceptual difficulties.

A quantitative estimate of direct and indirect employment of labour in any given sector can be made by means of a regional input-output table. The technique to use here is the inter-industry matrix multiplier which relates the increase in a sector of final demand to the intermediate inputs required to meet it. For instance, the increase in final demand of, say, exports of kraft paper and kraft liner will have a predictable impact on the local timber industry (forestry sector) and other supplying industries. This in turn will have effects on suppliers further back, all of which can only be satisfactorily examined with the aid of an inter-industry input-output table.

If it is possible to construct a regional input-output table showing the relationship in that region between households, industries and autonomous final demand sectors, then each round of the matrix-multiplier could be determined for investment made in any sector.

The point is that to prepare such a table for a region (or all regions) is possible, but it may be a major exercise in its own right. It may be possible to find regional imports and exports and make estimates of regional final demand, but the basic problems in regard to a regional input-output table are many. First, lack of all kinds of data at regional level. This includes lack of knowledge on regional consumption, investment, regional trade and inter-industry transactions. Second, the difficulty of finding the inter-industry destination of inter-regional import flows to sectors within the region.(1) Data on import and export statistics for each region need to be collected. At this stage of course, a distinction needs to be made between imports of each commodity from abroad and from "the rest of the country".(2) Third, other difficulties are also inherent in the system of input-output analysis. That is the constancy of the input coefficients. This basic assumption however, can be treated as unrealistic since (i) inter-region coefficients are liable to change: (ii) technical changes in products and processes may upset the static linear assumptions.(3)

It is sometimes suggested that national imput-output coefficients can be used at regional level in view of regional data difficulties. But it is absurd and misleading to follow such a procedure since, as D. B. Steele has pointed out, "national coefficients reflect the national product-mix which differs from the regional product-mix by the degree of regional specialisation".(4)

As far as input-output analysis is concerned Turkey is only a beginner in this field and requires more data, experience and time in order to construct an appropriate and useful inter-industry matrix-table. Turkey

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(1) D. B. Steele, Regional Multiplier in Great Britain, O.E.P., Vol.21, No.2, July 1969, p.270

(2) T. Wilson, The Regional Multiplier - A. Critique, O.E.P., Vol.20, November 1968, No.3, p.383

(3) Professor T. Wilson argues that, though some attempt can be made to forecast such technical changes and apply them into a predictive matrix the results of such an experiment should be treated with caution and such an analysis should be made on the national rather than on the regional level. Ibid, pp.383-384.

(4) D. B. Steele, Regional Multiplier in Great Britain, O.E.P., op.cit., p.270

was not even able to draw up a complete input-output table at national-economic level let alone constructing such a table at regional level (see Chapter 2).

In the absence of such complex studies, however, an alternative would be to estimate the forward and backward effects that are nearest to the project.(1) In this context two important factors should be taken into account: (i) the size of the project, (ii) the existence of idle capacity in the closely linked local industries.

If, for instance, in the derived activities (i.e. timber industry and transport services) there seems to be some unutilized capacity, no additional investment will take place and the whole of the extra value added(2) and extra employment can be ascribed to the paper mill project.(3) It should be noted however that, if derived employment is assumed as an indirect benefit, the investment required for such derived employment should be estimated.

The evaluation of the project in terms of employment effect may be useful in showing us a partial aspect of the project and in some cases may receive special importance, but nonetheless as I have made clear in Chapter 4 (Appendix A), employment effect of a project alone should not be considered as a priority-ranking device.

It is stated in the SEKA Report that the project, in addition to the above mentioned benefits, would ensure a systematic exploitation of timber production: and consequently it could be a constructive element towards a modern forestry management. This would be considered as an indirect benefit to the national economy.

It is true that domestic raw materials will be utilized extensively by directing them to the paper industry. Forestry products (timber, woods,

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(1) UN - Manual on Economic Development Projects, United Nations. New York 1958, p.224.

(2) Of course, in this case there will be an indirect value added effect by the increase in productivity in both timber and transport industries. Both industries will employ more people to meet the intermediate input demand of the paper mill.

(3) The regional multiplier effect should also be taken into account. Regional multiplier which is an inverse function of marginal propensity to save and marginal propensity for import can stimulate an additional output in a region and this in turn additional employment. This point will be taken up in Chapter 8.

etc.) may be more efficiently exploited in order to meet the demand of the paper and cellulose plants. It remains to be seen however, if the Gaycuma project will stimulate a well-organised forestry management. Certainly there is an indirect benefit hidden here, but this does not seem to have been explored enough and is merely listed in a qualitative manner.

5. Finally, the most important shortcoming of the SEKA's evaluation method was the choice of an investment criterion. As I mentioned earlier, SEKA planners adopted a simple accounting profitability method which is used in various forms by the private enterprises.

The basic reasons for departing from the commercial profitability criterion as far as the public sector is concerned were fully explained in Chapters 3 and 5 of this thesis. But still it may provide a better understanding if we concentrate on some of its aspects here.

The above criteria can be refuted on many grounds, but I shall place them in two categories.

1. First, the forms of accounting profitability applied by the SEKA are quite an inferior version of the private profitability rule. Advanced forms of the private profitability include internal rate of return (IRR) and present value criteria (PV) (see Chapter 3).

As was pointed out earlier, the commercial profitability of the Gaycuma project was specifically given in terms of profit before tax/sales ratio: profits after tax/sales ratio; and profits before tax/investment ratio (see Table 3). These ratios are derived from the simple accounting approach after estimating annual income, annual operating cost and deriving gross profits.

No information is available to see if these ratios are compared with other paper projects included in the paper industry or whether they are compared merely to the borrowing rate of interest which is in the order of 7 per cent.(1)

According to the profitability criteria which derive from simple accounting approach, projects are often evaluated from forecasts of operational

(1) The State Investment Bank (SIB) is the main source of internal finance for public projects. Interest rate charged by the Bank varies between 7 per cent and 9 per cent.

accounts and by working out a rate of return from a comparison of earnings with the total amount invested.

Industrial projects are evaluated by using the estimates of investment costs and operational cost for the first years of the project, or sometimes for a "normal" operating year. Given income and expenditure, depreciation, profits and payable taxes are worked out for the first years. In practice the simple accounting rate of return is calculated by comparing the various expressions for profits before or after depreciation, before or after tax, with capital invested.(1)

The profitability or equivalent annual rate of return on investment is often expressed as

$$P = \frac{B - C - D}{I} = \frac{B - C}{I} - d$$

where B, C and D are annual flows of (gross) benefits, current costs and depreciation; I is the initial capital outlay, and d is the annual rate of depreciation as a fraction of the initial investment ($d = D/I$).

According to this rule an evaluation will rank projects according to the highest p: or after setting a minimum value of $\bar{p}$ those projects which satisfy $p > \bar{p}$ will be undertaken.(2)

Despite the fact that these criteria are quite easy to apply,(3) they have many shortcomings among which the most important ones are:

a) It is not possible in practice to come to any definite conclusion nor is it possible in particular to compare two projects by looking at an average rate of return or a series of yearly rates of return for a number of years in the lifetime of a project. Two projects could only be compared, if one of them shows a higher rate of return than the other at all times.(4)

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(1) The rate of return is sometimes calculated by relating the average profits over a period of several years or over the whole lifespan of the project to the value of the investment.

(2) It must be mentioned in this connection that gross profit as a percentage of investment is the exact reciprocal of the pay-back period.
(i.e. $\frac{\text{Initial investment}}{\text{Annual gross profit}} = \frac{I}{B - C - D}$

(3) Its advantages are, first, like theinternal rate of return it requires only project data for ranking and, second, p is much easier to calculate than internal/

(4) See overleaf.

Besides some kind of standard would have to be laid down - what would be the lowest figure for the average return as calculated here at which a project would be regarded as profitable?

b) In practice (as in the case of the Gaycuma project) rates of return are often calculated only for theearly years of the project's lifetime. on the grounds that the future is not known. In other words, this criterion applies to projects where annual flow of net benefits is assumed constant.

But to decide in favour of a project by using this sort of criterion is tacitly to assume that the results of the first years will be repeated at least for the period of years required to write-off the initial investment. In case this assumption is not justified then sufficient data must be available to calculate the present values of expected returns. This,in other words, implies moving to a better investment criterion - i.e. present value (PV) criterion.

c) One would also need to be able to compare cash flows and thus rates of return with different distributions over time. It was to this end that the discounting technique was introduced.

Only the PV approach gives a clear expression of the total net benefits expected from a project and does so in a manner which involves consistent time-weighting for all projects. Therefore, the present value (PV) approach should be preferred to all others.(1)

d) Like the internal rate of return criterion, accounting rate of return criterion (annual) does not distinguish the size of a project since it merely ranks projects on the basis of their annual rate of return. Whereas total net benefits and the size of an investment should be given due consideration.

It can be concluded that annual profitability criterion shares the same advantages and disadvantages with the IRR, but it has more limited

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(contd.) internal rate of return (IRR). For its disadvantages see above section

(4) For an appraisal of accounting rate of return see I.M.D. Little & A. J. Mirrlees, Manual of Industrial Project Analysis in Developing Countries - Methodology and Case Studies, Vol.I. OECD. Development Centre Studies. Paris, 1968. Chap, IV, pp.138-139

(1) For a critical survey of various investment criteria, see A. K. Sen, Stephen A. Marglin and Thomas Weisskopf, Lectures on Social Cost-Benefit Analysis for Industrial Project Formulation and Evaluation. UN - Industrial Development Organization, June 1967, p.64. Use of PV approach for comparing bet benefits in different time periods calls for a choice of discount rate: this will be examined in detail in Chapter 8.

application and is easier to compute. As is the case in pay-off period rule the simplicity of p may recommend it for screening purposes, but the social present value (SPV) is ultimately the most reliable one.

II. The second problem which arises in connection with the accounting rate of return is that it is an extremely inferior device used by the private sector in investment decisions. It is not even widely used in private sector let alone for public enterprise.

As was pointed out the SEKA being a public enterprise should have aimed at a better criterion which could take into account not private profitability but social profits which comprise all these effects of the project I have mentioned earlier. As I have argued in Part II, and shall also argue in the following chapters, the most appropriate criterion for social evaluation of investments is the social present value (SPV) method which utilises the discounting technique and social prices which are sometimes termed "shadow" or "accounting" prices.

V- <u>Conclusion</u>: In the above sections I have only attempted to draw some attention to various aspects of the preliminary evaluation carried out by the SEKA on the Gaycuma project. Very briefly some of the fundamental weaknesses have been emphasized.

As it stands the SEKA's project evaluation method does not conform to any of the basic principles which ought to be followed in project evaluation. The accounting profitability criteria they have chosen is not an appropriate criterion to apply for public investment projects. The SEKA's evaluation method as a whole appears to be extremely simple, incomplete and one which may lead to wrong investment choices.

It is worth stressing that in my basic analysis of the Gaycuma project I will not be using figures presented in the SEKA's Report which I have examined in the above sections. Instead, I shall concentrate more on the figures given in the SPO Appraisal Form for the Gaycuma project. My fundamental criticism therefore, will be on the SPO's project evaluation method and the choice of investment criteria for the selection of industrial projects. This will be the subject-matter of the following two chapters (7 and 8).

CHAPTER 7

GAYCUMA PROJECT AS EVALUATED BY THE SPO

Introduction: In what follows I shall describe the method used by the SPO in the evaluation of the Gaycuma project and later explore the drawbacks of their evaluation system in the light of the theoretical framework I have introduced in Part II of this thesis. It must be stressed that evaluation of the project by the SPO constituted the second and the final stage of the evaluation which has formed the basis for the inclusion of the project in the investment programme. The figures which are given in the SPO's Appraisal Form(1) are different from the ones presented in Chapter 6. Thus, the appraisal form will be the basis for our analysis in this chapter.

I. TOTAL INVESTMENT: As can be seen from Table 1, total investments of the Gaycuma project reached 385.2 million T. Lira, domestic component being 239.8 million T. Liras and foreign currency component of 145.4 million T. Liras.(2)

The foreign-exchange component of the investment was corrected by applying a shadow foreign exchange rate. In the SPO's appraisal form the shadow foreign exchange was assumed to be 33 per cent above the official rate. The SPO planners, in contrast to the SEKA organisation, seemed to be aware of the distortion which existed in the foreign exchange market. The way this rate was determined is not clear, but it may have been one which was chosen crudely without conducting the required studies.

The total investment in Table 1, therefore, includes domestic and foreign exchange component of the investment plus the additional foreign

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(1) Most of the public investment projects are presented according to the SPO's Appraisal Forms, which are prepared beforehand and later distributed to various government agencies.

(2) There is a minor difference between the value of total investments given in the SEKA Report and the SPO Appraisal Form. For instance, in the SEKA Report, total investment was estimated to be 387.0 million T.L., foreign currency component being 145.4 million T.L., and domestic currency being 241.6 million T.L.

The difference is stated to be entirely due to the fact that investments in the SPO Appraisal Form represented the actual figures, especially for years 1966 and 1967. See B. Benderlioglu. A private untyped document, SPO, Dec. 1969, p.2.

exchange resulting from applying a shadow foreign exchange rate to the latter component of the total investment. When the foreign exchange rate is adjusted upward by 33 per cent this brings the "shadow" foreign exchange rate up to 1 $ = 12.07 T.L., instead of official rate of 1 $ = 9.08 T. Liras.(1)

II. VALUE ADDED: The second Table which is included in the SPO's Appraisal Form is about the value added resulting from the project (see Table 2). The value added is defined as comprising salaries, wages, depreciation, interest, rent, taxes, profits and others.

The yearly distribution of value added is given in the Table as increasing with the utilized capacity of the plant. In 1970 the value added is given as 58.000 thousand T.L., increasing to 119.336 thousand T.L. in 1973.

Table 1. INVESTMENTS

Thousand TL.

Years	1966	1967	1968	1969	1970	Total
1. Domestic Currency	11.900	66.640	66.300	46.380	48.636	239.856
2. Foreign Currency	27.590	18.160	56.510	19.400	23.819	145.479
3. (2) x 0.33	9.187	6.047	18.817	6.460	7.930	48.441
4. Total (1+2+3)	48.677	90.847	141.627	72.240	80.385	433.776

Table 2. VALUE ADDED BY THE PROJECT

Thousand TL.

Years (1)	1970	1971	1972	1973
1. Salaries and Wages	6.450	9.700	9.700	9.700
2. Depreciation	21.700	21.700	21.700	21.700
3. Interest	15.700	15.700	15.700	15.700
4. Rent	-	-	-	-
5. Taxes	13.900	34.900	38.100	38.500
6. Profits	- 260	26.100	31.600	32.700
7. Others	510	970	1.036	1.036
8. Total Value Added (A)	58.000	109.070	117.836	119.336

(1) The capacity utilized is 41 per cent in 1970, 88 per cent in 1971 and 100 per cent in 1972 and 1973.

(1) Accounting foreign exchange rate will be $\frac{9.08 \times 33}{100}$ = 2.99 T.L., higher than the official rate, bringing the intrinsic value to 1$ = 9.08+2.99= 12.07 T.Liras.

The increase in the value added in the first 4 years of the project operation is due to a rise in the capacity from 41 per cent in 1970 to 88 per cent in 1971 and 100 per cent in 1972 and 1973. With the capacity being full after 1973, the value added was assumed to remain the same for the rest of the project's life.

The figures given for salaries and wages include, as we saw in Chapter 6, payments for high level administrators, technicians, skilled and unskilled workers. Since during the operation of the plants the total number of personnel is estimated to remain 755, the figure for salaries and wages is given to be the same for the first years of the project (with the exception of 1970, where the capacity is small). The payment to personnel amounts to 9.7 million T. Lirds per annum.

Depreciation in the SPO's Appraisal Form was calculated on the basis of the linear depreciation method which implies that the volume of investment in the form of renewable fixed assets (machinery, building etc.) is divided by the number of years of life assigned to them.

Similarly, when total investment of 433.766.000 T.L. is divided by the lifespan of the project, which is 20 years, the annual depreciation to be appropriated amounts to T.L. 21.700 (more exact figure is 21.688 thousand Turkish lirds).

The interest charges included in the value added Table are calculated separately from the depreciation charges. The interest charges are shown in terms of "equivalent annual cost" of the capital subject to depreciation and interest charges. The computation of depreciation and interest cost annually can be derived from the following formula:

(1) Capital Recovery Factor (c.r.f.) $= \frac{I}{n} + \frac{i(n+1)}{2n}$

where i is the interest rate, n the number of years and I the original investment. The first term of the right hand side gives the annual

(1) The main difference between this method and the sinking fund method is that the former makes no assumption as to the destination of the reserve. Sinking fund method assumes that a fixed quota at compound interest will be deposited at the end of each year in order to provide a sum equal to the original investment . "Sinking fund factor" can be expressed as:

$(s.f.f.) = \frac{i}{(1+i)^n - 1}$, where I is the initial investment, i the rate of interest and n the lifespan of the asset. Here the amount of amortization/

linear depreciation cost and the second term gives the annual interest costs. Since original investment involved by the project I = 433.776.000 T.L., n = 20 years and the rate of interest applied I = 7 per cent, linear depreciation cost and annual interest cost becomes:

$$\text{c.r.f.} = \frac{433.776.000}{20} + \frac{0.07\ (20+1)}{2 \times 20}$$

$$\text{c.r.f.} = 21.689.000 + (0.0367) \times I$$

$$\text{c.r.f.} = \underset{\text{Depreciation}}{21.689.000\ \text{T.L.}} + \underset{\text{Interest cost}}{15.619.000\ \text{T.L.}}$$

The interest rate applied by the SPO is 7 per cent and both computations were based on this rate. This rate is the minimum rate that was applied to public industrial projects by the State Investment Bank.[1]

Taxes (item 5) are also included in value added as a direct component. There is no explanation in reference to taxes in the project presented to the SPO, but it seems that this figure represents direct and indirect taxes taken together. Taxes seem to constitute the largest direct component of the value added as can be seen from Table 2.

Direct taxes here include corporation tax which is levied as 35 per cent over gross profits to be achieved by the Gaycuma plant. The indirect tax, on the other hand, is the production tax which is charged on the value of gross production as 15 per cent over the latter.

Profits (item 6) represent net profits after deducting corporation tax which is mentioned above. At the beginning the paper and cellulose plant (1970) is working at 41 per cent capacity and thus it is making a loss of 260.000 T. Liras. But this loss is recovered in 1971 by reaching a capacity of 88 per cent and the plant is making a profit of 26.100.000 T. Liras. Also, a profit of 31.600.000 T.L. and 37.700.000 T.L. in 1972

(contd.) ation is computed by multiplying the original investment with the "sinking fund factor". For both formulae, see United Nations - Manual on Economic Development Projects, New York, 1958. pp.132-136.

[1] The State Investment Bank (SIB) may sometimes charge a rate which is above 7 per cent depending on the nature of the project. In practice the rate therefore, varies between 7 per cent and 9 per cent. An interview with B. Benderlioglu, SPO, Jan.-Feb., Ankara, 1969.

and 1973 respectively (in the last two years the utilized capacity is 100 per cent).(1)

The figures given under "others" (item 7) includes items such as social security funds and insurance charges.

III. FOREIGN EXCHANGE EARNINGS: In Table 3 the foreign-exchange earnings (or savings) of the Caycuma project are shown in terms of gross and net value. It is stated in the SPO Appraisal Form that the project does not involve foreign exchange spending during the operation of the paper and cellulose plants.(2) Consequently, the net foreign exchange savings of the project is similar to the gross foreign exchange savings (compare item (1) with item (2)).

The gross foreign exchange savings resulting from the project is derived by multiplying (cif) import prices of kraft paper, kraft-liner and semi-chemical cellulose which are domestically produced, with the volume of production substituting the importation of these goods. (See Table 3,a). In the SPO Appraisal Form, it is pointed out that (cif) import prices are 1.600 T.L. for kraft paper and kraft-liner, 700 T.L. for semi-chemical cellulose, the latter rising to 900 T.L. in 1973. The (cif) import prices for these substituted paper products belong to the year 1964. In the preliminary evaluation of the foreign exchange savings, the above-mentioned import prices are used as a first approximation. These prices were later changed.(3)

Table 3. Project's Foreign Exchange Savings (or Earnings)

(Thousand Turkish Liras)

Years	1970	1971	1972	1973
1. Foreign Exchange Savings (or Earnings)	60.800	117.000	126.000	126.000
2. Foreign Exchange Spending	-	-	-	-
3. Net Foreign Exchange Savings (or Earnings)	60.800	117.000	126.000	126.000
4. (3) x 0.333 (B)	20.268	60.995	63.952	63.952

(1) Though the plant is working at 100 per cent capacity there is a difference in profits in 1972 and 1973 and this is due to different composition in the product-mix. Interview with B. Benderlioglu, Ankara, 1969.

(2) This point is also confirmed in the recent typed document I obtained from B. Benderlioglu, a planner at the SPO, Ankara (Dec.1969). This implies that fuels, chemicals and all other operating items are domestically provided according to the information given.

(3)/

Table 3 a.

Thousand T. Liras

Plant selling prices	Import prices (cif 1964)	Years	Production Quantity (ton)	Value	Foreign Exch. Savings (cif)
Kraft-paper 2.500 T.L.	1.600	1970	27.000 + 11.000	97.000	60.800
Kraft-liner 2.500 T.L.	1.600	1971	46.000 + 19.000 +11.000 + 8.000	185.000	117.000
Semi-chemical cellulose 1.000 T.L.	700	1972	46.000 + 19.000 +20.000 + 11.000	197.000	126.000
Semi-chemical cellulose 1.300 T.L.	900	1973	46.000 + 19.000 +20.000 + 11.000	197.000	126.000

However, the foreign exchange savings of the Gaycuma project are calculated as the amount which corresponds to the difference between the official exchange rate and the "shadow" foreign exchange rate (see Table 3, row 4). Therefore, foreign exchange savings that are calculated at official rate are multiplied by 0.33 per cent in order to find the real foreign exchange savings of the project. The foreign exchange savings in the first four years of the plant operation are then found to be 20.268 thousand T. Liras in 1970, 60.995 thousand T.L. in 1971 and 63.952 thousand T.L. both in 1972 and 1973.(1)

IV. BENEFITS TO THE CONSUMERS - Correction from Consumers' Point of View:

In the Appraisal Form selling prices of the three major products, that is kraft paper, kraft-liner and semi-chemical cellulose, are given before the project comes into existence and also after the project is completed. The selling prices before the project are given as 1,200 T.L. per ton for semi-chemical cellulose, 2,540 T.L. per ton for kraft paper and 2,540 T.L. per ton for kraft liner (see Table 4). Sales prices after the

(contd.)
(3)(CIF) Import prices for kraft paper, kraft-liner and semi-chemical cellulose were later changed as 1656 TL. (per ton), 1656 TL., and 800 TL. respectively. This change, it is said, was due to more refined information obtained by the SPO at the time of appraisal. B. Benderlioglu, A private letter, December 1969, Ankara.

(1)These figures are wrong since there is an error in the multiplication carried out in row 4 of Table 3. This will be corrected in Chapter 8.

project, on the other hand, are estimated to be 1,150 TL per ton for semi-chemical cellulose, 2,500 TL per ton for kraft paper and kraft liner.[1]

Then the SPO Appraisal Form has taken the difference between the sale prices of the factory products before and after the project as representing a price difference per ton of these goods. As can be seen from Table 4, row 3, unit price difference is 50 TL per ton of semi-chemical cellulose, and 40 TL per ton of both kraft paper and kraft-liner.

Table 4. Correction from the Consumers' Point of View (in terms of price reductions)

Years	1970 1st year			1971 2nd year			1973 3rd year		
	1	2	3	1	2	3	1	2	3
1. Selling price of the product before the project (TL)	1200	2540	2540	1200	2540	2540	1200	2540	2540
2. Selling price of the product after the project (TL)	1150	2500		1150	2500		1150	2500	
3. Unit price difference (1-2) TL	50	40		50	40		50	40	
4. Production volume of substitution (ton)	** -	38.000		19.000	64.000		31.000	64.000	
5. Correction for Consumers (3x4) C*	+ 1520			+3510			+ 4110		

Notes: 1 refers to semi-chemical cellulose

2 refers to kraft-paper

3 refers to kraft-liner

*These figures are in terms of thousand Turkish Liras.

**There is no production of semi-chemical cellulose in the first year of the plant operation.

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(1) Production cost of the factory is estimated to be 2.306 TL per ton, for kraft paper, 2.306 TL per ton for kraft liner, and 870 TL per ton for semi-chemical cellulose. These figures are given in a recent document I obtained from the SPO. (B. Benderlioglu, a private letter, Ankara, December 1969).

Given the total volume of domestic production that is substituting for imports in each group of paper products and also the price difference per unit (per ton) in each individual product, benefits that are accruing to consumers in terms of price reductions are worked out.[1] This is done simply by multiplying the former (item 4) with the latter figure (item 3). Consequently the benefits accruing to consumers are presented to be 1,520 thousand TL. in 1970, 3,510 thousand TL. in 1971 and 4,110 thousand TL. in 1972. The latter figure, which corresponds to the full capacity of the plant, was assumed to be constant throughout the life of the project.

The benefits to consumers' aspect of the project evaluation raises many important problems. For instance, questions which can be asked are:

- are the cost assumptions realistic ones?
- are the transport costs to the consumer centres taken into account?
- how far are the estimates of sale prices of the factory realistic? etc.

These questions will be taken up in more detail in Chapter 8.

V. EMPLOYMENT EFFECT OF THE PROJECT: Employment effect of the Gaycuma project is indicated in the SPO Appraisal Form only in reference to the unskilled labour. Wages paid to the unskilled workers are adjusted downward by applying a shadow wage rate, which is taken as a half of the market wage rate in that region. The SPO have simply multiplied the wage payments to unskilled labour (Table 5, item (1)) by the pre-determined coefficient of 0.5 so as to obtain the corrected wage payments to the unskilled workers.

The SPO planners appear to be aware of the fact that the market wage rate of unskilled workers will overestimate the "intrinsic" value of labour. But there is no information available to explain why the market wage rate was corrected downward by 50 per cent. Also I have not been able

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(1) It was explained to me that the reason why the selling price of imported goods is higher than the domestic selling price of the same products after the project is because the former includes customs duty, transport cost and profit margin of the importer.

to find whether this adjustment was carried out on the basis of regional unemployment problem or overall unemployment conditions prevailing in the country.

Further, as can be seen from the Appraisal Form, there is, as in the case of SEKA Report, no reference to indirect employment benefits that might accrue to other sectors as a consequence of implementation of the Gaycuma project.(1) The shortcomings of the SPO method on this problem will be discussed in more detail in the following chapter.

VI. TOTAL BENEFIT FLOWS: As can be seen from Table 6, total flows of benefits comprise total value added, foreign exchange savings resulting from the project, benefits to consumers and employment effect of the project.

Total benefits of the project will increase from 80.353 thousand T.L. in 1970 to 188.248 thousand T.L. in 1973 as a consequence of a change in the utilized capacity of the plants. The total benefit flow in 1973 is assumed to remain constant throughout the life of the project since this figure corresponds to the full capacity operation of the plant. Another assumption here is that there will be no price changes during the lifespan of the project to alter the figures given in the Table.

As is mentioned earlier, the SPO planners have introduced shadow prices both for foreign exchange rate and market wage rate of unskilled workers. The prices applied in the computation of all other cost and benefit items are market prices. For instance, transport and energy costs which enter operating costs of the project are calculated on the basis of market prices. It follows that accounting prices have been partially adopted. The implication of this kind of pricing policy as far as project evaluation is concerned will be deferred until the next chapter.

It is also worth stressing that the total benefit flows which are included in Table 6 are direct benefits and do not include indirect benefits of the project. As we shall argue later, most of the benefits are via backward and forward linkages and these ought to be brought into cost-benefit

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(1) It is stated by B. Benderlioglu, a planner of the SPO, that "employment effect" criterion was not applied in the project evaluation by the SPO. I am told that this criterion has not been developed enough to have some applicability during the First Plan. See B. Benderlioglu, a planner in the SPO, a private untyped letter, December 1969, p.2.

Table 5. Employment Effect of the Project

Thousand T. Liras

Years	1970	1971	1972
1. Payment to Unskilled Labour (T. Liras)	1,130	1,700	1,700
2. Coefficient	0.5	0.5	0.5
3. Employment Effect (1 x 2) D	565	850	850

Table 6. Total Benefit Flows of the Project

Thousand T. Liras

Years	1970	1971	1972	1973
Total Value Added A	58.000	109.070	117.836	119.336
Net Foreign Exchange Savings (Corrected) B	20.268	60.955	63.952	63.952
Correction for Consumers C	1.520	3.510	4.110	4.110
Employment Effect D	565	850	850	850
TOTAL (A+B+C+D)	80.353	174.385	186.748	188.248

analysis for an appropriate assessment of the project.

VII. PRESENT VALUE OF INVESTMENT AND BENEFIT FLOWS

Table 7 presents the capital outlay of the Gaycuma project which is spread over five years, starting from 1966 to 1970.

The present worth factors (pwf) which are included in the Table correspond to a discount rate of 12 per cent. In other words, the SPO planners have chosen a 12 per cent discount rate for computing the present value of capital flows as well as benefit flows. As converted to 1966 base year, the present value of investment disbursements is worked out to be 308,214 thousand T.L., instead of its market value of 433,776 thousand T.L.

Table 7. Present Worth of the Investment Expenditure

Years	Flow of Investment Expenditure	Present Worth Factor: at 12 per cent	Present Worth of Investment
1	48.677	.8929	43.463
2	90.847	.7972	72.423
3	141.627	.7118	100.810
4	72.240	.6355	45.908
5	80.385	.5674	45.610
6		.5066	
7		.4523	
TOTAL	433.776		308.214

Similarly, present worth factors which correspond to a 12 per cent discount rate are applied to the benefit flows of the project in order to bring them back to present day. The present value of total benefit flows amounts to 824.664 thousand T. Liras (see Table 8).

The choice of a discount rate for present value (PV) computations, is the most important problem in the social benefit cost analysis. The theoretical discussion on the social discount rate and the relevant discount rate for underdeveloped countries will be reserved for the following chapter. The basic reasons for choosing a 12 per cent discount rate in Turkey will also be appraised.

VIII. BENEFIT-COST RATIO: The benefit-cost ratio of the Gaycuma project was simply worked out by dividing the total present value of benefits during the lifespan of the project (which is 20 years) by the total present value of capital expenditure involved during its construction period. The benefit-cost ratio of the Gaycuma project was found to be 2.67, which was taken as a base for the admission of the project.

$$\text{The benefit-cost ratio} = \frac{\text{PV of Benefit flows}}{\text{PV of Investment flows}} = \frac{824.664}{308.214} = 2.67$$

Table 8. Present Worth of the Flow of Benefits

Years	Benefit Flows	Present Worth Factor: 12 per cent	Present worth of Benefits
5	80.353	.5674	45.592
6	174.385	.5066	88.343
7	186.748	.4523	84.466
8	188.248	.4039	76.033
9	188.248	.3606	67.882
10	188.248	.3220	60.615
11	188.248	.2875	54.121
12	"	.2567	48.323
13	"	.2292	43.146
14	"	.2046	38.515
15	"	.1827	34.392
16	"	.1631	30.703
17	"	.1456	27.408
18	"	.1300	24.472
19	"	.1161	21.855
20	"	.1037	19.521
21	"	.0926	17.431
22	"	.0826	15.549
23	"	.0738	13.892
24	"	.0659	12.405
Total			824.664

CHAPTER 8.

APPRAISAL AND CRITICISM OF THE S P O PLANNERS' EVALUATION OF THE CAYCUMA PROJECT

In what follows, the various aspects of the SPO's project evaluation technique adopted in the Caycuma project will be assessed. Some of the points which will be raised in this Chapter are relevant not only to Caycuma project but to all public industrial projects. The Tables I refer to in the following sections, are the ones cited in Chapter 7.

I - Definition of Value Added

The major problems involved in project analysis are the composition of the value added created by the project and the prices to be used in computing various items included in the value added. These two issues will be examined in turn in respect to the Caycuma paper and Cellulose project.

The value added is formally expressed as the difference between the sales value of the estimated production in the project and the purchases from other enterprises (i.e. raw materials, energy, fuel, lubricants, transport etc.) and is numerically equal to the total of salaries, wages, rent, interest and profits[1].

Value added can be either net or gross and estimated at factor cost or market price according to whether depreciation on indirect taxes and subsidies are excluded. If the former, value added is calculated on a net basis; if the latter, it is computed at factor cost.

From the layout of Table 2, one can see that value added concept that the planners have used is the gross value added at market prices since depreciation and indirect taxes are included. For the net value added (NVA) to be calculated depreciation should be excluded from the gross production value. This will give net value added at market prices. If, on the other hand, depreciation, indirect taxes and subsidies are deducted from the gross production value then that will give net value added (NVA) at factor cost.

From/

1. U.N. - Manual on Economic Development Projects. United Nations, New York, 1958. p.220.

From the standpoint of a private firm, what is relevant is the net value added at factor cost. In other words, gross production minus depreciation, indirect taxes and subsidies. But for a public project evaluation depreciation, and indirect taxes (taxes on inputs) should be included for the value added estimates. Therefore, the planners' concept of value added which includes depreciation is an appropriate one.

A clarification of an important point may also be relevant here. Computation of value added for public and private sectors will differ in respect to the treatment of direct and indirect taxes. Direct taxes and indirect taxes are excluded from the value added estimation of the private sector because the main goal is to maximise profits net of taxes. From public sector point of view, direct taxes need to be included in the total Value Added. The indirect taxes, on the other hand, will necessitate a further adjustment which will be taken up later on. This point is often confused and may also lead to some serious misunderstanding on the part of Value Added computation. The principle behind the definition and estimation of Value Added must be borne in mind when dealing with investment appraisal.

The second problem arises when it is asked what prices, market or shadow prices, to apply in the computation of value added and particularly in the various items it comprises.

It is generally acknowledged that market prices in developing countries are often unsuitable, but there is less agreement on the degree of market imperfections and hence on the need to evolve shadow prices. Some economists who are sceptical of a proper determination of shadow prices argue that market prices for all their impefections should be prefered. Most economists, however, argue that market prices are defective for the reasons which I have extensively explained in Chapter 3[1], and thus social cost-benefit analysis cannot be imagined without the application of shadow prices[2].

Market prices would represent the true value of goods and services if the law of supply and demand operates freely under perfect competitive conditions with full employment of all resources and complete mobility of all factors. If,/

1. For a full discussion of market imperfections see Chapter 3.

2. A compromise is sometimes reached by reconciling the disadvantages of both market and shadow prices. It is suggested to draw up two column schedule of the costs of a project expressed both in market and in shadow prices. That way a double check may be provided. U.N. Cost-Benefit Analysis of Social Projects. ' Research Institute for Social Development and Office of Social Affairs. Report No.7., Geneva, April, 1966, p.22.

If, because of any interference, obstacles or regulations, these conditions do not exist then the price system will be distorted. It will not correspond any longer to that ideal system of equilibrium nor represent the value of the factors from the point of view of the society as a whole.

It is then necessary to correct market prices in order to obtain what has been termed the "social cost" of the factors. In other words: Should custom duties and tariffs be included in the cost, or should the cost of imported goods be calculated at the official exchange rate, or should the market wage rate be the price of labour which is in surplus in underdeveloped countries?

The answers to such questions raise pricing problems; price modifications fall into two groups: (a) eliminating the effect of taxes or subsidies from the prices, (b) use of so-called social opportunity costs of factors of production.

The first price modification includes the elimination of indirect taxes and subsidies in order to obtain the true price of goods and services produced. For instance, if there are custom duties on the raw materials imported these indirect taxes should be excluded from the market cost of raw materials. Also, if there is a sales tax imposed on prices then this amount of tax must be eliminated if the true sale price is to be estimated.

The prices of factors of production (labour, capital and foreign exchange) must also reflect their opportunity costs and this in principle is scarcity prices. These prices depend on the supply and demand for such factors of production. Although such costs can often be taken as being expressed by the market prices of the resources in question in developed countries, the same cannot be said for developing countries where capital, cost and foreign exchange rate are underestimated and labour cost is overestimated. Hence capital cost (interest rate) and foreign exchange rate need an upward adjustment while the labour cost needs a downward adjustment in order to reflect their scarcity values[1].

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1. These adjustments become more apparent especially when public projects are concerned. When decision has to be taken by the public authority and has to be justified in terms of increase in the social welfare which it produces many market prices no longer reflect the valuation of society as a whole. This is so because of the existence of market imperfections and of consumers' surplus result in prices which differ significantly from those which would obtain in conditions of free competition. There are many reasons for rejecting market prices for output and factors of production and substituting them with social prices. These were however discussed in length in Chapter 3.

Because market imperfections result in prices different from those which would be obtained under free competitive conditions the public authority has to adjust market prices by factors which make allowance for the estimated degree of imperfection[1].

For these price adjustments market research techniques and demand and supply elasticities would be required in order to determine the "shadow" prices to be used in Cost-benefit analysis.

a - Wages and Salaries

Let us turn to the Caycuma paper project. Wages and salaries are included in the value added (Table 2), but it seems that they are valued at market prices rather than social prices. It is a common practice in project evaluation to apply market prices for high level personnel and skilled workers, but this is not correct when unskilled workers are valued.

If market prices are used for the unskilled workers they will then be overestimated on the grounds that the market wage rate does not reflect their true value from the society's point of view. What is relevant here is the social opportunity cost of labour employed by the project.

If, by drawing such unskilled labour into employment no alternative opportunities are foregone, the wages paid should not enter into the sum of social costs. In this case social opportunity cost of labour is zero. But if a new factory is to be constructed where a high level of productivity per man is anticipated, and it has to employ labour previously occupied in low productivity agricultural work the social cost is different (the case of underemployment). Though the wages which the factory would pay represent the workers' contribution to the value of manufactured production, the sacrifice involved in directing such labour to the industry from agriculture is equivalent to the wages paid to those workers in the latter activity.

Therefore,/

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1. For extensive literature on the differences between social and individual welfare function see R. Turvey, On Divergencies between Social Cost and Private Cost, Economica, August, 1963, pp.309-313; also, A.R. Prest and R. Turvey, Cost Benefit Analysis: A Survey in Surveys of Economic Theory. A.E. Ass. Royal Econ. Society, Vol.III, Resource Allocation, New York, 1966. pp.164-168.

Therefore, it must be asked beforehand from which activity labour will be diverted for employment in the project and what is the society's loss of production will be as a consequence of the project.

In the Value Added table presented by the SPO wages seem to be valued at market prices without given due attention to the implications resulting from opportunity cost of unskilled labour. Caycuma paper plant employs unskilled labour which is diverted from agricultural activities. The Zonguldak region is one of the regions with a high level of unemployment and, therefore, the social cost of labour employed by the project should be somewhere below the market wage rate[1].

A practical solution will be to consider as opportunity cost, in a given case, the average income of all unskilled labour in the country or area calculated by dividing total wages paid by the total number of workers whether employed or not.

Another alternative is to use "accounting" wage rates which will prevail under conditions of equilibrium. But because of difficulties involved in measuring the consequences of investments on future accounting prices, a rough estimate may be sufficient for the actual fundamental disequilibrium affecting the market price. The project can be evaluated using a certain percentage of the average market rate for wages, i.e. 50, 60, 70 percent[2].

In the determination of shadow wage rates the following guidelines should be borne in mind:

(a) If it is certain that some of the labour would be previously unemployed and there were no possibilities of replacement in other activities a social cost of zero might be assigned. If labour is diverted from a low productivity sector (i.e. Agriculture) into high productivity sector the wage rate which will enter calculations will be the labour cost in the previous occupation[3].

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1. A high level of unemployment does not always lead to a decline in wage rates since legal minimum rates may be established on collective contracts or other factors may have their effect. Hence market prices do not reflect the true social cost of labour and should be replaced by a shadow wage rate.

2. See J. Tinbergen, The Design of Development, Baltimore, 1966, p. 86

3. If workers are diverted to other regions the expenditure on the provision of housing, transport, water supply and other services must also be taken into account.

(b) There will be greater differences between social cost and market price for unskilled labourers and non-specialised workers. Correction of the market cost of labour will be more justified, when the structural conditions causing the open or disguised unemployment are more deep-rooted.

(c) If there is an unemployment benefit (transfer payments) paid to unskilled workers this amount will need to be deducted from the marginal opportunity costs of workers. Conversely, if wages are squeezed below marginal opportunity costs by monopsony practices.

(d) In the absence of more specific data, a percentage of market price can be adopted based on available criteria and adopted to all labour in all projects under comparison.

It should be added, however, that these percentages need to be changed later in order to see what effects the changes would have on the final order of priority of projects. It is hard to believe that shadow wage rate would forever remain below the actual wage. Unemployment, underemployment, market imperfections, all the factors that make for a discrepancy between actual and shadow wages are things that one would expect to be substantially reduced if not eliminated as an economy develops successfully[1]. Therefore, a dynamic approach must be used for a more accurate assessment of real wage rates.

Correcting future labour costs calls for estimates of future unemployment and supply and demand conditions. Such forecasts however, should be left to the central government while public agencies should correct market prices according to the local underemployment and divergencies between market and social cost of labour[2].

(e) /

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1. On this point, see A.C. Harberger, Techniques of Project Appraisal, National Economic Planning - National Bureau Conference Series No. 19, New York, 1967. pp.132-134, p.142.

2. See A.R. Prest and R. Turvey, Cost-Benefit Analysis: A Survey. in Surveys of Economic Theory, A.E. A. Royal Economic Society, Vol.III Resource Allocation, New York, 1966, p.166.

(e) The following important point must also be carefully observed: it may be easier to allow for the overpricing of labour which is used in constructing or operating a project than to allow for overpricing of equipment, fuel, materials which are overpriced because they too include in their costs overpriced labour[1].

Therefore, if correction is made for project labour costs only, the relative social cost of project labour and of other inputs may be distorted more than if no correction at all is made.

b - Taxes

As far as taxes are concerned, from the Value Added Table (No.2), it can be guessed that taxes include both direct and indirect taxes. There is no adequate information in the Caycuma Project regarding taxes and their distribution.

I was told, however, by the responsible planner at the SPO that there were two types of taxes involved in the project. The Caycuma Paper Plant as a part of SEKA state economic enterprise is liable to pay a corporation tax of 35 percent of the gross profits. The other tax is production tax which is in the order of 15 percent to be levied on the production cost.

Given the following two assumptions one can deduce direct and indirect taxes in the following manner:

(1) First assumption is that taxes (item 5) include both direct and indirect taxes.

(2) Second assumption is that by profits (item 6) it is implied net profit after direct tax is paid.

If these two assumptions happen to be correct profits before direct tax can be calculated as follows: Since in 1970 there is a loss instead of profits taxes in that year will represent only indirect taxes paid to inputs during the operation of the plant.

But/

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1. Ibid, p.166

But in 1971 profits before taxes will be the sum of corporate tax paid (35 percent) and the net profit after taxes (65 percent).

Profit before Corporate Tax	100 percent
Corporate Tax	35 percent
Net Profit after Corporate Tax	65 percent

Gross Profits before Direct Tax is paid becomes:

$$GP = \frac{26{,}100 \times 100}{65} = 40{,}153{,}8 \quad TL^{1}$$

Thus, the difference between Gross Profits (before corporate tax) and the net profits will give us direct taxes:

$$40{,}153{,}8 - 26{,}100.0 = 14{,}053.8 \text{ Direct Taxes.}$$

From this indirect taxes can be found by deducting direct taxes from total taxes (item 5):

Total Taxes	=	34,900
Direct Taxes	=	14,053
Indirect Taxes		20,847

Thus, indirect taxes will amount to 20,847 thousand T. Liras in 1971.

For 1972, the same method can be applied in order to find out gross profits before tax and direct and indirect components of taxes (item 5).

$$\text{Gross Profits} = \frac{31{,}600 \times 100}{65} = 48{,}615{,}3$$

Gross Profits before Direct Tax (Corp.Tax)	=	48,615,3
Net Profits After Direct Tax	=	31,600,0
Direct Tax		17,015,3

Direct Taxes being known, in direct taxes will be:

$$38{,}000 - 17{,}015 = 21{,}085$$

Thus indirect taxes will amount to 21,085 thousand T. Liras in 1972. In other words, indirect taxes constitute 55 percent of the total taxes paid by the Project.

In/

1. All figures here are in terms of thousand Turkish Liras.

In 1973, profits before tax, direct and indirect Taxes, using the same method will be:

Gross Profits before Direct Tax	=	$\frac{32,700 \times 100}{65}$
	=	50,307,6
Gross Profits before Direct Tax (Corp. Tax)	=	50,307,6
Net Profits after Direct Tax	=	32,700,0
Direct Tax		17,607,6

Indirect Taxes become: Total Taxes - Direct Taxes

38,500 - 17,607,6 = 20,893.

Indirect Taxes in 1973 amount to 20,893 thousand T. Liras or represent 54.2 percent of total taxes.

Coming back again to the treatment of direct and indirect taxes, one may first begin by stating the fact that the issue involved here, will represent different analysis from the public and private sectors points of view.

It is generally agreed that while private profit making decision would allow for income and profit tax payments; this may not be the case as far as a public sector is concerned. In the latter sector direct taxes must be included in the value added computations since direct taxes paid will constitute a real contribution to the national income.

For private enterprise the goal is to maximise the net of tax yield earned on the capital outstanding in a project. Thus, from the point of view of private enterprise, net receipts comprise profits less taxes when paid plus depreciation. In other words, cash receipts are valued at net basis by deducting tax payments from their gross profits.

It follows that, in a private sector, direct taxes will be excluded from the value added calculations while they must be included in the value added of a public project.[1]

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1. On this point, see A.R. Prest and R. Turvey, Cost Benefit Analysis: A Survey, E.J. December 1965; (Reprint) in Surveys of Economic Theory, A.E.A. Royal Economic Society Vol.III, Resource Allocation, New York, 1966, p.165; also see I.M.D. Little and J.A. Mirrlees, Social Cost-Benefit Analysis. O.E.C.D. Development Centre Studies - Manual of Industrial Project Analysis in Developing Countries, Vol.II, Paris, 1969, pp.18-20.

Let us turn now to indirect taxes. Some economists suggest measuring taxed inputs at their factor cost rather than at their market value. This implies that in the calculation of raw and auxiliary materials (imported or domestically provided) the price to apply is not market value but factor cost of these materials. Therefore, in case raw materials are imported, custom duties and tariffs need to be eliminated from market values. The same applies, in the case of subsidies and sales taxes.

The purpose of eliminating the influences on prices of taxes and subsidies is to obtain the value of goods and services at the true cost of the factors. For example, greater or lesser custom duties or sales taxes cause variations in selling prices unrelated to the productive effort involved.

If there is a sales tax of Q monetary units per unit sold it is easy to subtract this from the market price and the difference is the monetary value of that unit. Also, it is essential to eliminate custom duties on the same basis.

Similarly, in the Caycuma Paper Project, for a correct computation of production cost, the custom duties on imported raw materials must be deducted from the market value in order to reach the real cost of the materials used. Similarly a correction would be needed on the part of subsidies, though there is no indication of these being provided to the Caycuma Paper Plant[1]. It is simple to correct for the subsidised price of the product when the subsidy is directly provided, but almost impossible if it is the indirect result of other measures as would be the case, if a raw material were obtained cheap because transport was subsidised. However, the implications of this point should be kept in mind during project appraisals.

It is sometimes argued that measuring taxed inputs at their market value is appropriate when the total supply of the input in question has a zero elasticity of supply[2]. This problem arises when an imported item is subject to a strict quota. In the case of computing the cost of imported input with a fairly high level of tariff protection, it is argued that price including duty is the best measure of social cost because in the absence of protection the/

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1. From the recent document I obtained from the SPO it appears that the Paper Mill project does not require subsidies and in fact the Plant is expected to meet the burden of producing craft paper at a higher cost than the c.i.f. import price. B. Benderlioglu, A Private Untyped Letter, December 1969, Ankara, p.3.

2. See A.R. Prest and R. Turvey, Cost-Benefit Analysis: A Survey, E.J. December, 1965, p.693.

the country's equilibrium rate would be lower[1].

But if imports are provided domestically and they have an elastic supply, their factor cost may be a best measure - i.e. elimination of indirect taxes. Since almost all of the raw materials and other inputs required by the Paper Plant are provided domestically[2] and because these inputs will have an elastic supply (the plant is located very close to the centre of raw materials which are to be provided by Bolu and Kastomonu Forests) factor cost of inputs rather than market value is relevant.

It seems difficult to observe if such a distinction has been made by the planners when dealing with indirect taxes charged on input factors. Without having the annual operating cost figures of the project it is difficult to tell if indirect taxes (tariffs and production taxes) are eliminated from the valuation of raw materials, auxiliary raw materials and other expenditure items.

One may conclude that the issue of taxes has not been made clear by the Turkish planners while they appraised public investment projects. But, nonetheless, the inclusion of direct and indirect taxes in the Value Added Table can be apposite from public sector point of view.

c - Profits

As was mentioned in the earlier sections the profits item in the Value Added Table appears to be profits after taxes by which we mean net profits after corporation taxes are excluded. In dealing with the taxes under the given assumptions, we were able to compute gross profits before taxes as follows:

Years	Gross Profits Thousand T.L.	Net Profits Thousand T.L.
1970	-	- 260
1971	40,153,8	26,100
1972	48,615,3	31,600
1973	50,307,6	32,700

1. Ibid. p.693.

2. It is already stated in the original project submitted by SEKA enterprise.

Annual profits (net) which amount to 32,700 thousand T.L. in 1973 are supposed to remain constant throughout the life period of the Paper Mill. This is based on the assumption that output and input prices would remain the same over the life of the asset.

It is, however, sometimes argued that in estimating the expected costs and revenues for a project allowance should be made for the effects of any general inflation of the price level anticipated during the life of the project[1]. This is a complex problem to take into account in cost-benefit analysis and since general inflation can be expected to have a similar effect on both costs and revenues there may be no need to build its impact into the calculation of profits and cash flows. But, nonetheless it is necessary to take account of changes in relative prices where it is forecast that the movements of prices and costs of items relevant to a particular investment project are likely to differ from the inflation of prices and costs in general. The relevant costs and prices would include wages and salaries and the costs of raw materials and auxiliary materials required by the Project, as well as expected movements in the price obtainable for the goods produced in relation to possible movements in prices in general[2].

Though estimate of profits or revenues stemming from an investment project should be carried out according to relative price and cost changes in output and factor inputs this issue in practice is reduced to a situation where future demand for the products and sales revenue and prices received and operating costs would be assumed to be the same during the operation of the Plant.

It appears that the SPO planners have followed this simple assumption in estimating the revenue and operating costs of the Paper Project. Annual Profits are taken to mean simply the difference between market value of annual sales and annual operating costs.

From a recent document obtained from the SPO[3] it appears that operating expenditure of the Caycuma Paper Plant includes items such as raw materials, auxiliary raw materials, transport of raw materials, auxiliary materials, fuel, energy and water, labour, salaries and wages, depreciation, administrative costs, insurance and others, selling costs and interest charges. According/

1. See N.E.D.C. - Investment Appraisal, Great Britain, National Economic Development Council, 1967, p.8.

2. N.E.D.C. - Investment Appraisal, Ibid, p.8.

3. Mr. B. Benderlioglu, planner at the SPO. A Private Letter, December, 1969, Ankara, p.3.

According to this information annual operating cost of the Paper Mill amounts to 125,597 thousand T. Liras[1].

As I have pointed out earlier most of these operating cost elements need to be computed on the basis of social prices instead of market prices. However, there is no indication of this being done by the planners.

1. This figure does not include the working capital required by the Plant, Ibid. p.4.

II. Foreign-Exchange Savings

Following the value added calculations the planners have tried to see the indirect effect of the Caycuma Paper Mill in terms of foreign exchange savings or earnings since the project is an import-substitution in the kraft paper and cellulose industry. Foreign exchange savings at the official rate is the amount of foreign exchange that has been saved as a result of producing these paper products domestically. At the official exchange rate (1 $ = 9 T.L.), gross foreign exchange savings stemming from the execution of the project are 60,800 thousand T. Liras in 1970, 117,000 thousand T. Liras in 1971, 126,000 thousand T.Liras in 1972 and 126.000 thousand T. Liras in 1973 respectively, (see Table 3, Chapter 7).

For net foreign exchange savings to be computed, foreign exchange expenditure on raw materials, equipment and chemicals has to be deducted from the total value of foreign exchange savings. However, since the paper mill does not require raw materials or chemicals from abroad[1] as they are fully provided in the domestic market, net foreign exchange savings is then the same as the gross foreign exchange savings (see Table 3).

As a next step the planners have applied a foreign exchange correction of the order of 33 percent to the above figures so as to find the real level of foreign exchange savings. In other words, this implies that the foreign exchange savings are valued at the exchange rate of 1 $ = 12 T.L., instead of the official exchange rate of 1 $ = 9 T.L. But the correct measure of foreign exchange benefits due to the project is neither the foreign exchange savings valued at 1 $ = 12 T.L. nor the foreign exchange savings valued at the official rate. The net foreign exchange savings is the amount which corresponds to the difference between these two rates.

Let us take the foreign exchange savings in the first year 1970:

(i) Foreign exchange savings at (C.I.F.) import price is given as 60,8000,000 T.L. This is the foreign exchange savings valued at official exchange rate.

(ii) Foreign exchange savings at the "social" price of exchange rate/

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1. Mr. B. Benderlioglu at the SPO has made it clear to me that the paper mill does not require raw materials from abroad. A Typed Letter, December, 1969, p.3.

rate becomes[1]:

$$60,800,000 \times 1.333 = 81,046,000 \text{ T.L.}$$

(iii) Net foreign exchange savings of the paper mill is the difference between (ii) and (i). Thus, the net foreign exchange savings in 1970 becomes:

$$81,046,000 - 60,800,000 = 20,246,000 \text{ T.L.}$$

The foreign exchange savings for other years can be calculated on the same basis.

This is so because foreign exchange savings on market rate are included to some extent in the value added calculations. Therefore, foreign exchange savings corresponding only to the difference between the official rate and the equilibrium rate will be necessary.

Whilst the planners' reasoning behind the inclusion of one-third of the net foreign exchange earnings as the real foreign exchange saved by the project is convincing, the figures corresponding to these foreign exchange benefits are not accurately calculated. In fact there is a multiplication error in row 4 of Table 3, (Chapter 7) of the Caycuma Paper Mill's appraisal form. It is surprising to notice that such an error has not been discovered for a project which has already been approved and executed. If figures for foreign exchange savings are corrected the PV of total benefits and thus benefit cost ratio may change considerably. This element of error will be taken into account when I compute present value of benefit and cost streams at different discount rates, (See section X). Nor is there any explanation of the way the shadow foreign exchange rate of 1 $ = 12 T.L. was derived for project analysis.

Their reasoning in working out the corrected net foreign exchange savings appears to be a correct one for the following reason: Suppose that the Paper Mill project did not exist and Turkey was still importing kraft paper, kraft-liner and semi-chemical cellulose which are now to be produced domestically; now, in this case the foreign exchange expenditure incurred in the importation of these paper goods would have been adjusted by adding a 33 percent foreign exchange/

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1. 1.333 coefficient of foreign exchange rate means that the exchange rate has been revalued 33 percent higher than the official rate. Hence, this corresponds to 1 $ = 12 T. Liras. This is another way of calculating the foreign exchange savings given in Table 3, Chapter 7. There, the net foreign exchange savings are simply multiplied by the coefficient 0.333 in order to find the real foreign exchange benefits of the project.

exchange penalty to its value based on the official rate. Hence, because these paper products are no longer imported the net foreign exchange earnings of the project will be equal to the amount of foreign exchange corresponding to the difference between the "shadow" and "official" rates. The foreign exchange savings at official and shadow exchange rates are presented in Table 1.

TABLE 1

Foreign Exchange Savings at Official and Shadow Rates

(000 T.L.)

	1970	1971	1972	1973
1. Foreign Exchange Savings at Official Rate	60,800	117,000	126,000	126,000
2. Foreign Exchange Expenditure	-	-	-	-
3. Net Foreign Exchange Savings/ Earnings	60,800	117,000	126,000	126,000
4. Net Foreign Exchange Savings at (1) "shadow" exchange rate (3 x 1.333)	81,046	155,610	167,958	167,958
5. Net Foreign Exchange Savings after (2) Correction (4 - 3)	20,246	38,961	41,958	41,958

Note: (1) Adjusting the exchange rate as 33 percent higher than official rate implies that foreign exchange coefficient will be 1.333.

(2) These figures do not correspond to the figures given in Table 3, in Chapter 7, since the multiplication error has been corrected.

A. Determination of the Accounting Exchange Rate:

On this subject I could not find sufficient information from the SPO. However, Mr. T. Kivanc who is a planner at the SPO has indicated in his article that various factors have been taken into account in the determination of the shadow foreign exchange rate. According to him, these factors include direct restrictions on foreign currency, exports and imports position, the purchasing power of the domestic currency, and a comparison of domestic prices and world prices for goods which are important in the domestic production and consumption[1]. On the other hand, there are even suggestions that the shadow exchange rate was simply determined on the basis of the price of the U.S. dollar in the black-market[2].

Consequently, the SPO has decided to use a shadow exchange rate of 1 $ = 12 T.L. instead of the official rate of 1 $ = 9 T.L. in the appraisal of public industrial projects.

In the absence of satisfactory information and a coherent explanation of the social price of foreign exchange by the SPO, one can only presume that one of the following methods has been adopted.

(1) The first solution is to use the weighted average of all import and exports rate. This approach is based on the theory that though in practice there are many exchange rates not all will be over-valued nor all undervalued. It is argued that despite the fact that the average would not be completely free from these effects, it may be nearer to the equilibrium rate than any currently in use.

But this method is often rejected on the grounds that all the rates may conceivably be either over or undervalued or at least the majority of them. Therefore, to use the average rate might then introduce an error greater than that which is supposed to be corrected.

(2) Another method is perhaps to use the "parity rate" calculated on the basis of the theory of the purchasing power of different currencies. The index of purchasing power of a currency in its own country is the reciprocal of the price index. This implies that the higher the price levels the lower the purchasing power. The "purchasing power parity" theory suggests that the equilibrium exchange rate between any two currencies is determined by, or tends/

1. See T. Kivanc, Yatirim Projelerinin Ekonomi Yönünden Degerlendirilmesi - Alternatif Projeler Arasinda Bir Secim Calismasi, DPT. Nisan, 1965, pp. 20-21.
2. Mr. B. Benderlioglu has written to me stating that the black-market price of U.S.Dollar was 12 T.L. in 1966 and that it rose now to 13.50 T.L.

tends to be equal to, the ratio of the internal purchasing power of the two monies (reciprocal of some price level) in the respective countries[1].

The theory of "parity purchasing power (PPP)" of a currency assumes that, other factors being equal[2], the relative variation of the exchange rate between currencies will be proportional to the relative variation of the purchasing power in the respective countries[3].

Let us illustrate the point by a simple but realistic example. Suppose we have two countries, A and B where the former denotes Turkey and the latter, the U.S.A. Suppose also price indices have varied in the two countries. The base year is 1960 and 100 represents the domestic price index in both countries and also the price ratio that is the purchasing power in that year.

The equilibrium exchange rate in the base year is 9.05 T.L. per U.S. Dollar. If the price index in Turkey rose from 100 to 200 and in the U.S.A. it rose from 100 to 130 over the period 1960-1966[4], the new ratio between the purchasing powers in 1966 will be -

$$\frac{B_{pp}}{A_{pp}} = \frac{\frac{100}{130}}{\frac{100}{200}} = \frac{200}{130} = 1.53$$

Since prices move unproportionally the parity equilibrium would change according to the relative variations in the purchasing power of the Turkish Lira and the U.S.A. dollar.

The/

1. See G. Haberler, A Survey of International Trade, International Finance Section, Department of Economics, Princeton University, July 1961, No.1. pp.45-51. The price level here is usually a general price level either at wholesale or at retail (consumer prices).

2. Other factors in this context are connected with the supply and demand of foreign currency. These factors include the propensity to import, the level of income and the influx of foreign aid from abroad. See U.N. Manual on Economic Development Projects, New York, 1958. p.204.

3. For the "absolute" and the "relative" interpretation of the Purchasing Power Parity Doctrine, see Bela Balassa, The Purchasing Power Parity Doctrine: A Reappraisal, J.P.E. Vol.72, December, 1964, No.6. pp.584-596.

4. I am assuming here that annual price increase in Turkey is 16 percent and in the U.S.A. it is 5 percent.

The above figure indicates the increase of the ratio of the price indices from 100 to 153 and the true foreign exchange rate for 1966 becomes:

$$9.05 \times 1.53 = 13.8 \text{ T. Liras.}$$

The parity exchange rate is simply obtained by multiplying the exchange rate for the base year which is assumed to be equilibrium[1] by the ratio of the price index. The results of this simple example are presented in Table 2:

TABLE 2

PARITY EXCHANGE RATE

			1960	1966
1.	Domestic price index in Turkey (T. Lira)	A	100	200
2.	Domestic Price index in the U.S.A. (Dollar)	B	100	130
3.	Index of the Price Ratio	$\frac{A}{B}$	100	153
4.	Prevailing Exchange Rate		9.05	9.05
5.	Parity Exchange Rate		9.05	13.8

It must, however, be stressed that this method is also not free from some theoretical objections. The relative variation of the exchange rate between two currencies will be proportional to the relative changes in the purchasing powers in both countries provided other factors are equal. But if factors like propensity to import and the level of income change overtime parity exchange rate cannot be assumed to change proportionally.

The proponents of this doctrine stress the importance of the monetary factors and/

1. The equilibrium exchange rate is that rate which keeps the balance of payments in equilibrium.

and see the causation running from the money supply to prices and to exchange rates[1]. But at the same time they neglect changes in income levels and in demand and supply relationships. An important point which is raised in the doctrine of Purchasing Power Parity is what prices to use for international comparisons. If, for example, international comparison of changes in prices is based on wholesale prices these indices might not be a proper device to use since they are often heavily weighted with traded goods. Therefore, it is argued that the prices of these goods may reflect changes in the world market rather than domestic inflationary pressures[2]. G. Haberler has also pointed out that the wholesale price index which is heavily weighted with prices of internationally traded goods will be a poor guide for judging the existence and magnitude of a fundamental disequilibrium[3]. He goes on to state that "the moral may seem to be that we should use an index of domestic prices (cost of living) or of costs (wages) which do not adjust so quickly and would show a disparity if equilibrium has not been reached[4].

Bela Balassa has also argued that structural changes should be taken into account. The productivity increase may not be a uniform one both in sectors producing/

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1. L.B. Yeager suggests that "the causation runs much more strongly from price levels to exchange rates than the other way around" and he attempts to support this argument on two accounts. First, that trade flows affect domestic prices only slightly and second, that movements in the general price level are determined by changes in the money supply. See L.B. Yeager, A Rehabilitation of Purchasing Power Parity, J.P.E. December, 1958, p.522. These propositions, however, are refuted on the grounds that Yeager's propositions do not accept the marginal cost pricing and commodity arbitrage which would lead to an international equalisation of the prices of traded goods. Also, Yeager's assumption that constancy of money supply would check "foreign-induced inflation" implies the acceptance of a simple version of the quantity theory of money. In short, he excludes the possibility of demand and cost-push inflation.

2. See Bela Balassa, The Purchasing Power Parity Doctrine: A Reappraisal, J.P.E., Vol.72, December, 1964. No.6, p.592.

3. See G. Haberler, A Survey of International Trade Theory, International Finance Section, Department of Economics, Princeton University, July 1961, No.1, p.49.

4. Ibid, p.49.

producing traded goods and the service sector. If, for instance, in the former sector there is a uniform increase in the productivity and a smaller rise in the productivity of the service sector, then the price ratio between the traded commodities will remain unchanged while the relative prices of non-traded goods will rise. But, now, because the latter does not enter international trade, Purchasing Power Parity calculations will incorrectly reflect the need for adjustment in exchange rates[1].

The purchasing power parity doctrine could still find application if productivity increases and wage adjustments were identical in every country, and if we also assume neutral production and consumption effects. Possibly, under those restrictive assumptions, parallel changes in the general price level will take place and the doctrine will give the correct answer: in this case, of course, there is no need for adjusting the rate of exchange.

But the PPP doctrine is expected to provide guidance in cases where prices in individual countries do not move in a parallel fashion. Bela Balassa has emphasized the fact that changes in the general price level would be determined in the process of technological improvements and wage adjustments neither of which can be expected to follow the same course in each country. In this case an inter-country comparison of changes in the general price level cannot be used to indicate the need for modifications in exchange rate parities. He also draws our attention to the importance of non-monetary factors in the process of price determination. In his judgment "in the presence of disparate changes in productivity and prices in the sectors of traded and non-traded goods the reliance on general price indices for deciding on exchange rate adjustments appears to be misplaced[2].

The conclusions which might be derived from the writings on the purchasing power parity doctrine can be summarised as follows:

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1. Bela Balassa, The Purchasing Power Parity Doctrine: A Reappraisal. op.cit. p.593. He feels that in a more general model, the impact on the general price level of productivity improvements in sectors producing traded goods can be examined under alternative assumptions with regard to changes in money wages.

2. See Bela Balassa, op.cit. p.595. For a more thorough discussion of the theory of Purchasing Power Parity see Bela Balassa, The purchasing Power Parity Doctrine: A Reappraisal. J.P.E. Vol.72, December, 1964 pp.592-596.

(i) That price indices heavily weighted with internationally traded goods will not appropriately indicate the need for modifications in exchange rates.

(ii) That the familiar models of international trade should be amended by giving explicit consideration to non-traded goods.

(iii) That more useful results can be obtained if, instead of attempting to rely on aggregate indices more attention is paid to the behaviour of sectoral indices with appropriate disaggregation[1].

It can, therefore, be pointed out that the introduction of non-traded goods can enhance the realism of these models. If, non-traded goods are incorporated in the model, the relationship between purchasing power parities and exchange rates can be more meaningful and provide better inter-country comparisons. This relationship can also be helpful to judge the overvaluation or undervaluation of a currency and changes in the degree of over or undervaluation.

1. Ibid. p.596.

B. Foreign Exchange Savings-to-Input Ratio:

In the following section, an attempt will be made to calculate the Caycuma Paper Plant's "foreign exchange savings-to-input ratio".[1] It may seem useful to investigate the extent to which the foreign exchange investment has been utilised in relation to the returns from it. In other words, we are interested here, first, to see the foreign exchange earnings per unit of foreign exchange invested in the project, and secondly, foreign exchange savings per unit of capital investment including domestic and foreign exchange components.

It might be expected from an evaluator to work out the foreign exchange earnings to input ratio for the purpose of discovering the degree of utilisation in the scarce factors of the economy. Where there is an acute shortage of foreign exchange it makes sense to see the effect of the project on the balance of payments in terms of foreign exchange earnings and spending.

It must be stressed at the outset that this ratio is not supposed to be used as a ranking device for project selection. As was made clear in Chapter 4 (Appendix A), balance of payments effect criterion can be a misleading tool in the selection of projects and therefore it can only be useful to indicate to us the partial aspect of the project examined. This is what should be expected from the results which will be derived below.

Foreign exchange product-to-input ratio can be written as follows:

$$\pi = \sum_{i=1}^{n} \frac{B_f}{(1+i)^u} \Big/ \sum_{i=1}^{n} \frac{I_f}{(1+i)^n}$$

where B_f denotes foreign exchange earnings or savings, I_f foreign exchange component of investment, n life of the project and i the discount rate.

Annual foreign exchange savings streams of the Paper Mill are given in Table 3, in the project Appraisal Form (See Chapter 7). As can be noted foreign exchange savings of the project is the amount which corresponds to the difference between the foreign exchange savings valued at "social" exchange rate and official exchange rate. It has been mentioned earlier that there is a multiplication error in Table 3, row (4) (in Chapter 7), but if this error is corrected the foreign exchange savings of the Paper Project become as follows (See Table 3).

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1. For definition and interpretation see, U.N. Manual on Economic Development Projects, United Nations, New York, 1958. pp.230-231; and see Chapter 4, Appendix A.

TABLE 3

FOREIGN EXCHANGE EARNINGS/OR SAVINGS
OF THE PAPER PLANT

(In 000 T.L.)

	1970	1971	1972	1973
1. Foreign Exchange Earnings/or Savings	60,800	117,000	126,000	126,000
2. Foreign Exchange Expenditure	-	-	-	-
3. Net Foreign Exchange Earnings	60,800	117,000	126,000	126,000
4. Corrected Net Foreign Exchange Earnings - (3 x 0.333) (1)	20,246	38,961	41,958	41,958

Source: Table 3 in Chapter 7.

Note: (1) The previous figures were 20,268 thousand T.L., 60,995 thousand T.L., and 63,952 thousand T.L. respectively.

(1) First, foreign exchange savings stemming from the projects operation have to be translated to the present value at the social discount rate which is applied by the SPO. Here I shall assume that the SPO's rate of discount of 12 percent is a reasonable rate to apply for this purpose[1]. But this does not imply that this is the best discount rate to apply in Turkey for project evaluation, as I shall argue in Section VII.

Present value of annual foreign exchange streams are calculated in Table 4.

1. It should be noted that the estimate of discount rate to be used is especially difficult in the case of foreign exchange. If the latter is in shorter supply than capital, its utilisation would entail higher rates of interest than those on capital in general.

TABLE 4

PRESENT VALUE OF FOREIGN EXCHANGE BENEFITS:

At $i = 12\%$, $n = 20$

(In 000 T.L.)

Years	Net Foreign Exchange Savings	(1) Present Worth Factor at 12% Discount	(2) Present Value of foreign Exchange Savings.
1			
2			
3			
4			
5	20,246	.5674	11,487,5
6	38,961	.5066	19,737,6
7	41,958	.4523	18,977,6
8	41,958	.4038	16,942,6
9	41,958	.3606	15,130,0
10	41,958	.3219	13,506,2
11	41,958	.2874	12,058,7
12	41,958	.2566	10,766,4
13	41,958	.2291	9,612,5
14	41,958	.2046	8,584,6
15	41,958	.1826	7,661,5
16	41,958	.1631	6,843,3
17	41,958	.1456	6,109.0
18	41,958	.1300	5,454,5
19	41,958	.1161	4,871,3
20	41,958	.1036	4,346,8
21	41,958	.0925	3,881,1
22	41,958	.0826	3,465,7
23	41,958	.0737	3,092,3
24	41,958	.0658	2,760,8
TOTAL			185,290,0

Notes: (1) For present worth factors at 12 percent discount rate see A.J. Merrett and A. Sykes Capital Budgeting and Company Finance, Longmans, London, 1969, Appendix Table A, p.152.

(2) /

Notes (continued)

(2) It should be noted that the above PV calculation can also be worked out much simpler by using the "present worth factor for uniform series". First, the figures of the first two years are multiplied with the "single present worth factor" (pwf) separately. These are 11,479,4 T.L. and 19,714,2 T.L. respectively. Second, since foreign exchange streams in the remaining 18 years are running in a uniform series it is sufficient to multiply the annual foreign exchange stream with the "series present worth factor" which corresponds to 18 years and a 12 percent discount rate. Therefore, 41,958 x 7.250 = 304,195,5 T.L. Third, the latter figure must be brought to the base year value by multiplying it with the "single" present worth factor which is 0.5066 (pwf' - 12% - 5). This gives us 154,105,4 T.L. Thus PV of foreign exchange savings over 20 years becomes:

11,479,4 + 19,714,2 + 154,105,4 = 185,299,0 T.L.

Present value of foreign exchange earnings/savings amount to 185,290,000 T.L. on the basis of a 12 percent discount rate.

(2) The second step is to separate the foreign exchange components of the investments involved in the project. The foreign exchange component of investment after being re-corrected by applying a 33 percent "shadow" foreign exchange rate has been converted to the present value on the same discount rate, i.e. 12 percent (See Table 5).

TABLE 5

PV of Foreign Exchange Component of Investment (000 T.L.)

Years	Foreign Exchange Component Of Investment (1)	Present Worth Factor: at 12% .	PV of Foreign Exchange Component of Investment
1	36,777	.8929	32,838,1
2	24,207	.7972	19,297,8
3	75,327	.7118	53,617,7
4	25,860	.6355	16,434,0
5	31,749	.5674	18,014,3
TOTAL			140,201,9

Notes: (1) Foreign Exchange component of Investment in addition to its market value also includes a 33 percent foreign exchange/

exchange penalty (premium).

(2) Source: From Table 1, Chapter 7.

The present value of foreign exchange portion of investment at 12 percent discount rate amounts to 140,201,900 T. Liras.

(3) Third step is to place these figures we have obtained in the formula we have cited above. The foreign exchange-to-input ratio of the Paper Mill Project becomes:

(a) PV of foreign exchange savings/earnings
(For $i = 12\%$, $n = 20$)
$B_f = 185,290,000$ T.L.

(b) PV of foreign exchange component of Investment
(For $i = 12\%$, $n = 2o$)
$I_f = 140,201,900$ T.L.

(c) Foreign Exchange Benefits-to-Input Ratio:

$$\pi = \frac{185,290,000}{140,201,900}$$

$$\boxed{\pi = 1.32}$$

Apart from the foreign exchange savings-to-input ratio it is also useful to work out the ratio of foreign exchange earnings/savings-to-total capital investment. This ratio will simply indicate the foreign exchange returns per unit of capital invested. Especially in import substituting project it might be desirable to know the returns on total investment cost in terms of foreign exchange savings.

For this ratio, we need PV of foreign exchange savings throughout the life of the project and PV of total investment cost of the project.

Since we know that PV of foreign exchange benefits is 185,290,000 T.L. and PV of total investment is 308,293,000 T.L.[1] the foreign exchange product-to-capital/

1. This figure includes the foreign exchange correction introduced on the foreign exchange component of total investment. (See Ch.7, Table 7). One of the reasons for applying "shadow" price for foreign exchange is to give special priority to projects which are using more of domestic raw materials, machinery and equipment, over projects using imported goods. The second reason of course, is to find the real value of the scarce foreign exchange.

capital ratio becomes:

$$\bar{\pi} = \frac{185{,}290{,}000}{308{,}293{,}000}$$

$$\boxed{\bar{\pi} = 0.60}$$

It follows that the foreign exchange product-to-input ratio is 1.32 and the foreign exchange product-to-capital ratio is 0.60. The former ratio can be considered as a satisfactory figure because it indicates that the Paper Mill project will have a considerable positive effect on the balance of payments. This also implies that direct recovery of capital in foreign exchange is fairly rapid in the Caycuma Project.

III. Correction From the Consumers' Point of View:

Another correction in the benefits stemming from the Caycuma Project is in connection with the benefits accruing to the consumers.

The Unit price difference between selling price of the product before the Plant and selling price of the paper products after the Caycuma Plant comes into existence is attributed to consumers as benefits in terms of less payments by them. Unit price difference per ton is estimated to be 50 T.Liras/per ton for semi-chemical cellulose and 40 T.Liras/per ton for both kraft paper and kraft liner (See Table 4 in Chapter 7). These differences in prices mean that consumers will be paying less in their spending as compared to the pre-project period. Total benefits to consumers will thus be the outcome of these unit price differences multiplied by the volume of import substitution in respective paper products.

The planners' assertion that these benefits resulting from price reductions with the establishment of the Caycuma Paper Plant should be included in the total benefits is at the outset rather dubious. In my thinking the inclusion of these benefits will be a double-counting since these benefits are merely transferred from private importers (as their profits) to the consumers. Therefore, it can be argued that the benefits here are only moving from one group of the society to another.

One may take the argument one step further. Because the paper products in question are no longer imported the government will forego the custom duties it used to get from the private entrepreneurs when they imported them. The government, therefore, will be creating indirect benefits to consumers on the one hand, and it will also be foregoing a loss equivalent to the amount of custom duties collected from the importation of these goods.

One may conclude that what is relevant from the society's point of view is not the difference between the previous and new selling prices by the private and government agencies, (S.E.E.) respectively, but the net difference between this and the custom duties foregone owing to non-importation of these goods anymore. This means that the benefits accruing to consumers must be reduced as much as custom duties lost by the government authorities[1].

1. This may be very important particularly where the marginal utility of government receipts are very high when the government is facing a serious budget problem.

But the Turkish planners appear not to be disturbed by the complications this will give to in the estimation of benefits to consumers[1].

Besides, it is sometimes suggested that in the case of final products the benefits accruing from investment projects cannot be measured by multiplying the additional quantum of output either by the old or the new price since the former gives an overestimation and the latter an underestimation. Prest and Turvey argue that an average price between the old and new price could be more convenient[2]. In case the demand curve is linear an unweighted average of before and after prices may be sufficient, but more intricate techniques would be needed if the demand curve is not linear.

The same difficulties can also arise when costs are in question. It is necessary to adjust prices of factors so as to eliminate any rental element which is measured by excesses over transfer earnings in their next best alternative use. There is a similar problem to the demand side in that as more and more of a factor is absorbed in any one line of output the price of the alternative product which it might have been making rises further and further.

One is faced once again with a choice to make between valuing factors at the original price (prices prior to the expansion of output of commodities in question), the ultimate price, or some intermediate level. If it is a linear supply curve, a price half-way between the old and new price will be sufficient as it is in the case of demand[3].

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1. Another important point here is whether selling price of the Paper Plant has been fixed according to consumer centers or production center. The kraft paper and kraft liner will be consumed by the cement and fertilizer industries. Since these industries are situated elsewhere in the country the transport costs of paper products to the consumption centers should be taken into account.

2. This situation may particularly arise when the size of the investment so large that old prices may be affected. In other words, production may increase by a lump instead of small increments. In such cases, neither the old price nor the new price would correctly estimate the benefits. What is needed, as Prest and Turvey have suggested "a measure of the addition to the area under the demand curve, which is on the assumption that the marginal utility of money remains unchanged, in the sense of assessing what the recipients would pay rather than go without them". It is added later as a practical solution to use an average price between the old and the new price. See A.R. Prest and R. Turvey, Cost-Benefit Analysis: A Survey, E.J. op.cit. p.691.

3. See A.R. Prest and R. Turvey, Ibid., pp.691-692.

IV. Employment Effect

The employment effect of the Caycuma project as can be seen from Table 5 (Chapter 7), is not very clear as there is no explanation of what the planners have intended to do.

In my thinking, however, there are two possible explanations of the employment effect they have included in the benefit flows of the project.

The first possibility is that wages which are valued at makret prices are corrected by applying a "shadow wage" rate which is 50 percent lower than the market wage rate. Therefore, instead of taking the market value of wage payments the social costs of labour are taken to be included in the value added calculations.

But if wages are already included in the value added Table, which appears a possibility, this means that wages are included twice in the benefits computations, once at the market value added Table and once at the social cost as representing the employment effect (See Table 5). There seems to be a double counting as far as wages are concerned.

The second possible explanation which sounds more convincing is that market wage rates which are applied to unskilled workers do not reflect their real contribution to the national income or in other words their marginal productivity. The market wages may be squeezed below the marginal opportunity cost of labour by monopoly practices. Thus, for a correct representation of the employment effect the wages valued at market prices are put up by a coefficient of 0.50 so as to reach the social opportunity costs of workers.

This second possibility may explain Table 5, but it is still difficult to understand how in view of the large unemployment pocket in the Zonguldak region, the social opportunity costs of unskilled workers can be above the market wage rate. On the contrary, one may think wages valued at market prices should be adjusted downwards rather than upwards as the planners did.

Though the planners, for cost benefit estimations, have included employment effect in terms of wage payments (in monetary units); the real contribution/

contribution of the Paper Mill to employment can be observed from the following formula[1]:

$$E = \frac{\sum_{i=1}^{n} I_n}{L}$$

where E denotes employment effect, In total investment cost and L unskilled workers employed by the project. As can be seen, employment effect is the ratio between investment and the unskilled workers employed by this investment.

Taking the corresponding figures from the Caycuma Paper Project, the employment effect becomes:

$$E = \frac{433,776,000 \text{ T.L.}}{225^{(2)}} = 1,927,000 \text{ T.L.}$$

This means that to employ one unskilled labourer 1,927,000 T. Liras are needed which makes the project a highly capital intensive one. This, however, is not surprising because the project by nature is capital-intensive and requires more skilled workers than unskilled workers.

It may, however, be noted that I have here only included direct effects whereas the exclusion of indirect employment effects may underestimate the projects' total employment benefits. When raw materials are provided domestically the employment in industries providing these raw materials will also increase. For instance, the Paper Mill project will create additional employment opportunities in the forestry and timber industry, transport and services sectors. As I have pointed out in Chapter 6, the indirect employment which will be generated in these industries should be ascribed to the Paper Mill project; the expansion in the supplying industries will, of course, require additional workers in order to meet the requirements of the paper plant. As was made clear in Chapter 6, an estimate of all these indirect employment effects will involve the use of a regional input-output matrix table. However, such an exercise is not possible to conduct in the absence of regional inter-industry figures. Nor is it the purpose of this study to attempt to estimate such indirect effects. Though these kinds of regional analyses are difficult to conduct and compute, nonetheless, they should be considered in project appraisals.[3]

Furthermore/

1. For employment effect criterion see Appendix A in Chapter 4.
2. The total number of workers is 755, out of which unskilled workers are only 225.
3. For a discussion on indirect employment effect see Chapter 6.

Furthermore, indirect employment effects in industries consuming final goods should also be included. The industries which will consume the final goods are cement and fertilizer industries which will use the kraft paper and kraft liner in packing their cement and fertilizer products.

Finally, when general unemployment exists expenditure upon a project by creating a multiplier effect will provide additional real incomes in the rest of the economy. This additional income in turn may also induce further employment effect.

As I have mentioned briefly in Chapter 6, the regional multiplier effect of a sector (or project) should also be taken into consideration. The following section is an attempt to define what the regional multiplier is and to examine the extent to which the regional multiplier is a relevant and important concept in regional development studies.

Before I introduce the formula of the multiplier it is useful to understand why it is relevant to regional problems. To know the value of multiplier (=k) enables us to have some indication of the consequences for regional income and employment of policy measures which involve the injection of investment into the region[1]. It could also provide quantitative indications, in terms of regional income and employment effect, arising from expenditure entailed by the policy. Of course, some sectors will have a greater impact on regional income and employment through their contraction or expansion than others. This is where it is useful to know the multiplier effects of particular sectors and industries. If differences were sufficiently large it might be worthwhile giving consideration to the idea of regional incentives schemes based on a sector multiplier[2]. Besides, multiplier analysis emphasises that regions should not be considered in isolation for the simple reason that money injected into a region often leaks out into other regions. This could be important not only for single region, as it shows the difficulties in the way of increasing its income, but also from national standpoint. For example, money injected into one region flows to a large extent into other regions, some of which may have already been affected by excessive demands.

Finally, /

1. See K.J. Allen, The Regional Multiplier: Some Problems in Estimation, in "Regional and Urban Studies - A Social Science Approach" Edited by J.B. Cullingworth and S.C. Orr. George Allen & Unwin Ltd., London, 1969. pp.81-82.

2. Ibid, p.82.

Finally, the multiplier indicates the regional inter-relationship and its quantity shows the extent of these and the extent of the problems likely to arise in regional development[1].

The question here is that if a certain money is injected into an economic system the income of that system increases not by the value of that injection but by some multiple of it.

Let us illustrate the point by a simple example. If 1000 T.L. is injected into an economy in the form of, say, Road Building programme, then the income of the road builders increases by 1000 T. Liras[2]. Some of this extra 1000 T.Liras is spent, suppose, on bread and thus increases income of the bread producers. They, in turn, spend their extra money on other commodities, increasing the income in these activities. It follows that the income of one group, by its expenditure, adds to the income of another group. When the initial injection goes round, it naturally generates further income.

The multiplier is a figure which indicates the relationship of final income to the initial injection. If, for instance, as a consequence of injection of the 1000 T.L. the income of the system was to rise by 2000 T.L. then the multiplier would be 2.

Second question is to find what determines the size of the multiplier. The answer to that will depend on whether the economic system is a closed economy or an open one. In a closed economy, the multiplier can be written as:

$k = \frac{1}{1-c}$ or $\frac{1}{s}$ where c denotes marginal propensity to consume and s marginal propensity to save. As can be seen, the smaller is s or the larger is c the greater will be the multiplier. If the initial injection of money is passed on intact at each round then there is no limit to the final income change - the multiplier in that case would be infinite[3]. In a closed economy savings are considered to be the leak. At each round not all of the increase in income is spent but some will be saved. The increase in income of the next round is consequently less by the amount of savings than the previous/

1. Ibid, p.82.
2. The assumption in the example is that all productive costs are labour costs.
3. Without any leakages all of the additional income will be spent ($c = 1$), and the multiplier would be infinity:

$$k = \frac{1}{1-c} = \frac{1}{1-1} = \frac{1}{0} = \infty$$

previous round. The proportion of the increased income which is saved is called the "marginal propensity to save". In calculating the multiplier however, there is no need to take off the savings at each round. The simple assumption here is that marginal propensity to save is the same at each round. On this assumption the multiplier is inversely related to the marginal propensity to save (s). If s = 0.2, i.e. 20 percent of increase in income is saved, then the multiplier (k) is 5 $(k = \frac{100}{20})$.

The essence of regional mutliplier lies in the size of possible "leakages" all of which reduce the marginal propensity to consume (c). In a closed economy, it is plausible to see savings as the only leak but in an open economy (considering inter-regional and foreign trade) the following leaks need to be taken into account[1].

(i) savings (s)
(ii) payment of taxes (both direct and indirect taxes) (t).
(iii) purchase of goods produced in other regions and abroad (m).

Since the multiplier is inversely related to the above leaks[2]

$$k = \frac{1}{s + t + m}.$$

This is the formula which could be used in estimating regional multiplier. It must be realised here that the variables in the formula should be measured in marginal terms. In other words, we need data to find the marginal propensity to save, the marginal propensity to pay direct taxes i.e. the proportion of additional income paid in taxes, and data to find the marginal propensity to import raw materials, semi-finished goods and consumer goods from other regions as well as abroad.

In the absence of regional data to estimate these marginal propensities to leak/

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1. See K.J. Allen, The Regional Multiplier; Some Problems in Estimation. op.cit. p.84, and D.B. Steele, Regional Multipliers in Great Britain, O.E.P. Vol.21, July, 1969, No. 2 pp -268-289

2. In an open economy the following equation holds:
$c + s + t + m = 1.$

leak the alternative often is to use the average propensities[1]. To estimate values for the leaks on aggregate data and average propensities may constitute an alternative method, but it requires exhaustive calculations and it may also not give an accurate result for the multiplier.

It should, however, be emphasised that marginal propensities of s, t and m may not coincide with the average propensities to leak. If marginal propensities were substituted for the average propensities then a more accurate measure of the regional multiplier can be obtained.

The assumption that average rate of direct taxes are equal to marginal rates cannot be assumed to be valid. Of course, it is normal to expect that marginal rates of taxation are well above the average rate.

Again, leaks from expenditure may indicate different results between average rates and marginal rates. Leaks will be greater using marginal as opposed to average rates if the additional expenditure arising out of higher incomes is spent on those goods which have a higher than average leak. It must be noted that any change in leaks through increased income is largely dependent on changed expenditure pattern.

The multiplier will be still smaller if we consider the extent to which it is necessary for that region to import materials and semi-finished products since this involves payments going outside the region and this represents an additional leak. Therefore, for an accurate estimate of the multiplier, marginal propensity to import these above goods and consumer goods should be calculated.

As/

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1. K.J. Allen in his estimates of Scottish regional multiplier has applied three distinct methods: first, a crude aggregate method which takes average propensities to leak; second, average propensities with disaggregated data; third, this method uses marginal propensities to leak. His analysis has demonstrated that regional multiplier for Scotland varies according to the method used. Regional multiplier estimated on average propensities to leak and on aggregate data gives a multiplier of 2.2 for Scotland. When marginal propensities to leak are used the regional multiplier becomes 1.52 which is the most reliable,figure. For different methods of estimating regional multiplier See K.J. Allen, The Regional Multiplier: Some Problems in Estimation, op.cit. pp.89-94.

As far as the Zonguldak region and the Caycuma Paper Mill in Turkey are concerned, it is very difficult to conduct a regional multiplier analysis. For such analysis one would need regional as well as national data (including inter-regional) in order to be able to estimate average and marginal propensities to the abovementioned leakages. The data required for the Zonguldak region includes regional output, personal income, savings, taxes (both direct and indirect), consumption, exports and imports from other regions and abroad[1]. In the absence of such specific data related to the Zonguldak region, it is hardly possible to carry out a regional multiplier analysis for that region or any other region in Turkey for that matter.

Nevertheless, in an appendix attached to this Chapter (Appendix A) an attempt has been made to estimate the regional multiplier for Zonguldak region. Following that the multiplier effect of the Caycuma Paper Plant will also be worked out by using the coefficients of leakages in Zonguldak region. As I have stressed earlier the multiplier could also be used at sectoral level or industrial level. It may be of some significance to see the effects of particular types of money injected in terms of regional income and employment. This is where it may serve some use to know the multiplier effects of the Paper Mill project which will create an additional income in the Zonguldak region. Because of lack of data it is impossible to estimate the exact magnitude of the marginal propensities to leak, but on some rough assumptions which are based on aggregate data, these propensities have been calculated for the Zonguldak region. The Caycuma Paper Plant's income effect through the working of the multiplier has also been estimated on this basis (See Appendix A to Chapter 8).

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1. Leaks reducing personal income include (i) savings, (ii) direct taxes, (iii) national insurance contributions. Those leaks which are a function of expenditure include (a) indirect taxation (b) purchases from other regions. Finally, imports of food and consumer goods from abroad as a percentage of regional personal consumption. The figuresrelated to these leaks are necessary for an estimate of multiplier.

V. Total Benefit Flows

As Table 6 illustrates, total benefit flows comprise value added in terms of contribution to the national income, net foreign exchange savings, indirect benefits accruing to the consumers in terms of less payments, and finally employment effect provided by the project.

We have already commented on all these direct and indirect benefits flows that result from the Caycuma Project.

The inclusion of all these benefits are correct in principle, but the way they have been calculated is incomplete and inadequate.

There is still another problem that is closely connected with the estimation of total benefits whether they are in public or private sector. This is the treatment of external effects or secondary benefits. Handling of secondary benefits usually known as externalities or sometimes termed "spillover" effects creates some problems. When there is full employment there really are no secondary benefits[1]. Prest and Turvey observed that so long as the conditions for optimal resource allocation are fulfilled we need nor worry about the secondary benefits but only the primary benefits[2].

But in reality neither does full employment exist nor are the optimum resource allocation conditions fulfilled. So one cannot rule out the question of considering externalities. When there is a Keynesian unemployment any investment is better than no investment and one should take into account the volume of multiplier effects of that investment. Thus, a social overhead capital project by creating external economies can be more preferable to another project with a higher direct effect. An estimate of capital productivity in terms of direct value added has no special advantage as a criterion of evaluation, as demonstrated by those projects producing services such as electrical energy, transportation, usually of low direct value added but considerable/

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1. See R.N. McKean, Efficiency in Government Through Systems Analysis - With Emphasis on Water Resource, New York, J. Wiley & Sons, Inc., 1958, p.158.

2. See A.R. Prest and R. Turvey, Cost-Benefit Analysis: A Survey, in "Surveys of Economic Theory", American Economic Association and The Royal Economic Society, Macmillan, St. Martin's Press, New York, 1966, pp.161-162.

considerable indirect importance. If they are judged by the direct criterion they would not be given priority whereas considered indirectly they have a higher priority rate. Hence it is important that both direct and indirect effects of the investment should be taken into account.

The common practice as far as these externalities are concerned is to distinguish between "technological" and "pecuniary" spillovers. We want to know whether there has been any increase in output due to the project. Such an increase in output takes place in the presence of technological externalities which affect the volume of physical output of the producers to be obtained from their physical inputs. In other words, technological spillovers refer to incremental output and should be considered. But this does not happen in the case of pecuniary externalities which affect only the price of other producers' goods. That is to say in the case of the latter there is no net additional benefit, but merely a transfer of income from one place to another and their inclusion will mean double counting[1].

Because of practical measurement limitations it often happens that only the immediate or primary effects of the project are taken into account. But for a sound and correct appraisal of investment projects the indirect effects should also be included.

Indirect effects are of two types: "backward" effects and "forward" effects.

"Backward" value added will be attributable to the project investments only in so far as demand derived from the project can be satisfied without new investment, that is to say by fully utilizing idle capacity. Let us take an example: if forestry industry is producing at less than normal capacity, owing to the lack of a suitable market, but a new source of demand is opened to it by the installation of a paper and cellulose plant, the basic investments for increased output already exist. Consequently, the new values added can be largely ascribed to the Caycuma project's investments.

Forward effects also need to be included in total benefits. If, for want of supplies, the enterprise which will use the goods and services of the project as/

1. For an extensive discussion of technological and pecuniary Spillovers, see R.N. McKean, Efficiency in Government Through Systems Analysis. J. Wiley & Sons, Inc., New York, 1958, pp.134-150. (esp. Chapter 8).

as input factors, has idle installed capacity, these factors can be utilized without further investment. It may be supposed in consequence, that the increased income generated in the existing enterprise comes from the project investments with which an improved product-capital ratio has been produced[1].

In both types of indirect value added, there must be unutilized capacity in the benefiting enterprise; also utilization of that capacity must not entail any further investment. If both conditions are fulfilled in principle, the value added accruing to the existing enterprise can be attributed to the project.

Nevertheless, the measurement of indirect effects becomes more complex and less precise in proportion to their distance from the project as the dynamic centre[2]. This is unavoidable and the limitations of such types of estimates should be taken into account and indirect effects should be calculated only in so far as they contribute in any significant degree to evaluation criteria.

Total benefits included in Table 6, are calculated on the assumption that there will be no price changes in raw materials, no fluctuations in foreign exchange rate, no change in the opportunity cost of factors of production, i.e. shadow wage rate and shadow capital cost. Still another assumption is that selling prices of the Caycuma Plant will remain the same during the economic life of the project.

It is generally agreed that if perfect equilibrium exists, the market forces will act in such a way that the prices of goods will be equal to the marginal cost of raw materials, labour, capital and other inputs required in production. In their turn, the prices of labour, capital and foreign exchange will be equal to the opportunity cost of the respective factors such cost being defined as the amount by which production would be reduced in an over-all economy if the availability of such inputs were to decrease in a unit. The prices of labour, capital and foreign exchange are therefore those which will balance supply and demand in relation to these factors. If the economy is expanding and everyting is properly foreseen, prices will also reflect future demand and supply in such a way that equilibrium will be maintained over the long-term.

But/

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1. Value added may also arise in the distribution stage. If distribution continues to function on the basis of existing installations and fixed investments, the value added may be attributed to the project's investments.

2. Indirect effects can be traced via input-output tables. Chenery, however suggests that if shadow prices are applied to inputs and outputs indirect effects will be already taken care of, but this view is theoretically still under discussion.

But none of these conditions really exists in underdeveloped countries, and, therefore, current prices can hardly reflect future demand and supply conditions.

Therefore, a re-current problem in cost-benefit analysis of a public investment is that of deciding whether the current or expected market valuation of the costs and benefits which it generates are appropriate. In a world of changing prices we will face difficulty if we estimate and compare projects on the basis of current prices. Since prices will change over time, adjustments need to be made to the expected prices of future outputs and inputs to allow for anticipated changes in relative prices of the items involved. This means that changes in market prices of outputs and inputs must be borne in mind when evaluation of a project is carried out. Still, if shadow prices are used for factors of production, these prices must not be assumed to remain constant. For instance, social labour cost cannot be predicted to be always 50 percent of the market wage rate throughout the life of the project; nor the cost of capital will remain constant[1]. Similarly, prices of future outputs need to be estimated and current prices of outputs must not be assumed to be constant during the life of the project. The prices of outputs can be affected by various factors such as changes in demand and supply of inputs, technology, and overall and industrial growth in future years.

But in the "Caycuma Paper and Cellulose" Project, Turkish planners seem to be assuming no price changes over time both in inputs and outputs values. Their estimate of direct and indirect values added is, therefore, very much simplified and instead of adopting a dynamic approach where prices are allowed to change percentage-wise in future years[2], they have been content with the application of static assumptions.

The difficulties involved in allowing for expected price changes in inputs and outputs are, of course, obvious; but this still does not help but make the evaluation a less precise and insufficient one.

In my opinion, what is needed here is that to measure benefits in terms of constant/

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1. For the change in input prices, See A.R. Prest and R. Turvey, Cost Benefit Analysis: A Survey, E.J. December, 1965, p.691.

2. These estimates of course require market research and future forecasts on the part of demand and supply conditions in capital, labour and foreign exchange markets as well as estimate of the economic growth in the future.

constant prices, or to measure the benefits in terms of current prices, but in that case we have to deflate or inflate according to the circumstances.

VI. Total Investment

So far, I have been concerned with the benefits side of the project, but initial capital cost too, may create some complex problems which need to be taken into consideration.

The investment expenditure of the Caycuma Project has not been given in detail in the SPO Appraisal Form. The only data we have are the breakdown of total investment between domestic and foreign currency components.

However, from a recent document I have obtained from the SPO[1], there is some information in reference to items included in domestic investment and foreign investment. But, it must be pointed out that the items which are mentioned are not given in numerical form.

According to this new information, domestic component of investment comprises expenditures on site outlay and site preparation, water supply, buildings (factory buildings, office buildings, social housing scheme), domestic machinery and equipment; transport cost and insurance of imported machinery, domestic transport, assembling cost of machinery, furniture, manpower and training, unexpected costs, costs of shifting to operation, custom duties and tariffs, interest charges during the construction period.

Foreign currency component of investments on the other hand, includes (F.O.B.) import price of machinery and equipment, payments to foreign personnel for the assembling and construction operation.

As is the case with the benefits of the project, investment outlay of the project which comprises the above-mentioned items needs to be valued at social cost rather than at market prices.

In the Caycuma project's investment outlay, only the foreign exchange component of investment has been adjusted according to a shadow foreign exchange rate which is assumed to be 33 percent above the official exchange rate (see Table 1). In other words, the foreign exchange component has been corrected upwards by adding to the market value of machinery and equipment imported a premium/

1. B. Benderlioglu, a planner at the SPO., A private untyped document on Caycuma Project, December, 1969, Ankara, p.1.

premium of 0.333 (or 33 percent) in order to arrive at the social cost of these items. Thus, the value of foreign exchange part of investment is equal to the foreign exchange spent at official rate plus the amount of foreign exchange premium corresponding to the difference between the official and shadow exchange rate[1].

But this foreign exchange correction is the only one that was undertaken by the planners as far as the imported machinery and equipment are concerned. Yet similar corrections will be needed on the domestic economic front.

Social cost of the Caycuma Investments must also be estimated in conforming with the particular circumstances of each item included. For instance, in addition to the foreign exchange correction, the following adjustments need to be taken into account:

(i) customs duties must be eliminated,

(ii) unskilled labour involved must be valued according to its opportunity cost and this can be expressed in terms of percentage of the market value. Skilled labour which includes engineers and administrators, however, can be valued on the basis of market prices as is common practice.

(iii) domestic materials and equipment should be estimated net of indirect taxes. In other words, indirect taxes will be suppressed in order to compute the social cost of the materials and equipment involved.

(iv) In addition to these, the costs of domestic supply of water and energy, and transport during the construction of the plants need to be priced on the basis of "accounting" prices, rather than actual market prices.

1. An addition of the 0.333 coefficient to the foreign exchange rate will bring the official rate up to 1 $ = 12 T.Liras against its official rate of 1 $ = 9 T. Liras. It must be noted that instead of adding 33 percent of the foreign investments to the foreign exchange component, the same result can be simply obtained by multiplying the latter with a coefficient of 1.33 in order to compute the corrected value of the foreign capital outstanding in the project.

VII Discount Rate

The economic evaluation of public investment projects is done through the application of benefit-cost ratio. This means that total benefits and investments are converted into the present value on the basis of a pre-determined discount rate.

The shadow discount rate which is applied in the evaluation of benefit and cost flows of the Caycuma project is 12 percent[1]; as can be noticed from the present worth factor included in Tables 7 and 8.

Given this rate of discount, the benefit-cost ratio of the Caycuma project was found from the following formula:

$$R = \sum_{n=1}^{n} \frac{B}{(1+i)^n} \Big/ \sum_{n=1}^{n} \frac{I_n}{(1+i)^n}$$

$$B = \sum_{n=1}^{n} \frac{B}{(1+i)^n} = 824.664$$

$$C = \sum_{n=1}^{n} \frac{I_n}{(1+i)^n} = 308.214$$

$$R = {}^{B}/_{C} = \frac{824.664}{308.214}$$

$$R = 2.67$$

The present value of benefits and costs and consequently the choice of projects will largely depend upon the discount rate selected. Thus, its full examination is essential.

The determination of discount rates for investments appraisal raises many questions which ought to be taken into account.

For instance, which rate of discount, private or social should be used? Should the social time-preference rate or social opportunity cost of capital be the choice? What are the arguments behind these two basic methods? Is there a need for choosing higher discount rates for developing countries as compared/

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1. The 12 percent social discount rate is the rate which is determined above the market rate of interest by the government and the planners. This rate is applied to almost all public investment projects as indicated in the Project Evaluation Forms prepared by the SPO.

compared to developed countries? Do we need to have different discount rates for various sectors of the public sector? Does the discount rate change over time? etc.

As a matter of fact, the question of discount rate has been considered extensively in the past and up to the present day by authors like Pigou[1], Sen[2], Eckstein[3], McKean[4], Marglin[5], Feldstein[6], Baumol[7] and Henderson[8]; but none of them has come up with any single simple clear-cut solution to the problem of determining an appreciable and workable discount rate.

The problem of discount rate does not only arise because of the imperfection of the capital-market, but also because of the serious argument on the private time preferences versus social time preferences in respect to the well-being of present or future generations.

The debates which have tried to elucidate the subjective element in the choice of discount rate by the authorities have centred on two types of discount rates; (1) the social time preference rate (STP), and (2) the social opportunity costs of capital (SOC).

The case for the STP discount rate was based on the assertion that consumers' sovereignty cannot be a measure of inter-temporal values, namely, that individuals take a "myopic" view of their own future interests and they attach an inconsiderably /

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1. A.C. Pigou, The Economics of Welfare, London, Macmillan & Co. Ltd., 1950, p.25.

2. A.K. Sen, On Optimizing the Rate of Saving, E.J., September, 1961, p.487.

3. O. Eckstein, A Survey of The Theory of Public Expenditure, Public Finances; Needs, Sources, Utilization, Princeton University Press, N.B.E.R., 1961, pp.453, 454-460.

4. R. McKean, Efficiency In Government Through Systems Analysis, op.cit. pp.115-127.

5. S.A. Marglin, The Social Rate of Discount and the Optimum Rate of Investment. QJE. February, 1963.

6. M.S. Feldstein, The Social Time Preference Discount Rate in Cost-Benefit Analysis, E.J. March, 1964.

7. W.J. Baumol, On The Social Rate of Discount, AER. September, 1968, Vol.LVIII, No.4.

8. P.D. Henderson, Notes on Public Investment Criteria in the United Kingdom. Bulletin of the Oxford University Institute of Economics and Statistics, Vol.27, 1965.

inconsiderably small value to the consumption of future generations[1]. As a rule, both the individual and society place a higher value on present consumption than on future consumption. But the rates of time preference of the two do not coincide because the factors which govern the preferences of each have differing values. These factors are: expectation of life and other risks, private as opposed to public welfare, anticipated scales and patterns of expenditure and growth rates of income.

It therefore becomes necessary that the government should choose and impose a discount rate which reflects the time preferences of the society as a whole. Economists like Pigou, Dobb, Holzman and Sen[2], are in favour of imposing on the public a responsibility for the Welfare of future generations, while Eckstein and Marglin[3] believe that the interests of future generations should be recognized to the extent that the current public sanctions them through the domocratic process.

Feldstein's view is to allow administrative determination of the Social Time, preference with whatever weight to the welfare of future generations these democratic administrators would allow [4]. In other words Feldstein argues that for public investment decisions market-determined evaluation of future consumption must be rejected in favour of a politically-determined social time preference function. He goes on to argue that a social time preference rate should be "a normative rate reflecting the government's evaluation of the relative/

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1. A.C. Pigou argued that individuals are short-sighted about the future and that government intervention is needed to give adequate weight to the welfare of future generations. See A.C. Pigou, The Economics of Welfare, op.cit. pp.24-30.

2. Holzman argues that true consumer sovereignty requires that the "wishes of consumers of the future be presented in the decision", See F.D. Holzman, Consumer Sovereignty and the Rate of Economic Development, Econ. Internazionale, May 1958; A.K. Sen also argues that a democratic solution to an intertemporal problem is impossible if the opinions of all who are concerned must be considered. Thus, it must be a government responsibility to select a rate which reflects social time-preference of the society. See, on Optimizing the Rate of Savings, E.J. September, 1961, p.486.

3. S.A. Marglin, The Social Rate of Discount and the Optimum Rate of Investment. QJE, February, 1963, p.15.

4. M.S. Feldstein, The Social Time Preference Discount Rate in Cost-Benefit Analysis, E.J. March, 1964, p.367.

relative desirability of consumption at different points in time".[1]

He also feels that the rate chosen by the government should be used to discount the stream of consumption which is foregone by society because the public project under consideration has been undertaken. In other words, Feldstein advocates the establishment of a link between a social time preference rate and the estimation of the social opportunity cost of a public project.[2]

The other type of discount rate is based on the social opportunity cost of capital outstanding in the project. This measures the value to society of the production (or consumption) which the funds that it pre-empts would have generated in the next best use to which they might have been put.

O. Eckstein, for instance, strongly argues the case for establishing social opportunity cost. Since there are imperfections in the private economy and particularly in the capital market, opportunity cost must be measured and utilized as a criterion in determining public budgets and must be valued at a social rate of interest.[3]

This approach, however, will require the measurement of marginal rates of return/

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1. M.S. Feldstein, Opportunity Cost Calculations in Cost-Benefit Analysis, Public Finance, No.2., 1964, p.118, and his, The Social Time Preference Discount Rate in Cost-Benefit Analysis. E.J. March, 1964, p.367. Feldstein's indifference curve analyses have shown to us that the social time preference rate can vary through time in response to changes in the consumption level and growth rates, the rate of population growth and the pure time preference rate. Thus, it is wrong to assume that STP is merely a function of time. See Ibid, pp.378-379.

2. See M.S. Feldstein, Net Social Benefit and the Public Investment Decisions, O.E.P. March, 1964; and also, above article, p.379. Feldstein, also suggests to distinguish between: (a) market preferences, (b) preferences expressed through ballot-box, (c) what the government in its wisdom thinks is good for this generation and future generations taken together. See M.S. Fellstein, The Social Time Preference Discount Rate in Cost-Benefit Analysis, E.J. March, 1964, pp.364, 365, 366.

3. O. Eckstein, A Survey of The Theory of Public Expenditure, op.cit. p.463. Eckstein and Krutilla have worked on social opportunity calculations by assuming a tax cut as an alternative to The Public Project. They considered the ways in which a likely tax cut would affect income groups and then asked how the notional recipients would utilize their hypothetical receipts. Consequently they have arrived at a weighted average rate of return. Under some assumptions the opportunity cost of capital in the U.S.A. in the late 1950's was found to be 5 - 6 percent. See O. Eckstein and J.V. Krutilla, Multiple Purpose River Development Studies in Applied Economics Analysis, John Hopkins Press, Baltimore 1961, Chapter 4, pp.78-127.

return on private investment since it has not yet been proved that the marginal efficiency of private investment really equals the interest rate. Even if such a measure is made, it may be relevant only in so far as costs evaluated consisted exclusively of displaced private investment[1].

Under perfect competition the measurement of the social opportunity cost incurred by a project would present no problems. It would simply be the sum of the prices paid for the factors of production used in the project[2]; but in a world of market imperfections (not least in the capital market), other means have to be found of measuring social opportunity cost. It can be measured as a sum of money - discounted present value of the streams of consumption that would have been obtained if the project in question had not been undertaken or as a rate. McKean argues that when there is no market perfection and there is a fixed budget the internal rate of return of the marginal project will represent the opportunity cost of capital and this should be used as social discount rate[3].

A number of other solutions have been suggested in practice in order to measure the discount rate needed in cost-benefit analysis. One course is to make allowance for market imperfections in the market for investment funds. In other words, impeded access to credit, varying degrees of information and risk premia will be taken into consideration.

Another course is to choose the rate of interest paid by the government on its public debt; and finally, a weighted average of market interest rates is calculated/

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1. A.R. Prest, and R. Turvey, Cost-Benefit Analysis: A Survey, A.E.A., op.cit. p.171.

2. When all of a fixed budget is to be spent, there will be no need for an opportunity cost rate of interest. McKean has even argued that in this case there is no need for a social discount rate of interest either and the market rate of interest will be sufficient. See R.N. McKean, Efficiency in Government Through Systems Analysis, John Wiley & Sons, Inc., New York, 1958., pp.78-79.
   This is true, only if the maximand is not the present worth of benefits less costs, for if it is some rate of discount is obviously required.

3. R.N. McKean, op.cit., pp.82-120, 121, (Esp. Chapter 5).

calculated in the belief that the result represents the marginal private time preferences of the citizens who provide the funds via borrowings or taxation[1].

However, all these methods have been largely criticised for being incomplete, misleading and impracticable. It must also be noted that the method of financing the project (i.e. borrowing, taxation, or by monetary policy) will have a considerable effect on the type of social opportunity cost and the appropriate way of measuring it.

Not only is the private capital-market rates of interest as a measure of the social time preference strongly attacked, but the practical solutions suggested above have been regarded as not representative of social time preferences.

It follows from the above arguments that discussions on social time preference rates and social opportunity cost discount rates do not cut very much ice in most empirical works and there has not been a successful and convincing application of these nations in cost-benefit analysis. Nor do the ideas about allowing for future changes in interest rates seem to receive much attention.[2]

Generally speaking, the rule in practice has been to choose an interest rate or rates on the basis of observed rates ruling at the time for calculating present values.

Thus, the choice of discount rates, in view of all these ambiguities, may still remain a matter of value judgment as Eckstein has pointed out[3].

As/

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1. This type of discount rate was applied by J.V. Krütilla and O. Eckstein in Multipurpose River-Basin Development, 1958, Chapter 4. This method was however strongly criticised for not being practicable. There are logical and statistical problems associated with assigning tax cuts to different income groups. Also as Hirschleifer pointed out the composite interest rate finally derived has an unknown allowance for a risk premium in it.

2. J. Margolis was the first to suggest that the discount rate for evaluating public investment projects need not remain constant, but he did not develop the idea much further. See his, The Economic Evaluation of Water Resource Development, AER. March, 1959, p.102.
Feldstein, however, takes up the idea and argues that the STP rate may vary through time, if Society's location in the consumption space changes or if the shapes or positions of the indifference curves do not remain constant. See his Indifference Curves Analysis, in "The Social Time Preference Discount rate in Cost-Benefit Analysis". E.J. March, 1964, p.376.

3. O. Eckstein, A Survey of The Theory of Public Expenditure, op.cit. p.460.

As far as underdeveloped countries are concerned, the question of determining social discount rate becomes more difficult. The market interest rate is not an appropriate representative of the value of capital in underdeveloped countries. A problem of calculating the cost of capitital, that is to say interest rates, may arise since they are usually fixed by special government regulations. Owing to the shortage of capital and the implicit imperfection of the market in developing countries the real cost of capital will most probably exceed the maximum cost authorised by the Law or other regulations. Thus, shortage of capital will lead to a rate of interest higher than the market one[1].

In developing countries one may observe a number of rates of interest. For instance in Turkey in the organised capital market, capital can be borrowed at a rate between 7%- 9% while there also exists an disorganized market in rural areas where money is borrowed at 50 percent of interest or even more.

One may then ask the question of how to determine the social discount rate for evaluating public investment projects. It is not an easy question to answer since there are a large number of factors which may affect this decision.

(1) In my thinking, however, developing countries should use a social discount rate since market rate of interest does not reflect the true value of capital. If the capital is underpriced and no shadow price is used, capital intensive projects will be favoured. If, on the other hand, higher (social) discount rates are used, many of the investment projects of the developing countries may not appear profitable and this can hamper their resource utilization.

But it can be argued that a discount rate higher than market rate will at least have the advantage of rejecting projects with a rather low rate of return, i.e. transport and luxury housing projects[2].

(2) Developing countries should apply a rate of discount which is higher than the discount rates used in developed countries. It is arguable that developing countries by using a <u>higher rate</u> will be able to pass projects with a high rate of profitability which will, in turn, achieve higher rates of/

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1. The determination of a social discount rate is therefore a matter of - Do Governments intervene in capital markets with any effectiveness, and how well organised and unified is the capital market in a country?

2. It is sometimes argued that different discount rates for different sectors or projects may be needed, but opinions on that are divided on the grounds that such differentiation would be technically very difficult and probably incorrect.

of growth of income and thus a higher level of welfare for future generations.

Developed countries are not depressed by the lack of capital and they may be able to lower the social discount rate in order to take care of future generations to a greater extent than the developing countries would be able to do. The developed countries can forego the risk of applying a lower social discount rate which would ultimately give priority to projects with higher capital-intensity and with long durability. But this is what the underdeveloped country cannot afford.

Advanced countries with their abundant capital resources are able to consider the social time preference rate as well as the social opportunity cost of capital. In other words, they can take care of present and future generations simultaneously; but in developing countries, they should first be concerned about the present generation which happens to be poorer, rather than the future generation which would be better off anyhow.[1]

Only when a country is stagnating and where only a major restriction of current consumption can put life into its development programme may one wish to make sacrifice for tomorrow, for without it, the future generation will be as impoverished as the present one.

The distribution of income in favour of the poor of today's generation rather than/

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1. W. Baumol and A.C. Harberger feel that by and large the future can be left to take care of itself. There is no need to lower artificially the social rate of discount in order to increase further the prospective wealth of future generations.
   W. Baumol argues that "the rate of interest should be set by the market and the needs of public policy .... and no attempt should be made to subsidise the future by artificial reductions in discount rates designed only for that purpose". He also insists that "... an appropriate instrument would be a set of selective subsidies rather than a low general discount rate that encourages indiscriminately all sorts of investment programmes whether or not they are relevant". See W. Baumol, On The Social Rate of Discount. AER. Vol. LVIII, No.4., September, 1968, pp. 801-802.
   A.C. Harberger has also argued on the similar lines by stating that "intergeneration comparison, as a normative problem arises only if we expect the future generations as a whole to be poorer than we are. There is no normative reason for making the present (poor) generation save more than it wants to in order to make future richer generations still richer". See A.C. Harberger, Techniques of Project Appraisal, National Economic Planning, National Bureau Conference Series, No.9., New York, 1967, p.140.

than the future poor is not an argument against government activity. Obviously, more government projects are needed, but this does not imply more long term projects. What we need is more but less-durable government investments and a low rate of discount on public projects is precisely the wrong way to go about their achievement.

One can go along partly with Feldstein[1] to suggest that for public investment decisions, a shadow price which reflects both social time preference and social opportunity cost of funds should be the choice. But in my opinion, more weight should be given to social opportunity cost of capital when under-developed countries are in question. Besides, the social discount rate should be a rate which may reflect government judgment of the relative social utility of consumption at different points in time. A dynamic approach which takes into account the future changes in discount rates is needed.

Despite the difficulty of determining an appropriate discount rate for under-developed countries, there are strong arguments in favour of applying a rate of discount of 10 percent[2]. Tinbergen, for instance, has argued that 10 per cent or a little more may be a suitable rate of discount to apply in developing countries in the case of a lack of the information needed[3].

The interest for discounting must be chosen with the utmost care since very small differences translate into very large differences of current values. Naturally, a variation in the rates of discount used in the calculation may therefore affect the order of priority of the projects. Thus, if the difference between the market rate and social discount rate is not taken into account serious errors may be incurred in allotting priority to projects with a relatively high capital intensity in relation to national availability of capital.

Finally/

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1. M.S. Feldstein, The Social Time Preference Discount Rate in Cost-Benefit Analysis, E.J. March, 1964. p.379.

2. On this point, see U.N. Cost-Benefit Analysis of Social Projects Research Institute for Social Development and Office of Social Affairs, Report No. 7, Geneva, April, 1966, p.23; and also J. Tinbergen, The Design of Development, The John Hopkins Press, Baltimore, 1966, pp.39, 86.

3. J. Tinbergen points out that for "the equilibrium rate of interest", factors like (a) the rate at which it will be possible to attract additional capital; and (b) the profitability of marginal projects corrected for risk such as inflation can be taken into consideration. Thus, he adds that "Even if it is difficult to obtain figures of any accuracy, it would be wise to try figures of the order of 10 percent and over, if only to observe the consequences". See the Author's, The Design of Development, The John Hopkins Press, Baltimore 1966, p.39

Finally, one may conclude that a higher discount rate is more advantageous than the lower one, since, at least the former will avoid misallocation of factor use by rejecting the inferior projects[1].

In view of all these discussions the planners' decision to choose a discount rate of 12 percent seems to be a reasonable one. This is in line with the recommendations suggested by many economists but I feel instead of applying only one rate of discount, at least two rates of social discount should be applied before arriving at the final decision and priority ranking.

In other words, projects need to be checked on the basis of various discount rates. It must be noted that in a mixed economy with market imperfections and multiple interest rates, no single discount rate can be taken as a measure of both time preference and the productivity of capital.

Besides, the chosen discount rate of 12 percent has been assumed to remain constant during the economic life of projects. But as we know, STP rate need not be constant as it may vary according to changes in the consumption level and growth rates, the rate of population growth and the pure time preference rate[2].

Similarly, a social discount rate based upon the social opportunity cost of capital may depend on factors which will affect the marginal productivity of capital. These factors are[3]: (a) the rate of capital formation, (b) the rate/

1. An application of a social discount rate based on social opportunity cost of capital will be more relevant to Turkey's conditions. Since by a high discount rate, investment funds will be mainly allocated to productive sectors and projects with a high rate of return rather than to social overhead capital projects which can pass the test only if a lower discount rate is taken. In our thinking, productive projects which can even pass the test of a higher discount rate, will contribute more to the welfare of present as well as future generations. This conclusion supports our argument in the earlier chapters, that investment funds need to be allocated to productive sectors and projects.

2. See M.S. Feldstein, The Social Time Preference Rate in Cost-Benefit Analysis, op.cit. pp.374-375. Feldstein also concludes that "slowly but continuously raising the pure-time discount rate seems to be the best compromise between those who would not have society look endlessly into the future, and those who can see no normal justification for not doing so". Ibid, pp.378-379. Social Time preference rate may remain constant only if there is a constant elasticity of marginal utility function. See M.S. Feldstein, op.cit. p.371.

3. See A.C. Harberger, Techniques of Project Appraisal, National Economic Planning, National Bureau Conference Series, No.9, New York, 1967, p.136

rate of labour-force growth, (c) the nature and degree of "neutrality" or "non-neutrality" of technical advance (d) the nature of changes in the pattern of demand, (e) particularly of relative shifts toward or away from capital-intensive industries.

Clearly some of these factors will produce a secularly rising rate of marginal productivity, others will produce a secularly declining rate. Therefore, there are strong reasons to believe that marginal productivity of capital will change in the long-term future and the factors causing this change have got to be taken into consideration during the determination of an appropriate discount rate.

This rate should, of course, be modified whenever there are good reasons to expect that in the future the typical rate of social marginal productivity of capital will differ from that observed in the past; for the present and near future years, it should be modified when there is evidence of an abnormal scarcity or glut of investible funds[1].

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1. Harberger has also concluded that the past average social rate of return to capital is the best first approximation of the rate desirable for cost-benefit analysis. Ibid, p.141.

VIII. Present Value Criterion:

As can be seen from the Caycuma Project evaluation form (Chapter 7), the criterion applied by the planners is the present value rule which gives a benefit cost ratio of 2.6. This has been the general rule applied in investment projects examined and evaluated by the State Planning Organisation (SPO).

One may ask: Is the present value rule an appropriate one for underdeveloped countries? Before we answer this question, it would seem essential to discuss briefly two of the investment criteria, namely the internal rate of return and present value. There is extensive literature on the subject, but I will merely try to show their advantages and disadvantages when they are used as an investment decision rule[1].

Let us first start with the internal rate of return rule. The internal rate of return of an investment means the rate of discount which makes the present value of the projects' receipt stream equal to the present value of its cost stream or, putting it differently, the rate of discount which makes the present value zero[2].

When there is no capital rationing, this rule suggests that planners should invest until the internal rate of return from incremental investment is no higher than the market rate of interest; thus, projects which have an internal rate of return higher than the market interest rate will be selected for implementation and projects with a rate of return lower than the market rate will be rejected.

If a project has a higher yield than the market rate, its present value will be positive when projects' cost and receipts stream are discounted at the market/

1. Present value and internal rate of return rules were briefly mentioned in Chapter 3. Here, a comparison between the two will be made in more detail.

2. If, for instance, a $\not{}$100 investment provides $\not{}$5 per year in perpetuity, its internal rate of return is 5 percent; that is with a discount rate of 5 percent the present value of the receipt stream would be the same ($\not{}$100) as that of the cost stream.
The internal rate of return is defined as the value of i which satisfies the equation:

$$\sum_{p=o}^{p=n} \frac{R_p - D_p}{(1 + i)^p} - I = 0$$

market rate. If the projects' yield is less than the market rate the investment will have a negative present worth when the latter rate is used to discount the streams[1]. The internal rate of return of the first project not covered by the budget will be the marginal rate of return. If the net benefit streams from all projects in the list were then discounted at this rate all those with higher internal rates would have positive present values and would clearly be preferred to those with lower internal rates which would have negative present worths:

As far as capital budget is unconstrained, both internal rate of return and present value rules will give identical results and a choice between them would not matter much[2].

As it looks, internal rate of return rule would pick the correct set and will also have the merit of eliminating the repeated calculation of each projects' present value at various discount rates.

But it is always the case that the problem is not to decide on the basis of absence of capital rationing, but rather on the basis of capital rationing which exists both in developing and developed countries for various reasons. In other words, there are constraints which limit the freedom of action of the departments or industries concerned and prevent them from undertaking all projects which are in principle acceptable. These constraints can be physical, organisational or financial[3].

As far as the public sector is concerned, the capital rationing can be imposed at /

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1. For an extensive discussion on the internal rate of return and present value rule, see R.N. McKean, Efficiency in Government Through Systems Analysis, John Wiley & Sons, Inc., New York, 1958, pp.75-91; P.D. Henderson, Notes on Public Investment Criteria in the United Kingdom. Bulletin of the Oxford University Institute of Economics and Statistics, Vol.27, 1965., pp.55-62, and Myles M. Dryden, Capital Budgeting: Treatment of Uncertainty and Investment Criteria, Scottish Journal of Political Economy, Vol.II, February, 1964, pp.235-241.

2. See P.D. Henderson, Notes on Public Investment Criteria in the United Kingdom. Bulletin of the Oxford University Institute of Economics and Statistics. Vol.27, No.1, February 1965, p.62; Myles M. Dryden has also pointed out that under limited assumptions that is, perfectly competitive capital markets, completely divisible projects and no interdependencies among the projects, the two criteria lead to the same choice. See his Capital Budgeting: Treatment of Uncertainty and Investment Criteria, Scottish Journal of Political Economy, Vol.II, February 1964, p.241.

3. P.D. Henderson, op.cit., p.75.

at three different levels. First, the government may have rules to limit the total of public expenditure, both on current and capital account in a particular period. It may be wished that public expenditure should not exceed some specific proportion of total national income.

Second, there may be quantitative limit on the total public investment, rather than public expenditure as a whole.

Third, a quantitative limit may also be imposed on the capital expenditures of particular agencies whether departments or industries so that each of these has to work within the limit of the pre-determined capital budget.

The last case is very relevant to the investment agencies in developing countries where they are expected to reach an appropriate decision within the capital budget devoted to them. In this case the total budget should not be spent unless the money cost of the projects which have positive present worth under whatever decision rule has been adopted, reaches or exceeds the budgeted amount. Where the costs of such projects exceed the budget then genuine capital rationing for the agency may be said to exist.

Here there are two common alternative rationing devices which can be used to keep capital expenditure within the constraints.

The first is the rate of interest. The planners or analysts can raise the rate at which future benefits are discounted until the cost of the projects with a positive present value falls within the capital budget. This is tantamount to discounting at the internal rate of return of the marginal project, that is the project which by this method of ranking is the least deserving of those that win a place in the budget[1].

The second alternative is to find the present value of each project by discounting at a pre-determined social time-preference rate; to rank projects according to their benefit-cost ratios, and to work down the list until the budget is exhausted.

A choice between these two devices may be influenced by the independent judgment/

1. On the marginal rate of return as being used as a discount rate in present value calculations, see R.N. McKean, Efficiency in Government Through Systems Analysis - A Rand Corporation Research Study, John Wiley & Sons, Inc., New York, 1958, pp.82-89.

judgment on the respective merits of the internal rate of return rule and the present value rule. This brings us to the present-value investment rule which is widely adopted in projects appraisals.

The present value investment rule implies choosing the project which has the larger present value when the streams of benefits and costs are discounted, by a pre-determined rate. The formula for this criterion can be written as follows:

$$\frac{\dfrac{b_1}{(1+i)^1} + \dfrac{b_2}{(1+i)^2} + \cdots\cdots\cdots + \dfrac{b_n + s}{(1+i)^n}}{\dfrac{c_1}{(1+i)^1} + \dfrac{c_2}{(1+i)^2} + \cdots\cdots\cdots + \dfrac{c_n}{(1+i)^n}} > 1$$

where b represents annual cash flows of the project; n represents life of the project; i pre-determined discount rate; c prospective cost streams, and s scrap value.

The ratio between the present value of benefits and costs will be the ranking device upon which the choice of investment projects will depend; provided the ratio is above unity.

If independent projects[1] are the case, of such investments the planners should undertake those which have positive present worths when the streams are discounted at the pre-determined rate.

The same rule can also be applied to interdependent projects including those which are mutually exclusive. In this case the analyst would choose those projects which have the highest present worths when the streams are discounted at the specific rate[2].

Under no capital rationing and a perfectly functioning capital market, the discount rate is the market rate which is equal to the marginal rate of return.

But as far as capital rationing is concerned, an investing agency would have no reason to use the market rate for discounting. The investment budget might either/

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1. Those projects whose costs and receipts do not depend upon whether or not any of the other ventures are undertaken.

2. Those projects are not necessarily with the highest internal rate of return.

either fall short of or go beyond the point where the marginal yield equalled the market rate of interest[1]. In this case, McKean argues that the discount rate should be the marginal rate of return that is the yield that could be earned in the next best opportunities open to the investor[2].

McKean's idea of using the marginal rate of return as the discount rate seems to be very near to the concept of using social opportunity cost of capital as the discount rate. But this is not as simple as that. First of all, use of the marginal internal rate of return as the discount rate rests on the assumption that it is the marginal rate that can be earned. If net receipts can be reinvested at the marginal internal rate its use as the discount rate gives the right answers[3]. But if net receipts cannot in fact be reinvested at that rate because of institutional reasons, then that "internal rate" is not the marginal rate of return and is no more relevant.

Moreover, this discount rate is impracticable since every set of investment projects will have a different marginal project and marginal internal rate of return, and also this marginal rate of return may change over time.

Further, use of the marginal internal rate ofreturn[4] as discount rate, does not take into account the social time-preference of the society which is quite important.

In my opinion, what we need is a social discount rate which can reflect both the marginal internal rate of return of capital (opportunity cost) and social time-preference rate of the government who act on behalf of the society.

In view of the present value rule, those projects with positive present worths that exhaust the budget constitute the correct set, the one that yields the maximum/

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1. See R.N. McKean, op.cit. p.82.
2. See R.N. McKean; Efficiency in Government Through Systems Analysis, op.cit., p.82.
3. On this point see R. Turvey, Present value Versus Internal Rate of Return - An Essay in the Theory of the Third Best. E.J. March, 1963. p.95.
4. When there is no capital rationing the marginal rate becomes: if investment is pushed until no additional projects yield more than the market rate of interest then the latter is the marginal rate. It must be noted however, that one must know the preferred set of investments before he can determine the marginal internal rate of return. R.N. McKean suggests that one course is to discount the stream of net benefits at various rates and find the discount rate at which the budget is exhausted by projects with a positive present worth or with gain streams whose present value exceeds those of their cost streams. See R.N. McKean, op.cit. pp.87-90.

maximum present worth with the given investment budget when the streams are discounted at the social rate of return.

When mutually exclusive projects are concerned, the various combination of projects would be evaluated at each discount rate and the final set will include the combination that had the largest present value at that discount rate.

All this does not mean that marginal internal rate of return is not a useful device to apply; on the contrary, it can be used as a first approximation to an appropriate social discount rate. As we have argued in the preceding sections, an underdeveloped country must give more weight to the social opportunity cost of capital as the necessary discount rate to adopt in project appraisal. Besides, the marginal internal rate of return of the marginal project can be used as the critical minimum rate to be satisfied by all projects included in the programme.

If the net receipts from all projects in the list are discounted at this rate, all those with higher internal rates would have positive present worths and those with lower internal rate of returns would have negative present worths. Thus, provided marginal rate of return is used as discount rate the ranking will be the same under both investment criteria[1].

Which investment rule is more advantageous and superior than the other? In my opinion there are many reasons which make the present value (PV) superior to the internal rate of return rule. These are:

(i) It is procedurally much simpler to apply than the internal rate of return rule. The latter is sometimes ambiguous because present worth can be zero at two or more discount rates.

In normal case a project is associated with two phases where an initial period of negative net benefits is followed by the second phase in which the stream of net benefits is positive.

When the sign of the stream of benefits changes once only (as above) from negative/

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1. See R.N. McKean, Efficiency in Government Through Systems Analysis, op.cit., p.89; He points out that if projects above (or below) the marginal project were ranked according to their present worths the ranking would shift as the different rates were used for discounting. However, the shift in ranking would not matter if all projects above the marginal project were undertaken and all the projects below the marginal project were excluded. See Ibid., pp.85-89.

negative to positive, there is a single unique solution for the internal rate of return. This is the case where, in the latter periods, gains exceed operating costs. If, however, there is more than one change of sign so that the period of the life of the project falls into more than two phases, there will then be more than one value for the internal rate of return. Sometimes the values of the rates may not even be real values.[1]

Because of the possibility of non-uniqueness the internal rate of return has been greatly criticised as a general rule and it has certainly a disadvantage from which the present value rule is completely free.[2]

(ii) The use of present value does, and the use of internal rate of return does not, involve a discount rate representing our relative evaluation of current and postponed returns and costs. If the government or society cares about the relative futurity of gains and losses, if that is to say, the objective is a present value the internal rate of return is the wrong criterion

In other words, the present value rule reflects the social time preference rate which is different than that of the private time preference rate which is represented by the market interest rate. Internal rate of return criterion however, does not take care of this social time preference function.

(iii) /

1. The situation becomes more critical and serious when there are three phases in one project, where the stream of net benefits is first, negative than positive, and then negative again. Examples for having non-real values for internal rate of return are: investments which involve terminal costs for damage, disposal or restitution, i.e. mine shafts which lead to subsidence, nuclear power and iron-ore works. On the non-uniqueness of the internal rate of return see, P.D. Henderson, Notes on Public Investment Criteria in the United Kingdom, Bulletin of the Oxford University Institute of Economics and Statistics, Vol.27., February, 1965, pp.61-62, and Myles M. Dryden, Capital Budgeting: Treatment of Uncertainty and Investment Criteria, Scottish Journal of Political Economy, Vol.II, February, 1964, pp.239-240.

2. P.D. Henderson argues that in the usual case (normal) where a unique solution exists the internal rate of return should be the choice, op. cit., pp.61-62; Professor A.J. Merrett and A. Sykes are also in favour of internal rate of return rule where they state that: "Our main conclusion is that for the vast majority of simple capital budgeting decisions, we consider that yield is both technically and practically superior to net present value. In these relatively simple situations, the disadvantages of net present value considerably outweigh its technical simplicity". See their book: The Finance and Analysis of Capital Projects, Longmans, 1963, pp.148-149, and A.J. Meriett, Net Present Value vs. The Internal Rate of Return Yet Again, Scottish Journal of Political Economy, Vol.XII, February, 1965, No. 4., pp.117-118.

(iii) Besides, while in present value rule discount rate can be changed over time, internal rate of return rule considers only a uniform discount rate. In the case of present value, one is not committed to using the same rate of discount throughout the life of projects. Thus, the planners are entirely free to adopt any time preference function which can be varied according to circumstances.

Also, as a result, computations of the present value of the projects for different rates of discount provide a reliable and sound decision when investment projects are selected.

(iv) When mutually exclusive projects are in question, the ranking according to internal rates of return points to the wrong set. Let us illustrate this point by an example.

Suppose we have projects A, B and C and also suppose A and B are mutually exclusive[1]:

Alternative Projects	Initial Investment	Net Benefits Year 1	Net Benefits Year 2	Internal Rate	Present Value Of Net Benefits Discounted at Marginal internal Rate 3%
A	$ 100	0	$ 115	7%	$ 108
B	$ 100	$ 110	0	9%	$ 107
C	$ 100	$ 104	0	4%	$ 101
D Alternative Investment that yield				3 %	

where internal rate of return is the rule, B and C are best investments. But suppose the rate of return on the next best investment, D is 3 percent which is then the marginal internal rate of return. If the net benefit streams are discounted at that rate, A becomes a better project than B and the correct set of projects is A plus C.

But it must be noted that if A and B were not mutually exclusive, both would be undertaken and A and B would be the best pair of investment projects.

In this case, a simple ranking by internal rate of return would point to the correct set. But as far as the two projects are mutually exclusive, simple internal rate of return rule is the wrong criterion.

(v) /

1. This example is taken from R.N. McKean, op.cit. p.90.

(v) More important, to rank projects according to the present value rule gives a clear and straightforward idea of the present value of net benefits accruing, while the internal rate of return would rank projects on the basis of their internal rates of return regardless of the scale of net benefits provided. A small project with a higher internal rate but with a less present net receipts will be preferred to a project with a lower internal rate of return but with a larger present value of net benefits. This is obviously a wrong choice.

Thus, there is a danger that project sizes and the combinations of inter-related projects will not be taken into account when internal rate of return rule is adopted.

(vi) It is sometimes agreed that a distinction must be made between the simple internal rate of return rule and the more improved version of it, that is Fisher's "rate of return over cost" rule.[1]

Fisher's "Rate of Return over Cost" rule implies taking the stream of differences between the net benefits of the two projects and calculating the internal rate of return on these. This rate is then compared with the pre-determined rate of interest. Here with a given rate of interest the two rules, that is present value and internal rate of return rules will give the same result provided that a unique internal rate of return exists[2].

The simple internal rate of return rule, on the other hand, would rank projects according to their internal rate of return or in other words, the projects which have rates of return greater than the borrowing rate or some arbitrary rate would be qualified for selection.

The simple internal rate of return rule however has been argued to be incorrect since a larger project may have a lower internal rate of return than a smaller one but still have a rate of the difference of the outlays which exceeds/

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1. On Fisher's Rate of Return over Cost, see M.S. Feldstein, and J.S. Flemming, The Problem of Time-stream Evaluation: Present Value versus Internal Rate of Return Rules. Bulletin of Oxford University Institute of Economics and Statistics, Vol.26, February 1964, pp.80-81.

2. But if there is more than one internal rate of return the choice on both criteria will give different results. See M.S. Feldstein and J.S. Fleming, op.cit. pp.80-81-82.

exceeds the minimum required. When this minimum is the market rate of interest it does of course, represent the opportunity cost of the finance. So when the marginal rate of return exceeds the minimum it represents a better investment than the next best alternative use of the funds it requires.

While simple internal rate of return fails to take into account the problem of size, the problem can be avoided by using Fisher's[1] "rate of return over cost" rule.

Let us take an example. The two incompatible projects are A and B and both have unique internal rate of return[2]:

Stream A	: -100	2,	10,	15,	20,	25,	35,	30,	30
Stream B	: -100	5,	15,	25,	30,	25,	20,	20,	20
Stream (A-B)	= 0	-3,	-5,	-10,	-10,	0,	15,	10,	10

It is computed that internal rate of return of A is 10 percent and that of B is 11 percent. The simple rate of return rule would tell us to choose B. But if we take Fisher's"Rate of Return over cost", we find that it is 6 percent for (A-B) and (B-A). As the Stream (A-B) changes sign from negative to positive, it represents a profitable investment at any interest rate less than 6 percent; only at rates above 6 percent would (B-A) be profitable.

Thus, on Fisher's rule one would choose A if the minimum value of the rate of return were less than 6 percent and B if it were more. This is exactly the same as the present value rule for Fisher's rate of return over cost is that rate which equates the present values of the two projects. At 5 percent for instance, A has present value 29 and B 27.6; at 9 percent the order is reversed with A at 4.2 and B at 6.7[3].

From the above example, it follows that the simple rate of return rule is wrong and the Fisher's "rate of return rule" should be applied instead, as it points to the same result as the present value formula with a constant discount rate.

(a) But even this interpretation of the internal rate of return rule is not free/

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1. For an extensive treatment of Fisher's Rate of Return over Cost, see A.A. Alchian, The Rate of Interest, Fisher's Rate of Return over Cost, and Keynes' Internal Rate of Return. AER. December, 1955, p.938.

2. For the sake of mere illustration, this example is taken from Feldstein and Fleming's The Problem of Time-Stream Evaluation: Present Value versus Internal Rate of Return Rules. op.cit. p.82.

free from weaknesses, as in some cases non-uniqueness arises. It is a similar case with the simple internal rate of return rule.

(b) Besides the comparison of the internal rate of return, both simple and the incremental rates of return, with any current interest rate may seem irrelevant, if the rate is assumed to change over the life of the project. Whereas in the case of Present Value rule planners are not committed to using a constant rate of discount, all the time.

(c) Further, it is much easier to compute[1] and compare the present values of incompatible projects than to calculate Fisher's rate of return over cost for a large set of projects. For example, if one wishes to evaluate combinations of independent projects, it is much simpler to add present values than to recalculate the internal rate of return of the overall time streams. The present value of two independent projects taken together is the sum of their separate present values. But no such simple rule can be devised for combining rates of return[2].

All these discussions lead us to the conclusion that present value rule is superior to internal rate of return rule whatever interpretation is given to it. It is also the most relevant criterion to apply in underdeveloped countries.

One may, therefore, feel that the Turkish Planners' decision to adopt the present value rule as the criterion is a correct one. But this does not mean that the present value formula is always the correct decision rule in whatever form it is applied.

One of the shortcomings of this criterion is that the selection of an appropriate/

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1. Dr. M.M. Dryden argues that there are no good non-theoretical reasons for rejecting the present value method and that a strong case can be made for preferring the present value to internal rate of return. He maintains that the present value is easier to calculate than solving internal rate of return by trial and error method. He also adds that "Thus, in practical situation of having to choose the best projects from a set of proposals .... it is evident that a variety of side calculations must be made in order to treat cases in which the internal rate is not applicable. Not a very tidy scheme;" See M.M. Dryden, Reply, on "Net Present Value versus the Internal Rate of Return Yet Again". Scottish Journal of Political Economy, Vol.XII, Feb., 1965 No.4., pp.120-121.

2. See M.S. Feldstein and J.S. Flemming; The Problem of Time Stream Evaluation: Present Value versus Internal Rate of Return Rules., op.cit., pp.82-83.

appropriate discount rate is not always easy. As was discussed in Section VII, there is not a clear-cut solution to the determination of the social discount rate. The arguments vary between using the social time preference rate or the social opportunity cost of capital or using a social discount rate which is the combination of both [1]. These two methods have been extensively debated in theory and practice and the selection of either is bound to involve serious objections[2].

However, looking at the Caycuma Paper project, one may feel that the selection of a discount rate of 12 percent is largely based upon the second method, that is to say, social opportunity cost of capital. I was told by one of the planners at the SPO, that in the selection of this discount rate the social opportunity cost of capital had played a decisive part, though the influence of other factors was also taken into account[3].

This, at first blush, may seem a reasonable method in view of the scarcity of capital in the country. But in our thinking we feel that the planners' choice of present value rule may be hampered if the discount rate chosen does not also reflect the social time preference function of the society as a whole. As Feldstein has pointed out, the social discount rate to be used in present value formula should be determined both on the basis of social time preference rate and the social opportunity cost of capital.

Another weakness of the present value formula applied by the planners is that it may lead to wrong investment decisions so long as the selection of projects is/

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1. For a very useful analysis on Social Discount Rate, see P.D. Henderson op.cit., pp.62-74. McKean's suggestion of using the marginal internal rate of return as the proper discount rate is a practical one, but it is not always free from serious objections.

2. It is mainly for this reason that use of internal rate of return has been suggested to be the choice. It is claimed that internal rate of return will avoid the subjective value judgment associated with the determination of appropriate discount rate. On this point, see A.J. Merrett, Net Present Value vs. The Internal Rate of Return, Yet Again. Scottish Journal of Political Economy, Vol.XII, February, 1965, pp. 117-118.

3. In determining shadow interest rate the following factors were said to be taken into consideration: the rate of return, on marginal projects, bank rate applied by the Central Bank, interest rates on industrial and Commercial credits and also the rates applied by private money-lenders. See, Tarik Kivanc, Yatirim Projelerinin Ekonomi Yonunden Degerlendirilmesi - Alternatif Projeler Arasinda Bir Secim Calismasi, DPT, Nisan, 1965, p.19.

is made according to benefit cost ratio alone. The ratio only tells us whether or not some return can be expected from the project and tells us little about the relative merits of projects whose ratios are greater (or less) than unity. In other words, if the conventional benefit-cost ratio is applied, a project that has high gross returns and operating costs will be at a relative disadvantage whatever its potential contribution to net worth.

When dealing with one project only the decision rule which depends on the benefit cost ratio is sufficient for admitting that project; but when more than one independent project is considered, the choice should depend not on the benefit cost ratio alone but on the size of the present value of net benefits of each project (NPV). The generally acceptable form of the criterion would be the maximisation of gains minus costs so long as both can be expressed in the same monetary unit. Thus, one may maintain that benefit-cost ratio by itself is very deceptive since it reveals nothing about the absolute scale of gains and costs. This is an important point which the planners ought to consider seriously.[1]

1. O. Eckstein states that benefit-cost ratio can be an appropriate criterion for certain kinds of investment decisions - that is to say for selecting among projects which do not differ largely in respect to capital intensity or riskiness. In other words, the test can be confined to choosing among projects that have similar turnover and risks.

   It is meaningful to apply benefit-cost ratio where the benefits are the same in both projects. In this case the ratio of costs of both projects will be sufficient rule for selecting projects.

Conclusion:

The following conclusions can be drawn from the discussions in the preceding sections:

(1) While in the absence of capital rationing the argument in favour of selecting one rule rather than another does not appear to be decisive, in the case of capital rationing which greatly exists in developing countries the present value criterion is superior to internal rate of return rule on formal grounds as well as in convenience of operation.

The present value rule has more advantages than the internal rate of return rule on the ground that use of a specific centrally determined social discount rate may be very significant and on the ground that it is much simpler to apply. As mentioned earlier, when internal rate of return is applied, there will be the complex problem of non-uniqueness (even negative values) which has been considered to be a fatal objection to its full use. No doubt this is a disadvantage from which the present value rule is completely free. On the other hand, even if cost flows of some years happen to be negative, the present value rule can give positive results.

(2) By and large, the choice between the two rules may be affected by a judgment on the prevalence of capital rationing and on the best way of selecting projects under these conditions. Therefore, the choice of criterion will mainly depend on what budget is considered, what aims are adopted when the capital rationing is the case and also on the pattern of time preferences.

It is therefore necessary that the government should see to what extent and in what ways arbitrary forms of financial rationing are in force. This is important not only that where such constraints exist they can be eliminated, but also in order that so long as capital rationing is unavoidable in particular cases the investment agencies concerned are using the appropriate decision rule for ranking projects.[1]

(3) Whether internal rate of return or present value rule is used the analyst is faced with some difficulties. In the former case it is necessary to specify/

1. P.D. Henderson argues that, imposition of arbitrary constraints on public expenditure simplifies the task of decision making, but it does so only at the cost of ensuring that the decisions made will be worse than they need have been. He also argues that, for a sound decision making it should be a government policy to eliminate all kinds of rationing in so far as they can be seen to exist. See P.D. Henderson, op.cit., pp.76-77.

specify a minimum acceptable rate of return which projects must reach in order to qualify for selection. In the latter case, a pre-determined rate of interest has to be used in discounting net benefits.

The choice of a rate of interest is very important, particularly when the present value rule is applied. The higher the rate chosen the greater bias in favour of projects with relatively low initial expenditure and benefits which accrue earlier rather than later. Therefore, whenever alternative projects exist which differ in time profiles of their prospective net benefits, the rate of interest used for discounting may have a decisive influence on the choice[1].

Total amount of public investment will also be affected as well as the composition of a given amount for the lower the chosen rate the higher this total will tend to be. Thus, the choice of a rate which implies a specific valuation of earlier rather than later costs and benefits is not just a matter of a philosophical interest, but may have a considerable influence on public investment programmes.

(4) If discount rate is higher than the marginal internal rate of return, many projects with positive present values could hardly qualify for selection[2]. Thus, it is more reasonable to use a rate that is consistent with the degree of capital rationing imposed at higher levels, and also consistent with attitude towards the future that is implied by higher level-decisions.

A discount rate different from the marginal internal rate of return is sometimes appropriate because policy-makers may have time preferences or subjective rates of return that differ from the marginal internal rate of return. Policy-makers/

1. If the discount rate is low, projects with high capital investment and with a lower annual operating cost, are preferable to those projects with a smaller capital outlay but with a high annual operating cost. If discount rate goes up progressively those projects with a larger investment lose their relative superiority.

2. A more practicable and reasonable method is to use the marginal internal rate of return as the first approximate discount rate as far as we are dealing with constrained capital budget. Thus, if the costs and streams are discounted at the internal rate of return, of the next best value the projects chosen will have positive present worths and the one rejected will have zero or negative present worths. The final test is the maximization of present worth for a given investment budget, when the streams are discounted at the marginal internal rate of return. See R.N. McKean, Efficiency In Government Through Systems Analysis, op.cit. pp.99-100.

Policy-makers may have pessimistic views about long-run prospects and attach a great weight to adopt in the near future. While they cannot increase consumption and reduce the government investment budget, they can discount the future at a high rate - higher than the marginal internal rate of return of capital, or vice versa if the policy-makers are optimistic.

It is my judgement that, in the determination of social discount rate (shadow) the following factors should be taken into consideration:

(i) the cost of loanable funds (market rate of interest)

(ii) the rate of return in similar investments,

(iii) the rate of return of capital in other alternatives (opp. cost of capital),

(iv) the general profitability rate of the enterprise.

(v) the risk element involved in the project.

(vi) the minimum rate of return expected from the investment by policy-makers.

(vii) social time preference rate of the government who acts on behalf of the society

  (a) what the government thinks it is good for the present generation.

  (b) what the government thinks it is good for present and future generations taken together.

(5) It should also be stressed investment projects should be appraised and evaluated in terms of other criteria as well. Appraising projects according to internal rate of return rule can be quite useful in providing a double-check over the selection of projects. A comparative and detailed study of all projects in terms of various investment criteria will, of course, lead to a better judgement and decision than the case of using only one investment rule.

It is for this reason that in Section X, I shall be examining the Caycuma Paper Mill in terms of internal rate of return criterion.

IX. The Correction of An Error

As was remarked earlier, in the computation of the foreign exchange savings of the project the SPO Planners have made an error in the multiplication of item (3) with (4) in Table 3 (See Chapter 7). In other words, the net foreign exchange savings in Table 3 were given as 20,268 thousand T.Lira for 1970, 60,995 thousand T.Lira for 1971 and 63,952 thousand T.Lira both in 1972 and 1973.

But if the multiplication error is corrected, the foreign exchange savings in the above years become 20,246 thousand T.Lira, 38,961 thousand T.L. and 41,958 thousand T.L. respectively (for these figures see Section II, Table 1). If this important correction is carried to the total benefits table the total benefits will change correspondingly. Total benefits in turn become 80,331 thousand T.L. in 1970, 152,391 thousand T.L. in 1971, 164,754 thousand T.L. in 1972 and 166,254 thousand T.L. in 1973. (See Table 6)

Now if we convert the total benefit flows to the present value again on the basis of the SPO's rate of discount of 12 percent the PV of total benefit streams over the lifespan of the project becomes 732,686,1 T.L. (See Table 7).[1] Similarly, if capital expenditure is converted to the present value it will amount to 308,293,0 T.L.[2]. Thus, the benefit cost ratio of the Paper Mill Project turns out to be 2.37 instead of SPO's ratio of 2.6

$$\text{Benefit-cost ratio (at } i = 12,\ n = 20) = \frac{732{,}686{,}1}{308{,}293{,}0}$$

$$\boxed{B/C = 2.37}$$

1. Previously this figure was 824,664,0 T.Lira, See Chapter 7.

2. For the PV of investment cost, see Chapter 7, Table 7

TABLE 6

TOTAL BENEFIT FLOWS

(In 000 T.L.)

			1970	1971	1972	1973
1.	Value Added	(A)	58,000	109,070	117,836	119,336
2.	Foreign Exchange Savings	(B)	20,246	38,961	41,958	41,958
3.	Benefits to Consumers	(C)	1,520	3,510	4,110	4,110
4.	Employment Effect	(D)	565	850	850	850
5.	TOTAL (A + B + C + D)[1]		80,331	152,391	164,754	166,254

Note: (1) These figures represent the benefit flows arrived at after the multiplication error has been corrected.

TABLE 7

PV OF TOTAL BENEFIT FLOWS OF THE PAPER MILL:

At i = 12%, n = 20.

(In 000 T.L.)

Years	Annual Benefit Flows	(a) Present Worth Factor: at 12% Discount Rate	PV of Benefit Flows
1			
2			
3			
4			
5	80,331	.5674	45,579,8
6	152,391	.5066	77,201,2
7	164,754	.4523	74,518,2
8	166,254	.4039	67,149,9
9	166,254	.3606	59,951,1
10	166,254	.3220	53,533,7
11	166,254	.2875	47,798,0
12	166,254	.2567	42,677,4
13	166,254	.2292	38,105,4
14	166,254	.2046	34,015,5
15	166,254	.1827	30,374,6
16	166,254	.1631	27,116,0
17	166,254	.1456	24,206,5
18	166,254	.1300	21,613,0
19	166,254	.1161	19,302,0
20	166,254	.1037	17,240,5
21	166,254	.0925	15,378,4
22	166,254	.0826	13,732,5
23	166,254	.0737	12,252,9
24	166,254	.0658	10,939,5
TOTAL			732,686,1

Note: (a) For present worth factors at 12% discount rate see A.J. Merrett and A. Sykes, Capital Budgeting and Company Finance, Longmans, London, 1969, Appendix Table A, p.152.

I have argued in Section VII, that the discount rate chosen by the SPO has been at the lower end of the desirable social discount rate for Turkey. In fact, I have conflicting information as to the value of the 12 percent discount rate applied by the SPO. The question is: whether the rate of discount of 12 percent corresponds to the actual market interest rate or to the social opportunity cost of capital? During the interview I had with the SPO in Ankara[1] I was told by one of the planners that the 12 percent discount rate represents roughly the social opportunity cost of capital in the second best alternative. But in the recent document I have received from the SPO it is stated that the 12 percent discount rate is in actual fact the market rate of interest which includes all kinds of banking charges. It is said that the normal rate of interest varies between 7 percent and 9 percent and if other bank expenses are included this will put the borrowing rate at 12 percent[2].

If this is true then the discount rate the SPO planners have applied in the PV calculations is a market rate of interest and not a social rate of discount which should reflect the social opportunity cost of capital which is pre-empted by the capital budget. It is fairly reasonable to argue that the social opportunity cost of capital is higher than the SPO have chosen and it may be necessary to raise it to 14 or 15 percent. Besides, the admissibility of any project should be decided not on the basis of one discount rate only but more than one discount rate as R.N. McKean has pointed out in his well-known book[3]. Especially this point becomes more relevant to underdeveloped countries where there are large variations in the interest rates applied because of an imperfect capital market and government interventions in the functioning of the market[4]. Thus, it is not plausible to conduct the PV analysis solely on the basis of a simple discount rate since this would not be a meaningful representative of the social opportunity cost of capital in these circumstances.

Another/

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1. An interview with SPO officials. January-February 1969, Ankara, Turkey.
2. A Private untyped letter from the SPO. B. Benderlioglu, SPO, Dec., 1969, Ankara.
3. See R.N. McKean, Efficiency in Government through Systems Analysis. John Wiley & Sons, Inc., New York, 1958, pp.124-125.
4. If there were a perfect capital market and no uncertainty there would be a unique rate of interest which would be the rate of time preference expressed by the capital market given the investment opportunities available and predicted. But if there is uncertainty, as indeed there always is, interest rates will diverge in so far as the discount rates are used to allow for risk, and these risks may vary between projects.

Another point is that the State Economic Enterprises should provide for a risk premium over the cost of borrowings. Finally, it can be maintained that investment in the public sector should yield more or less as high a return as in the private sector. This makes sense in the case of Turkey, since State Economic Enterprises are running profit-maximizing industries.

In Great Britain, for example, government projects are generally required to earn at least as much as their opportunity cost in the private sector which is measured by the cost of borrowings to the government plus a risk premium[1].

On the assumption that a rate of discount of 14 percent is a rough estimate of the social opportunity cost of capital in Turkey, the PV of total benefits and total capital expenditure of the Caycuma Paper Project will give us a lower benefit-cost ratio. If we apply the 14 percent discount rate the PV of total benefits streams of the project becomes 600,247,400 T.L. and the PV of total capital expenditure becomes 292,686,000 T.L. (See Table 8, and 9). Thus, the benefit-cost ratio of the Paper Plant at 14 percent discount rate becomes 2.0 as compared to a ratio of 2.3 at the 12 percent discount rate.

$$\text{Benefit-Cost Ratio } (i = 14\%,\ n = 20) = \frac{600,247,400}{292,686,000}$$

$$\boxed{B/C = 2.05}$$

This simple exercise indicates that the Caycuma Paper Project will still qualify for selection even at the social discount rate of 14 percent. It also indicates that the Paper Mill Project is fairly sensitive to the choice of the rate of discount. Therefore, this may emphasise the fact that the SPO should be very careful in determining the value of the discount rate.

In the above sensitivity analysis I have deliberately omitted the variations in the shadow foreign exchange rate. This is for the simple reason that an insertion of the same coefficient of foreign exchange penalty to the numerator and denominator of the above bene-fit cost formula would make no difference to the ultimate benefit-cost ratio. It should also be stressed that taking variations in the shadow wage rate will not carry much weight as influencing the benefit-cost ratios of the project. As can be seen from Table 6, wage payments constitute/

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1. See C.D. Foster and M.E. Beesley, Estimating the Social Benefit of Constructing an underground Railway in London, in "Readings in Welfare Economics" Edited by K.J. Arrow and T. Scitovsky, George Allen & Unwin Limited, 1969. pp.473-475.

constitute only 0.5 percent of total benefit flows.

It must also be added that the investment decision should not be based on the benefit-cost ratio alone, but for a more meaningful evaluation, it should take account of the net present value of the project. As R.N. McKean[1] has emphasised, one of the most significant partial tests is the maximization of present worth for a given investment when the streams are discounted at the marginal internal rate of return[2].

At the discount rate of 12 percent the NPV of the Paper Mill is 424,393,100 T.L. (732,686,100-308,293,000) and at 14 percent discount rate the NPV is 307,561,400 T.L. The credibility of the project should be decided on the basis of its contribution to the national economy and the above results indicate that the Paper Mill project is an acceptable project both on the basis of benefit-cost ratio and net present value rule.

1. See R.N. McKean, Efficiency in Government Through Systems Analysis John Wiley & Sons, Inc., New York, 1958, p.117.

2. But as we have pointed out elsewhere, a discount rate different from the marginal internal rate of return is sometimes appropriate because policy-makers may have time preferences or subjective rates of return that may differ from the marginal internal rate of return.

TABLE 8

PV OF TOTAL BENEFIT FLOWS OF THE PAPER MILL

At i = 14%, n = 20 years

(In 000 T.L.)

Years	Annual Benefit Flows	Present Worth Factor for 14% Discount	Present Value of benefit flows
1			
2			
3			
4			
5	80,331	.5193	41,715,8
6	152,391	.4555	69,414,1
7	164,754	.3996	65,835,6
8	166,254	.3505	58,272,0
9	166,254	.3075	51,123,1
10	166,254	.2697	44,838,7
11	166,254	.2366	39,335,6
12	166,254	.2075	34,497,7
13	166,254	.1820	30,258,2
14	166,254	.1597	26,550,7
15	166,254	.1400	23,275,5
16	166,254	.1228	20,415,9
17	166,254	.1078	17,922,1
18	166,254	.0945	15,711,0
19	166,254	.0829	13,782,4
20	166,254	.0727	12,086,6
21	166,254	.0638	10,607,0
22	166,254	.0559	9,293,5
23	166,254	.0491	8,163,0
24	166,254	.0430	7,148,9
TOTAL			600,247,4

TABLE 9

PRESENT VALUE OF CAPITAL INVESTMENT FLOWS:

At i = 14%, n = 20

(In 000 T.L.)

Years	(a) Investment Flows	(b) Present Worth Factor for 14% Discount	Present Value of Investment Flows
1	48,677	.8771	42,694,5
2	90,847	.7694	69,897,6
3	141,627	.6749	95,584,0
4	72,240	.5920	42,766,0
5	80,385	.5193	41,743,9
TOTAL	433,776		292,686,0

Note: (a) For capital investment figures see Chapter 7, Table 1

(b) For present worth factors at 14% discount rate, see A.J. Merrett and A. Sykes, Capital Budgeting and Company Finance, Longmans, London, 1969, p.152.

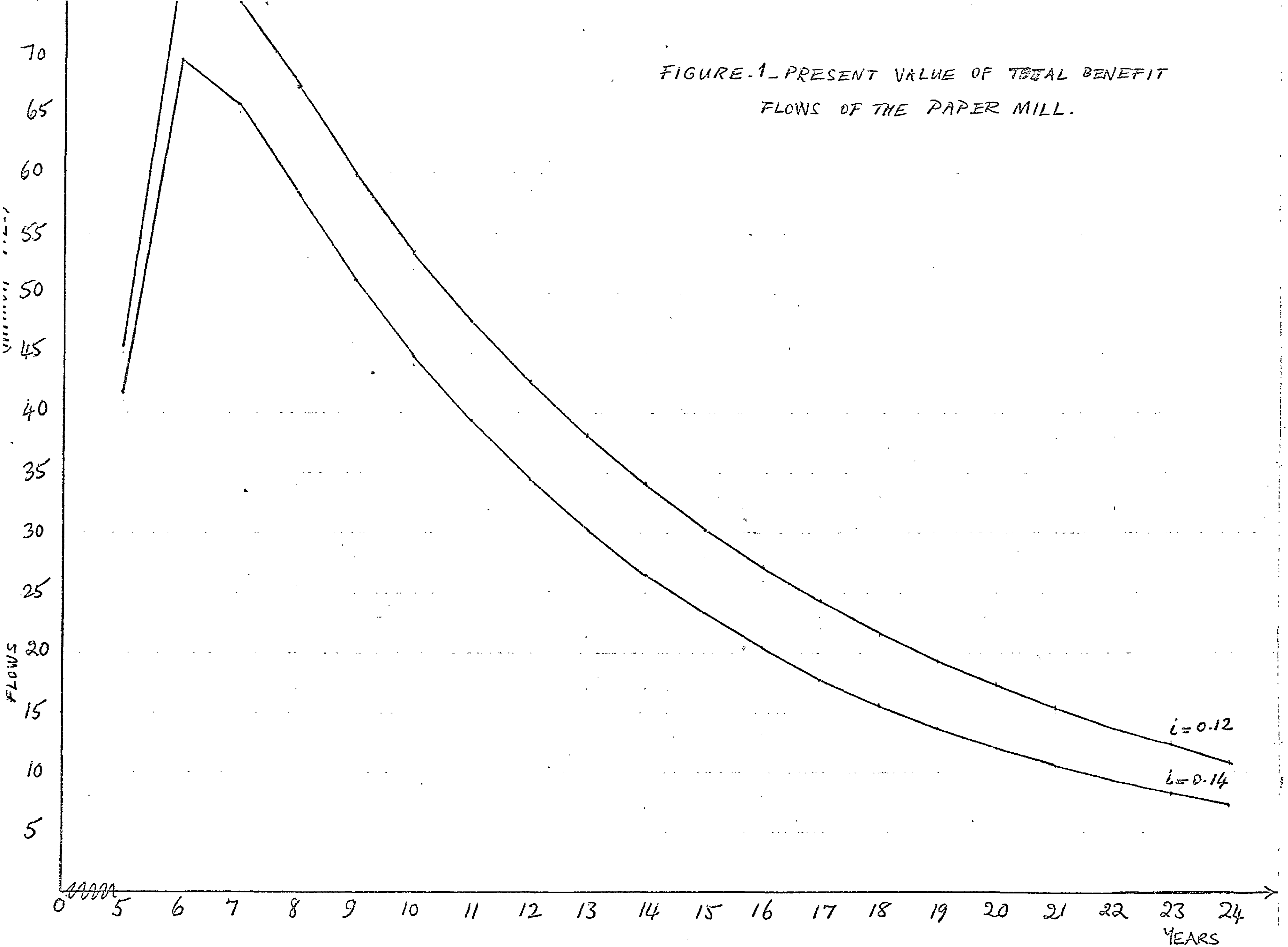

FIGURE-1_PRESENT VALUE OF TOTAL BENEFIT FLOWS OF THE PAPER MILL.

X. Internal Rate of Return of the Paper Mill Project:

A - For a sound investment decision in choosing among projects it is necessary to see if other investment criteria will also pass the projects proposed or designed for the investment programme. Before arriving at the final decision for ranking, tables indicating comparatively all merits and qualifications of all projects will be a very useful exercise for refined evaluation.

Similarly here I will be computing the internal rate of return[1] of the Caycuma Paper Project which the planners have not done for one or another reason. Before that, a clarification of a very important point is in order here. Generally speaking, the internal rate of return rule is widely applied in business accounting by private enterprise. Private sector, as a rule, looks at a project from a different angle. Contrary to the public sector the private entrepreneur (or firm) is basically concerned with maximizing their net of tax income by which we mean net profits plus depreciation provision[2]. P.D. Henderson has also pointed out that "it is wrong to include depreciation in costs, since this particular imputed cost is already fully allowed for by counting the initial investment as a negative cash flow at the time it takes place"[3]. What follows from this statement is that annual cash flows (ACF) which are to be used for internal rate of return computations should, in addition to net profits (excluding taxes), also include depreciation. It must, however, be noted that depreciation should be understood to include both interest charge plus the recovery of the initial capital involved.

The net cash receipts must be treated in exactly the same way whether the evaluation criterion is internal rate of return (discounted cash flows method) or present value. The only difference here is that public sector will include taxes paid in the annual cash flows while private sector would exclude them from their calculation.

Having/

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1. This method goes under various names including discounted cash flow (DCF) return, profitability index, compound interest rate of return and investors' return; the former, however, is the most widely used concept.

2. In general annual cash flow comprise profits less taxes plus depreciation. For this definition, see A.J. Merrett and A. Sykes, Capital Budgeting and Company Finance, Longmans, London, 1969, pp.1-2.

3. See P.D. Henderson, Notes on Public Investment Criteria in the United Kingdom, Bulletin of the Oxford University Institute of Economics and Statistics, Vol.27, February, 1965, No.1., p.59.

Having in mind this definition of cash flows (or receipts) and by using the same figures given in the Caycuma Project Appraisal Form (See Chapter 7), we can calculate the internal rate of return of the investment in the following fashion.[1]

As I pointed out earlier, the internal rate of return of any project is that discount rate which equates total present value of cash flows to its original capital investment. This rate of discount would make the net present value (NPV) of the project equal zero.

In order to find the exact value of the internal rate of return (or discounted cash flow return) of the Caycuma Project, I shall apply <u>two</u> different discount rates; one at the upper limit and the other at the lower limit so that we can have one positive net present value and one negative present value. In other words, the internal rate of return is found simply by interpolation.

(1) First, according to the above definition the annual cash flows of the Paper Mill Project are derived and these are presented in Table 10. Following this, annual cash flows of the project are converted to the presented value at the discount rate of 12 percent. This is done by multiplying the annual cash flow of each year with the present worth factor for each year which corresponds to 12 percent discount rate[2]. This is computed for 20 years for the latter is the economic life of the project. The present value of cash flows discounted at 12 percent will be:

310,193,000 T.L. (See Table 10 and figure 2).

(2) Second, annual cash flows are again converted to the present value, this time at the discount rate of 14 percent. The computation outlined in (1) will be repeated in the same way. The present worth factors which correspond to 14 percent discount rate are given in Table 11. The present value of cash flows over 20 years at 14 percent discount rate becomes:

254,257,100 T.L.

(3) /

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1. It should be stressed that I am here assuming that the selling prices of the products created by the Paper Plant are similar whether the Plant is in the hands of Public or Private Sector, and also that the same volume of product will be produced under both sectors.
It is perhaps necessary to point out that my purpose is to see whether the Paper Project would have been an acceptable one from the private evaluation point of view.

2. For tables indicating present worth factors at various discount rates, see A.J. Merrett and A. Sykes, Capital Budgeting and Company Finance, Longmans, London, 1969, pp.150-153 (esp. Appendix Table A); also, E.L. Grant and W.G. Ireson, Principles of Engineering Economy, (4th edit.) [illegible]

TABLE 10

PRESENT VALUE OF ANNUAL CASH FLOWS OF THE PAPER MILL: AT i = 12%, n = 20

T.L.

Years	(1) Annual Cash Flows	(2) Present Worth Factor at 12% Discount	Present Worth Of Cash Flows
1			
2			
3			
4			
5	37,140,000	.5674	21,073,200
6	63,500,000	.5066	32,169,100
7	69,000,000	.4523	31,208,700
8	70,100,000	.4039	28,313,300
9	70,100,000	.3606	25,278,000
10	70,100,000	.3220	22,572,200
11	70,100,000	.2875	20,153,700
12	70,100,000	.2567	17,994,600
13	70,100,000	.2292	16,066,900
14	70,100,000	.2046	14,342,400
15	70,100,000	.1827	12,807,200
16	70,100,000	.1631	11,433,300
17	70,100,000	.1456	10,206,500
18	70,100,000	.1300	9,113,000
19	70,100,000	.1161	8,138,600
20	70,100,000	.1037	7,269,300
21	70,100,000	.0925	6,484,200
22	70,100,000	.0826	5,790,200
23	70,100,000	.0737	5,166,300
24	70,100,000	.0658	4,612,500
TOTAL	1,361,340,000		310,193,200

Note: (1) Annual Cash flow includes net profits (excluding taxes) plus depreciation and interest.

(2) For present worth factors see A.J. Merrett and A. Sykes, Capital Budgeting and Company Finance, Longmans, London, 1969, p.152, (Appendix Table A)

(3) Third, capital investment of the project is converted to the present value at the same discount rate. The present value of capital outlay is 308,293,000 T.L. (See Chapter 7).

(4) Fourth, internal rate of return will be found by applying interpolation[1]:

(a) At 12 percent discount rate the present value of cash flows minus capital outlay will be:

$$310{,}193{,}2 - 308{,}293{,}0 = 1{,}900{,}2 \text{ T.L.}$$

(b) At 14 percent discount rate present value of cash flows minus capital outlay of the project will be:

$$254{,}257{,}1 - 308{,}293{,}0 = -54{,}035{,}9$$

At the correct DCF rate the calculated net present value is zero, but we have one positive net present value of T.L. 1,900,2 and one negative net present value of T.L. -54,035,9. The correct DCF return is somewhere between 12 percent and 14 percent and this can be found by interpolation.

Net present value at 12 percent :	+ 1,900,2
Subtract net present value at 14 percent	-54,035,9
Difference in Net Present Values	55,936,1

The real discount rate which equates benefit flows to initial capital outlay will be 0.03 $\left(\frac{1{,}900{,}2}{55{,}936{,}1}\right)$ of the way between 12 percent and 14 percent.

Hence, the internal rate of return of the Paper Mill Project becomes:

$$r = 12\% + \frac{1{,}900{,}2}{55{,}936{,}1}(14\% - 12\%)$$

$$r = 12\% + 0.03 \times (2)$$

$$r = 12\% + 0.06$$

$$\boxed{r = 12.06 \text{ percent}}$$

1. For interpolation method, see A.J. Merrett and A. Sykes, Ibid. pp.12-16.

TABLE 11

PRESENT VALUE OF ANNUAL CASH FLOWS OF THE PAPER MILL : At i = 14%, n = 20

T.L

Years	(1) Annual Cash Flows	(2) Present Worth Factor at 14% Discount	Present worth of Cash Flows
1			
2			
3			
4			
5	37,140,000	.5193	19,286,800
6	63,500,000	.4555	28,924,200
7	69,000,000	.3996	27,572,400
8	70,100,000	.3505	24,570,000
9	70,100,000	.3075	21,555,700
10	70,100,000	.2697	18,905,900
11	70,100,000	.2366	16,585,600
12	70,100,000	.2075	14,545,700
13	70,100,000	.1820	12,758,200
14	70,100,000	.1597	11,194,900
15	70,100,000	.1400	9,814,000
16	70,100,000	.1228	8,608,200
17	70,100,000	.1078	7,556,700
18	70,100,000	.0945	6,624,400
19	70,100,000	.0829	5,811,200
20	70,100,000	.0727	5,096,200
21	70,100,000	.0638	4,472,300
22	70,100,000	.0559	3,918,500
23	70,100,000	.0491	3,441,900
24	70,100,000	.0430	3,014,300
TOTAL	1,361,340,000		254,257,100

Note: (1) Annual Cash Flow includes net profits (excluding taxes) plus depreciation and interest

(2) For present worth factors, see A.J. Merrett and A. Sykes, Capital Budgeting and Company Finance, Longmans, London, 1969, p.152.

TABLE 12

FINDING THE DCF RETURN ON THE PAPER MILL PROJECT

000 T.L.

Years	Project Cash Flows	12% Discount Factors	Discounted Cash Flows at 12%	14% Discount Factors.	Discounted Cash Flows at 14%
0	-308,293,0		-308,293,0		-308,293,0
1					
2					
3					
4					
5	37,140,0	.5674	21,073,2	.5193	19,286,8
6	63,500,0	.5066	32,169,1	.4555	28,924,2
7	69,000,0	.4523	31,208,7	.3996	27,572,4
8	70,100,0	.4039	28,313,3	.3505	24,570,0
9	70,100,0	.3606	25,278,0	.3075	21,555,7
10	70,100,0	.3220	22,572,2	.2697	18,905,9
11	70,100,0	.2875	20,153,7	.2366	16,585,6
12	70,100,0	.2567	17,994,6	.2075	14,545,7
13	70,100,0	.2292	16,066,9	.1820	12,758,2
14	70,100,0	.2046	14,342,4	.1597	11,194,9
15	70,100,0	.1827	12,807,2	.1400	9,814,0
16	70,100,0	.1631	11,433,3	.1228	8,608,2
17	70,100,0	.1456	10,206,5	.1078	7,556,7
18	70,100,0	.1300	9,113,0	.0945	6,624,4
19	70,100,0	.1161	8,138,6	.0829	5,811,2
20	70,100,0	.1037	7,269,3	.0727	5,096,2
21	70,100,0	.0925	6,484,2	.0638	4,472,3
22	70,100,0	.0826	5,790,2	.0559	3,918,5
23	70,100,0	.0737	5,166,3	.0491	3,441,9
24	70,100,0	.0658	4,612,5	.0430	3,014,3
TOTALS			310,193,2		254,257,1
NET PRESENT VALUE (NPV)			+ 1,900,2		- 54,035,9

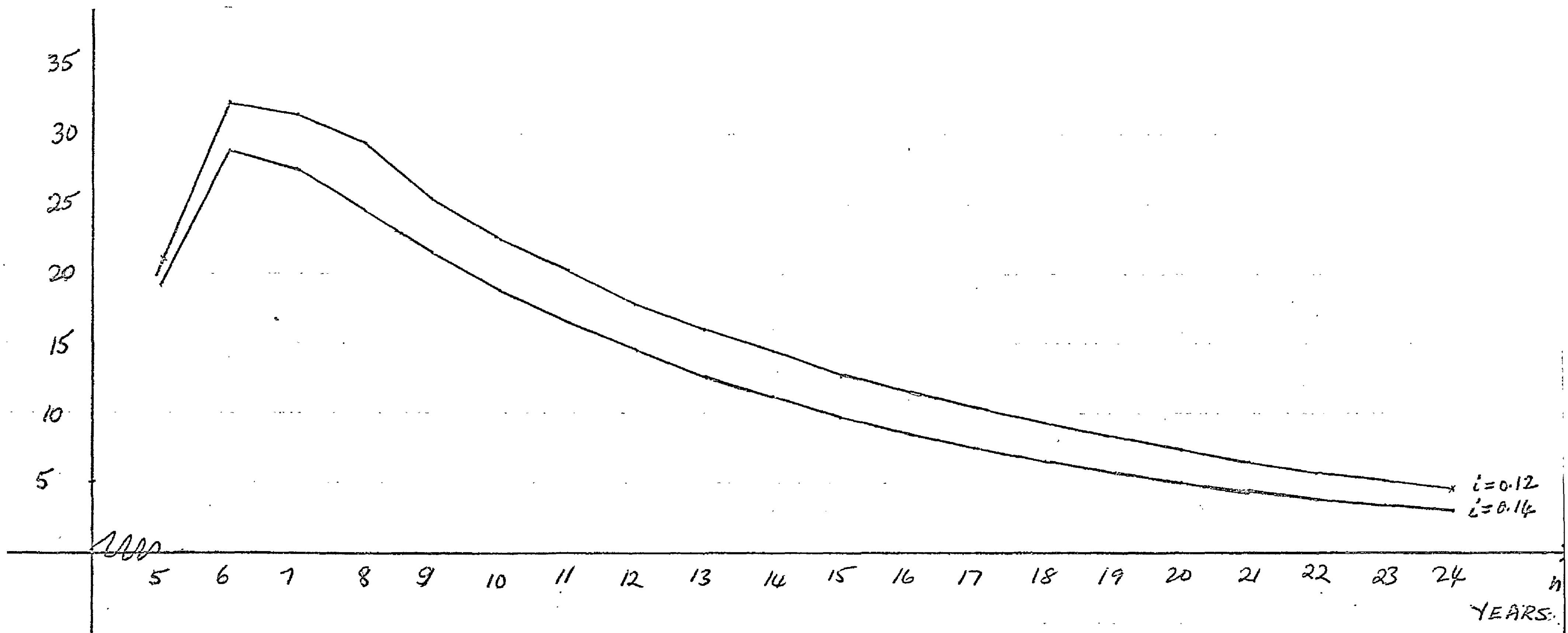

FIGURE 2 - PRESENT VALUE OF THE PAPER MILL'S CASH FLOWS

It follows that the internal rate of return of the Caycuma Project is above the borrowing rate of interest which is between 7 percent and 8 percent. This is in fact the interest rate applied to industrial credits provided by the State Investment Bank.[1]

As far as the market rate of interest is taken as a base the project is still admissible on the basis of the internal rate of return rule. But, as compared to the social discount rate which is assumed to be 12 percent, the project becomes a marginal project.

However, I am here concerned with the question of showing whether the Paper Mill Project would have been undertaken by the private firm, if the internal rate of return rule is applied. In actual fact there is some evidence to suggest that interest rate charged on borrowing by the private sector from the Industrial Development Bank, is almost 10.5 percent[2]. But if risk and uncertainty is taken into account the rate could be assumed to be higher and probably in the order of 12 percent. Besides, the opportunity cost of capital in the next best alternative investment is very near to 14 percent[3].

It follows that the Caycuma Project is an unacceptable project on the basis of private evaluation when the discounted cash flows rule is adopted.

B - In the following section, I shall attempt to find out if the project would be acceptable from the point of view of private sector, if present value rule was applied.

Under the following assumptions and using the same figures from the Project Form, present value and benefit-cost ratio for the private enterprise can be easily computed.

The assumptions here are:

(1) Cash receipts (or flows) comprise profits less taxes, plus depreciation provision.

(2)/

1. The new established State Investment Bank, provides credits to public industrial projects at a normal rate of 7 percent and 8 percent,. This rate, however, may vary according to the nature of the project. A private document obtained from the SPO, Ankara, Turkey, December, 1969.

2. Interview with Bozkurt Benderlioglu, at the SPO. Ankara, Jan.-Feb.1969.

3. I was told during the interview held with Bozkurt Benderlioglu that the opportunity cost of capital is assumed to be 14 percent. Interview, January-February, 1969, Ankara.

(2) Selling price of the products provided by the plant will be the same under private enterprise.

(3) Same volume of products are produced under private enterprise.

(4) The discount rate applied in the calculation of present value of benefits flows and capital flows is the same, if the project is undertaken by the private enterprise. In other words, the social discount rate is again assumed to be 12 percent. This assumption however, will be later relaxed so as to reflect the private time preference rate which is naturally a higher rate.

For the sake of simplifying our analysis, first, a discount rate of 12 percent will be applied to the conversion of private benefits and investments to the present value.

The present value of private cash flows are presented in Table 10. We know that total annual cash flows of 20 years converted to the present value amount to 310,193,2 T. Liras. The present value of investment flows are also presented in Table 13. There is, however, an important point to make here. The computation of investment from the public sector point of view has included a foreign exchange penalty of 33 percent, which must be excluded from the yearly investment flows so as to arrive at its value at market prices. Thus, foreign exchange adjustment which was carried out on the foreign exchange component of investment will not be necessary here and it must be eliminated in our present value calculation of investment flows.

The ratio between present value of private benefits over the present value of capital investment will give us the benefit-cost ratio of the Caycuma Project.

$$\text{Private Benefit-Cost ratio} = \frac{310,193,2}{273,193,2}$$

$$P_1 = 1.13$$

Clearly, the private benefit-cost ratio is very low as compared to the public benefit-cost ratio of 2.37. One may conclude that the Caycuma project evaluated by the private sector on the basis of present value rule is much less admissible and attractive.

TABLE 13

PRESENT WORTH OF INVESTMENT EXPENDITURE

(000 T.L.)

Years	Investment Flows (1)	Present Worth Factor (at 12 percent)	Present Value of Investment
1	39,490	.8929	35,260,6
2	84,800	.7972	67,602,5
3	122,810	.7118	87,416,1
4	65,780	.6355	41,803,1
5	72,455	.5674	41,110,9
TOTAL	385,355		273,193,2

Note: (1) The foreign exchange adjustment which is in the order of 33 percent is excluded from annual investments.

If it is compared to other alternative private projects, it may not possibly pass the test and qualify for selection. This could be assumed to be a minimum acceptable ratio by the private sector.

So far we have applied the social discount rate in the above computations; it must however be noted that the discount rate of the private sector may not coincide with the discount rate of the public sector. The private entrepreneur may place more weight on the opportunity cost of capital and less on the social time preference rate which reflects the welfare of future generations. Moreover, the risk premium and uncertainty involved in undertaking projects by the private sector may be greater than if they were undertaken by the public sector. Therefore, these and other considerations[1] may entail an application of a different discount rate for the private enterprise. As I have pointed out earlier, private borrowings from the Industrial Development Bank[2] is in the order of 10.5 percent. The risk premium and uncertainty and also the opportunity cost of capital in the next-best investment opportunity may/

1. For the arguments on the social discount rate, see Section VII in this Chapter.

2. IDB is a bank established a long time ago to provide medium and long term credits for the private industrial projects.

may permit us to assume that the private discount rate is 14 percent.[1]

The fact that the project is unacceptable becomes clearer when the same project is evaluated on the basis of a private discount rate which is quite distinct from the social discount rate applied by the SPO. The present value of cash flows and capital flows based on 14 percent discount rate are presented in Tables 11 and 14.

TABLE 14

PRESENT WORTH OF INVESTMENT FLOWS

(000 T.L.)

Years	Investment Flows	Present Worth Factor (14 percent)	Present Worth of Investment Flows
1	39,490	.8771	34,636,6
2	84,800	.7694	65,245,1
3	122,810	.6749	82,884,4
4	65,780	.5920	38,941,7
5	72,455	.5193	37,625,8
TOTAL	385,335		259,333,6

The private benefit-cost ratio on the basis of 14 percent discount rate becomes:

$$P_2 = \frac{253{,}257{,}1}{259{,}333{,}6}$$

$$P_2 = 0.97$$

It is clear that the private benefit-cost ratio is less than unity and the private enterprise may be in a position to reject the project on the grounds that it does not cover its capital cost.

The following observations can be inferred from the above analysis:

First, it can be seen that the public sector on the basis of present value rule based on a discount rate as high as 14 percent (even much higher)[2] would still pass the project[3], while the same project will be rejected by the private sector on the same discount rate. This points to the fact that a project which/

1. Interview with Bozkurt Benderlioglu. SPO, Ankara, 1969.
2. See Section IX.
3. The social evaluation of the project at 14 percent discount rate has given us a benefit-cost ratio of 2.05.

which is not profitable and acceptable from the private evaluation point of view, could easily qualify for selection when it is appraised and evaluated from the society's point of view.

Second, the Caycuma Paper Project would have been excluded from the overall investment programme if it was evaluated on the basis of private profitability. But it has been shown that the Project is an admissible one in terms of social evaluation which takes into account the project's contribution to national income, balance of payments and employment.

Third, clearly private evaluation of projects both in terms of internal rate of return rule and present value(PV) rule can lead to misleading allocation of investment resources when market rate of interest does not equal marginal productivity of capital and also when general effects of the project on the economy are not taken into account.

Fourth, it has also been shown that the choice of the project is very sensitive to the discount rate adopted in the PV computations. This is so both from private and public evaluation viewpoint. This implies that the Planning Agency should be very careful in the determination of an appropriate discount rate.

Finally, the SPO's decision to apply present value rule based on social evaluation method has been an extremely useful exercise in channelling investment funds to the best projects available.

XI. Final Assessment of the Paper Mill Project

In the previous sections of this chapter I have analysed the various aspects of the SPO's project evaluation technique adopted for the Caycuma project. It was impossible to go into details of each aspect of the evaluation method both theoretically and practically. My studies have been confined to some of the various aspects of the paper project; consequently some problems have received more attention than others which were simply touched upon. For example, to go into the details of how to determine (a) a shadow foreign exchange rate, (b) a shadow wage rate or (c) a social discount rate, to mention a few, involves extensive theoretical and empirical work which by itself can be a subject for separate study. Besides, lack of data at national as well as regional level did not permit me to pursue such important issues further than has been done in this chapter.

Nonetheless, one consolation in this kind of practical analysis is that an investment evaluator is not supposed to do all the work necessary for cost-benefit analysis. He will, of course, be obliged or have no alternative other than to accept various coefficients and variables of other experts who are responsible for their estimation. Thus, what is reasonable in this context is perhaps to take these coefficients for shadow prices - i.e. $Z = 0.333$, $w = 0.50$, $i = 12$ percent, as a first approximation and see whether with more information and knowledge they could be improved in any way. This is what I have attempted to do in this chapter.

Apart from the question of derivation of various coefficients for social project evaluation, an equally important problem is whether to confine the project analysis to a single investment criterion only. For a sound investment decision, a project should be evaluated on the basis of other criteria, as well since various partial aspects may be of some significance and necessitate this.

With this in mind, I have tried to examine the Caycuma Paper Mill by other partial evaluation devices. Some of them were carried out in the previous sections but some of them will be introduced below later.

It may be relevant to mention here the question of evaluating a project, not on its own but with other alternative projects. Since we do not have any alternative project in a similar line of production as the Caycuma Paper Mill, the only possible way to form an idea on the latter's selection is to compare it with other projects included in the paper industry.

In/

In various sections of this chapter, after deriving the present value of the benefits and cost streams with the aid of suitable criteria, I have passed some judgment upon the admissibility of the Paper Mill Project. The results which are obtained on the basis of various criteria can be summarised as in the following Table (Table 15).

TABLE 15

SUMMARY OF THE PAPER PROJECT'S RATE OF RETURNS AND BENEFIT-COST RATIOS

1.	Simple "Rate of $R_e$turn"	
	(a) Net Profit/Total Investment	8.4 percent
	(b) Gross Profit/Total Investment	13.0 percent
2.	Foreign Exchange Benefits-to-Input Ratio (Foreign Exchange Component) of Investment	1.32
3.	Foreign Exchange Benefits-to-Investment Ratio	0.60
4.	Employment Effect - Capital per worker	1,927,000 T.L.
5.	Internal Rate of Return "yield"	12.06 percent
6.	Ratio of PV of Benefits and Costs (i = 12%)	2.4
7.	Difference of PV of Benefits and Costs (NPV) (i = 12%)	424,393,100 T.L.
8.	Difference of PV of Benefits and Costs (NPV) (i = 14%)	307,561,400 T.L.

Note: All these returns and ratios are compiled from the results obtained in this chapter.

As can be seen from the Table simple rate of return of the project is the ratio between profits (net or gross) and total investment outlay of the project. The simple rate of return of the Paper Mill is found to be 8.4 percent and 13.0 percent depending on whether net profits or gross profits are/

are taken into account[1].

Much has been said on the criterion of annual accounting profitability (Chapter 6) which has been applied by SEKA in the evaluation of the project. This method simply relates the before-tax earnings or after-tax earnings to the initial capital of the plant. These and other variants of the simple rate of return however have the disadvantages that they normally involve the use of more or less arbitrary depreciation formulae and also they fail to take proper account of the impact of taxation and investment incentives provided[2].

Though their accuracy could be improved they would still be unsatisfactory because neither method pays sufficient regard to the estimated timings of returns[3]. The use of conventional methods for calculating the rate of return like use of pay-back criteria, is often likely to lead to wrong investment decisions, being made. They should not be used for final evaluation and ranking of public investment projects; though this does not mean that they should not be calculated at all. On the contrary, by providing an idea of the simple profitability of projects they can be used as a "screening" device in the selection of projects, and consequently may avoid waste of time on the part of planners who undertake project appraisal.

The foreign exchange benefits-to-input ratio could be useful in indicating the effect of the project on the balance of payments since it considers the relationships/

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1. The annual accounting profitability (or simple rate of return) is the ratio between profits and total investment. From the formula of

$$p = \frac{B - C - D}{I};$$

$$p_1 = \frac{32.700 \times 100}{385.335} = 8.4 \text{ percent (net profit)}$$

$$p_2 = \frac{50.307 \times 100}{385.335} = 13.0 \text{ percent (gross profit)}$$

Gross profits here include "corporation tax" paid by the Plant which is in the order of 35 percent. For net and gross profit figures see Chapter 6 and Value Added Table in Chapter 7.

2. See N.E.D.C. - Investment Appraisal, Great Britain, National Economic Development Council, N.E.D.C., 1967, p.3.

3. Ibid, p.3. The pay-back method, on the other hand, does not give an adequate indication of profitability, nor does it take into account timing of returns during the pay-back period and the returns after the pay-back period. For its disadvantages see N.E.D.C., Investment Appraisal, National Economic Development Council, Great Britain, 1967, p.3., and I.M.D. Little and A.J. Mirrlees, Manual of Industrial Project Analysis in Developing Countries, Vol.1, Methodology and Case Studies, O.E.C.D., Development Centre Studies, Paris, 1968, p.135-137.

relationships between foreign exchange earnings and expenditures resulting from the project. The foreign exchange earnings-to-input ratio of the Paper Project is 1.32 which indicates that its effect on the balance of payments is quite favourable. This positive ratio is perhaps due to the fact that the Caycuma Paper Plant is an import-substituting industry and more importantly, because its demands for raw materials and auxiliary materials are provided domestically which entails a substantial amount of foreign exchange savings during its operation.

Because foreign exchange savings/earnings are not the only objectives of the economy it can be argued that this criterion may lead to wrong investment decisions and therefore, an evaluator has to investigate the total effects of the investment on other economic goals as a whole, i.e. value added, employment etc.

A separate appendix was attached to Chapter 4, in order to discuss the limitations of the balance of payments effect and employment effect criteria. It would be repeating ourselves if we mention them again here[1]. However, it could be remarked that the Caycuma Paper Project does not contribute much in terms of direct employment effect, though it might have diffused indirect employment effects in other sectors. This, however, can be considered a typical characteristic of capital-intensive projects which have a very low labour-absorption ratio.

Internal rate of return rule was theoretically discussed and compared with its chief rival, present value rule at some considerable length. However, two important points can be made clear here: First, the internal rate of return of any project should be calculated in order to provide scrutiny among investment proposals. Second, though use of internal rate of return is extensively challenged both in theory and practice[2], it could still be useful for the planners in determining the social discount rate which should be based on the internal rate of return of the marginal project of the investment budget. In other words, the social discount rate which is required for PV calculations could/

1. See Chapter 4, Appendix A.

2. The usefulness of the internal rate of return criterion is severely limited by its failure to distinguish the best alternative among mutually exclusive projects and its failure to produce a single internal rate of return. Besides, internal rate of return also fails to take account of size and scale of the investment - it ranks a 20 percent rate of return on say £100 higher than a 15 percent rate of return on £1,000. At practical level too, it leads to tedious trial and error calculations which makes it more difficult than PV criterion. For a full discussion on Internal Rate of Return and Present Value Criteria, See Myles M. Dryden, Capital Budgeting: Treatment of Uncertainty and Investment Criteria, S.J.P.E., Vol.II, Feb.1964, pp.238-241.

could be decided in the light of social opportunity cost of capital - that is the internal rate of the return of the marginal project. As I.M.D. Little[1] emphasised, even for this purpose internal rates of return of various projects should be calculated.

Probably the best result and investment choice can be obtained through the application of the PV rule which I have expounded throughout this study. Although sufficient information has been given on its formulation, application and advantages as compared to other criteria it may be convenient to stress some of its merits.

There has been some extensive attempt to keep the internal rate of return intact by using a number of rather complex modifications which result in the elimination of its original version. But all these attempts which involve considerable tests and tedious side calculations are in effect nothing more than an improving of the application of the internal rate of return to be consistent with the PV criterion.

This resistance to give up the internal rate method can be explained by the fact that over a wide range of possible cases the two criteria may lead to the same investment decision. It is genuinely accepted that under limited assumptions, that is perfectly competitive capital markets, completely divisible projects and no interdependencies among the projects, the two criteria lead to the same choice[2]. But it is needless to add that all these rigorous assumptions are not realistic and especially in respect to the first assumption developing countries are far removed from these strict conditions. Consequently the two approaches are conceptually different and the norms of capital theory clearly indicate the superiority of the present value(PV) criterion[3].

Thé general conclusion on this topic is that the most valid method is that of present value relative to investment cost, after a proper choice of the rate of discount.

As I have discussed in various contexts, the PV rule can be used in two different/

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1. I.M.D. Little and A.J. Mirrlees, Manual of Industrial Project Analysis in Developing Countries, Vol.I, O.E.C.D., Paris, 1968, p.120.

2. See Myles D. Dryden, Capital Budgeting: Treatment of Uncertainty and Investment Criteria, op.cit., p.241.

3. Ibid. p.241. Merrett and Sykes are in favour of internal rate of return and recommend it as the best criterion. They state that "for the vast majority of simple capital budgeting decisions .... we consider that yield (internal rate of return) is both technically and practically superior to net present value", opcit., p.148. Their reason is that "it is more easily understood and accepted by business men" and that "it has the advantage of obviating needless dispute about a firm's cost of capital", op.cit., p.149, 150.

different forms. Having derived the PV of benefit and cost streams, one can, with the aid of a suitable criterion, pass some judgment upon the project. Here the present value from the practical point of view is expressed either (i) the ratio of the PV of benefit and cost streams or (ii) their difference. The former is known as benefit-cost ratio and the latter as Net Present Value (NPV). The choice will of course depend on the number of projects to be considered. There is no element of choice in the case of the Caycuma Project since it is the only project concerned with the production of kraft paper and has no other alternative either in a local sense or in production size. Now, since there is only one project, all that is required is some measure of the extent to which the benefits exceed the costs and for this obviously either of the two criteria above would be theoretically acceptable.

In practice, however, the ratio is in fact preferred[1] for the simple reason that the figure of 424.393.1 T.L. (at i = 12 percent) Table 15) for the difference in the PV of benefits and costs is likely to be operationally meaningless. For the Caycuma Paper Plant the ratio is 2.4 at the discount rate of 12 percent and 2.05 at the discount rate of 14 percent (See Table 15).

But if the situation is one where there is a series of projects competing for selection within a constrained budget, it may be wrong to consider only the ratio of PV of benefits and PV of cost streams. In this case, for a rational investment decision it is important that special emphasis is given to the NPV that is, the difference between PV of benefits and cost streams.

Therefore, one can conclude that in the case of the Caycuma Paper Plant, both variants of the PV rule can be important and the final choice should be based both on the ratio and the NPV where the latter form might be useful to indicate the contribution of the project to the national income[2].

For/

1. According to the PV rule ranking can be done on the basis of minimum (cut-off) ratio which is decided beforehand. In order to rank projects above the cut-off ratio, the net present value index is required. This index is the ratio between PV of cash flows and PV of investments. Projects with positive PV and above the minimum ratio are included and the projects with the highest PV index will be accepted. Then select those projects which have the highest $\frac{B}{I}$, until the budget is exhausted.

2. The NPV of a project is the sum of the present values of the cash flows for all years during the projects life. If the NPV of a project is greater than zero, then the benefits are expected to be more valuable than the outlays on the project and to that extent the project is worthwhile.

For a comprehensive and exact decision, other criteria should be taken into account for special reasons which may seem significant from a partial aspect viewpoint. The NPV of the Caycuma Project is: 424.393.1 T.L. at 12 percent discount rate and 307.561.4 T.L. at 14 percent discount rate (See Table 15).

How does the Caycuma Paper Project compare with the Return earned on other paper projects? The only study I have found in this field is the one carried out by Mr. T. Kivanc who is a Planner at the SPO. He has evaluated two alternative paper projects from the Society's point of view[1].

Alternative I, after providing a "pressing" process on raw materials[2] which are to be imported, will produce "laminated paper sheet". The Alternative II is to import these raw materials in non-impregnated form and to produce "impregnated and laminated paper sheets". Mr. T. Kivanc's findings for the two projects are presented here:

TABLE 16

RATE OF RETURNS AND BENEFIT-COST RATIOS
OF TWO "LAMINATED PAPER SHEET" PROJECTS

		Alternative I	Alternative II
(i)	Foreign Exchange Savings-to input ratio	3.84	4.56
(ii)	Foreign Exchange Savings-to Total Investment Ratio	0.93	1.38
(iii)	Employment Effect - capital required per worker (in million T.L.)	1.046	0.855
(iv)	Rate of Return ("yield")	14.04 p.c.	20.97 p.c.
(v)	PV of Benefits and PV of Investment Ratio	1.24	1.65
(vi)	Difference of PV of benefits and costs (NPV) (market)	71.559	80.585
(vii)	Difference of PV of benefits and Costs (NPV) (social prices)	6.107	24.419

Source: T. Kivanc, Yatirim Projelerinin Ekonomi Yönünden Degerlendirilmesi - Alternatif Projeler Arisinda Bir Secim Calismasi DPT April, 1965, Table 12, pp.40, 42, 43, 46.

1. The location of the two alternative projects is Bolu.
2. The raw materials to be imported are overlay, decor, kraft paper, balance paper etc. (to be imported in the form of impregnated papers)

From various aspects his findings have shown that Alternative II is more attractive and acceptable than Alternative I.

As can be seen from the Table 16, the internal rate of return of Alternative I is 14 percent and 21 percent in Alternative II. The ratio of PV of benefits and costs is 1.24 and 1.65 respectively.[1]

For the Caycuma Paper Project the rate of return is 12 percent which is a figure considerably lower than the "yields" in the above projects. But the ratio of PV of benefits to costs in the Caycuma project is 2.4 which does compare quite favourably with the other two projects[2]. It may be concluded that the Caycuma Paper Mill Project is an acceptable one both in terms of NPV calculations and PV of benefits and cost ratio.

Before we complete this section, it may appear appropriate to remark on the accuracy of the assumptions employed in benefit-cost analysis. As we have seen in the earlier sections in respect to time, theoretically the benefits and costs for each and every year of the plant's life should be calculated. This, however, may cause so large an additional work that the issue in practice is simply solved by assuming that the benefits and costs would remain constant throughout the life of the project. An evaluator should, however, investigate to see whether there are good reasons for not assuming that the benefits and costs remain constant.

The/

1. It should be noted that Mr. T. Kivanc has used a discount rate of 10 percent in his PV calculations.

2. The analysis method used in the project can be expressed by the following formula:

$$\text{Benefit-Cost Ratio} = \sum_{i=1}^{n} \frac{VA + (Z_s - Z_e)f + (ip - sp)Qu}{(1+i)^n} \Bigg/ \sum_{i=1}^{u} \frac{Id + If\,(1+f)}{(1+i)^n}$$

where v = value added (output valued at c.i.f. price), Z_s = foreign exchange savings due to import substitution, Z_e = foreign exchange expenditure, f = foreign exchange premium (ratio of the difference between shadow exchange rate and official exchange rate over the official exchange rate), ip = unit selling price before the factory, S_p = unit selling price of the factory, Qu, volume of production in n years, Id, domestic component of investment, I foreign exchange component of investment.

The difficulties here are of two kinds; first, nobody could forecast with great accuracy what the changes would be in the demand for paper products, or changes in selling conditions or in operating costs, i.e. charges in wages, salaries and costs of raw materials, or the expected movements in the price obtainable for the goods produced in relation to possible movements in prices in general. It is extremely difficult to forecast what the growth would be in all these cost and revenue elements twenty years hence.

Secondly, even if this growth of demand and sales it may not have a proportional effect on benefit and cost streams due to its unknown future effect upon operating costs.

It should be noted that the profitability of the project should be assured despite all these changes in the assumptions in forecasting prices and costs. Generally speaking, a reduction in net earnings may occur due to unfavourable selling conditions or increased operating costs. Profits will fall and also the PV of the prospective yield.

In the Caycuma Project, as with almost all project evaluations, it is therefore assumed that the benefits and costs would remain constant throughout the life of the project.

It follows that in the case study of the Caycuma Paper Mill there has been no mention of risk and uncertainty. It must be stressed that all investment projects involve risk since future events can never be predicted with complete certainty. There will usually be a wide range of possible cash flows which could result from a particular project because there are likely to be several different estimates of factors determining the cash flow, such as the initial capital costs, future demand for the product, the actions of competitors (private or public) and operating costs over the life of the project[1].

The treatment of the risks involved in a project will depend on a number of considerations. These are[2]: the range of possible unknowns from the project, the size of the enterprise, the general riskiness of the enterprise's operations and investment programme, the attitudes of the managers of State Economic Enterprises.

Professor/

1. Investment Appraisal, GB. N.E.D.C., p.12.
2. Investment Appraisal, Ibid, p.12.

Professor A.R. Prest has pointed out that the same risks and uncertainties are applicable to public enterprises as with private projects[1]. A rough approach in respect to uncertainty and risk involved is to estimate the most likely cash flow and to require that this should give a rate of return with a sufficient risk premium in addition to the enterprises cost of finance (interest charge). In this case it is reasonable to place a lower value on uncertain future earnings than on certain earnings. In this method of course, a higher rate of return would be required from riskier investments as opposed to relatively safe investments.

A second method probably is to vary the discount rate with the riskiness of the project.. This is sometimes treated as an arbitrary way of dealing with risk and uncertainty[2]. Thirdly, it is generally preferable to see how the outcome would be affected by changes in a number of the more important assumptions made about costs, sales revenue, prices received for output, and the life of the project[3].

For a more accurate analysis it is feasible to make some estimate of the possible outcomes and of the likelihood of their occurring. With projects that constitute a fairly small proportion of a firm's total activities, it is necessary to weight the NPV's (or rates of return) of the different possible outcomes by the probability of these outcomes[4] occurring.

If the weighted NPV of a project is greater than zero (or the weighted average rate of return is greater than the firm's - or the SPO's discount rate - cost of finance) the project is acceptable and where there is a choice between alternative projects, the project with the highest weighted average NPV should be chosen[5]. The reasoning behind this approach is that it is of course in the interests of private or public enterprises to have the balance of probabilities running in their favour.

But/

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1. A.R. Prest and R. Turvey, point out that "there is no reason to argue that public investment projects are free of uncertainty" and they add that allowances for uncertainty can be made - (i) in the assessment of annual levels of benefits and costs, (ii) in the assumption about length of life, and (iii) in the discount rate. See their "Cost-Benefit Analysis: A Survey". E.J. December, 1965, pp.699

2. Investment Appraisal op.cit., p.13.

3. See Investment Appraisal, G.B., N.E.D.C., 1967, p.13, Prof. A.R. Prest and R. Turvey feel that this method is most appropriate if the risk of dispersion of outcomes (or inputs) is irregularly, rather than regularly, distributed with time op.cit.,.p.699.

4. Investment Appraisal, op.cit., p.13.

5. Investment Appraisal, Ibid ., p.13.

But, on the other hand, if projects are large in relation to the public companies' size, or if particularly risky, a closer examination of the risks involved may be necessary. In such cases large projects should be considered individually and the risks carefully analysed[1]. In practice, managers of both public and private enterprises should try to assess the factors which make the outcome uncertain and the relative importance of these factors causing uncertainty. In case a particular project presents some considerable riskiness the whole of the enterprise's investment programme needs to be re-appraised. This factor may not be very important in the case of individual projects of average riskiness or with projects which constitute a small segment of the public enterprise but, ideally, investment programmes and their finance and riskiness should be considered as a whole[2].

The main source of risk and uncertainty sometimes lies in the possibility of obsolescence. The adjustment for uncertainty in this case can be made by shortening the life period of the Plant[3]. The life of the Paper Mill Project as noted from the PV calculations is twenty years which appears to be a fairly reasonable lifespan for these kinds of industrial projects[4]. Nevertheless, it would be very convenient to adopt more than one life period, possibly two, because there is always a danger of overestimation of lifespans of assets especially in developing countries. For this purpose, PV calculations should be made on the basis of a shorter lifespan in order to see the effect of this assumption on the selection of the project.

Furthermore, as I have mentioned earlier, another approach to allow for uncertainty and risk is to vary the discount rate applied for projects. To convert benefit and cost streams to the present-day values one needs an appropirate rate of social discount. This, however, is not an easy task. As I have pointed out in Section VII it is necessary to consider not only the STP rate but also the social opportunity cost of capital. The choice of a discount/

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1. Ibid. p.13. In deciding on the riskiness of projects the planners should bear in mind also the relationship of the projects with the public enterprises' other investment activities.

2. For a further discussion on the Treatment of Risk and Uncertainty see A.J. Merrett and A. Sykes, Finance and Analysis of Capital Projects, Longmans, 1966; also Myles M. Dryden, Capital Budgeting: Treatment of Uncertainty and Investment Criteria, in Scottish Journal of Political Economy. Vol.II, Feb. 1964, p.247-259.

3. A.R. Prest and Turvey state that this method is relevant when there may be the probabilities that benefits suddenly disappear or costs soar, op.cit., p.699.

4. For ex., operational life of a cement plant is taken as 20 years., and PV calculations are made on this basis, see I.M.D. Little and A.J. Mirrlees, Vol.I, op.cit., p.302.

discount rate has led to much controversy and it is needless to devote more time to all the theoretical issues involved, since I have already introduced a purely expository note in Section VII.

It follows from the above that it will be quite plausible to calculate the PV of benefits and costs streams by applying more than one discount rate. Especially this point becomes more relevant in underdeveloped countries where there is an imperfect capital market which results in large variations in the interest rates charged. Thus, it is not plausible to conduct the PV analysis on the basis of a single discount rate in these conditions. With this in mind I have therefore applied two discount rates, one of 12 percent which was already chosen by the SPO and the other of 14 percent which approximately corresponds to the social opportunity cost of capital. The results of the PV calculations based on both discount rates are given in Section IX.

The ratio of the PV of benefits to the present value of costs in the Caycuma Plant is very sensitive to the choice of a discount rate, where the ratio drops from 2.4 to 2.0 when the rate of discount rises from 12 percent to 14 percent (See Section IX).

Finally, it should be stressed without any hesitation, that the SPO's project evaluation method is far from being complete due to its theoretical and practical limitations. Most of the shortcomings stem from the controversial aspects of social benefit-cost analysis which has not gained a general form and from the failure of the SPO planners to treat benefit-cost analysis in a more comprehensive way.

Probably by changing various assumptions of the Caycuma project, i.e. price of output, wage rates, foreign exchange rates, discount rates, lifespan of the project, a more satisfactory result could have been obtained. Without such considerations taken into account it is hard to believe that some errors have not been committed in their project appraisals. It would be a useful exercise to carry out some kind of sensitivity analysis by changing the given assumptions in the paper projects. It must be realised that small errors in these assumptions entail considerable errors in the PV of benefits and cost streams and in turn the project's admissibility. Yet the method adopted by the SPO however imperfect is always better than the method applied by the SEKA Organisation which is its executor.

The/

The final judgment on cost-benefit analysis should be based upon its ability to help reach meaningful conclusions. In this respect it may seem pertinent that the Caycuma Paper Mill should be compared with other alternatives, instead of evaluating it in isolation. The more detailed the projects and the more alternatives to choose from, the better would be the investment choice.

One may conclude by saying that the analysis of the Caycuma Project, despite all its imperfections, has perhaps further indicated to us that a project which may seem unprofitable from the private firm's viewpoint and in terms of its own criteria may not necessarily be unprofitable if it is evaluated from society's point of view. Thus, social evaluation of projects in Turkey is likely to improve the selection of projects and formulation of Development Programmes.

APPENDIX A TO CHAPTER 8

Regional Multiplier for the Zonguldak Region and Multiplier Effect of the Paper Mill Plant *

I - it must be stressed at the outset that there is, to my knowledge, no definition or divisions of regions in Turkey to help one to conduct such an analysis at regional level. I shall, therefore, suppose that the Zonguldak region will comprise three major cities which are Zonguldak, Kastomonn, and Bolu. The last two towns are the ones providing the raw materials (timber and wood) to the paper mill. Since the larger the region, the more significant is the multiplier[1]; I feel this is a plausible step to take.

Secondly, the following coefficients in connection with marginal propensities to leak (s, t and m) will be assumed to be valid. These are:

(i) the marginal propensity to save out of personal disposable income (at National Level) is found to be 16.9 percent[2]. I have calculated this propensity for the First Plan Period 1962-67. Though this is a marginal propensity to save at national level it may seem reasonable to assume that it could also be valid for the Zonguldak region. This assumption implies that out of every 100 T.Lira increase in income, 16.9 T.Lira will leak as saving in the region.

(ii) The second assumption one needs to make in this context is in connection with the marginal propensity to pay direct and indirect taxes. From the figures given in the Second Five Year Plan, 1968-72, the figures for total taxes and gross national product have been compiled. Total taxes (direct and indirect) constitute 18 percent of GNP during the period 1967-71 (See Tables 1 and 2). This means that the average propensity to pay taxes in relation/

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* I am grateful to Mr. K.J. Allen in the Department of Social and Economic Research for his guidance and helpful comments during the estimation of the Regional Multiplier.

1. The smaller the region, the higher the leakages and in turn the smaller the multiplier will be. Thus, for a very small region, the multiplier becomes meaningless.

2. The relationship between the private disposable income and savings can be estimated in the following way: Disposable private income is found by deducting taxes plus public revenue from the GNP and by adding current account deficit. Then private saving is derived by deducting private consumption from disposable private income. Thus, the marginal private saving, on average, is found to be 16.9 percent for the period 1962-67. See the present author's M.A. Thesis: A Study of the 1963-67 Turkish Five-Year Plan for Economic Development with Special Reference to Investment Decisions and Resource Allocation. Durham University, England, May, 1966, p.128.

relation to the GNP is 18 percent. But for the estimate of regional multiplier what one needs is not the average, but rather the marginal propensity to pay taxes. Of course, the marginal rates of taxation are higher than the average rate and this is also the case in a region. In the absence of figures to calculate marginal propensity, the average figures (at aggregate level) will be used for this simple exercise.

In aggregate terms I have calculated the marginal propensity to pay taxes as 21 percent (see Table 1). The marginal propensity to pay taxes for 1968 and 1969 is found to be almost 24 percent and 23 percent respectively. But, if the average marginal propensity to pay taxes for the period 1967-70 is taken, the figure settles at 21 percent. It must be stressed however, that if the above is calculated on the basis of private personal income the rate might be expected to be well above 21 percent. However, for this study the marginal propensity to pay taxes will be taken as 21 percent for the Zonguldak region. This compares well with the marginal propensity to pay taxes in Scotland which has been estimated to be 33 percent[1]. As can be seen from Table 2, indirect taxes in Turkey constitute 70 percent of the total taxes which points to the fact that the marginal propensity to pay indirect taxes is higher than the marginal propensity to pay direct taxes.

TABLE 1

TOTAL TAXES AS PERCENTAGE OF GNP AND MARGINAL PROPENSITY TO PAY TAXES

(Bill. T.L.)

Years	G N P	Total Taxes	Average Propensity T/GNP	Marginal Propensity $\Delta T/\Delta$ GNP
1967	85.1	14.9	17.5	-
1968	91.1	15.8	17.3	15
1969	97.4	17.3	17.8	23.8
1970	104.3	18.9	18.1	23.2
Average Marginal Propensity to Pay Taxes				20.7

Notes: GNP and Total Taxes figures are from DPT. Kalkinma Plani, Ikinci Bes Yil 1968-1972, Ankara, 1967, pp.22-23. Average and Marginal propensities to pay taxes are calculated accordingly.

1. See K.J. Allen, The Regional Multiplier: Some Problems in Estimation. op.cit. p.92. I am also told by Mr. Allen that though in his article 33 percent is given as representative of the marginal propensity to pay direct taxes, this figure should be understood to include indirect taxes too. He has also suggested to me that the marginal propensity to pay taxes in Southern Italy varies between 17 and 20 percent. However, he feels that this does not include indirect taxes. Therefore, my assumption of propensity to pay taxes seems reasonable one. For Italian figures, see F. Pilloton, Effetti Moltiplicativi, Degli Investimenti, Della "Casa per Il Mezzogiorno, Giuffre", Roma 1960, p.71.

TABLE 2

DIRECT AND INDIRECT TAXES AS PERCENTAGE OF GNP

Years	Direct Taxes	Indirect Taxes	Total Taxes
1967	5.3	12.2	17.5
1968	4.9	12.4	17.3
1969	5.1	12.6	17.8
1970	5.3	12.8	18.1

Source: DPT. Kalkinma Plani, Ikinci, Bes Yil, 1968-72, p.23.

(iii) The third assumption required for regional multiplier is the marginal propensity to import goods from other regions and abroad. This involves an estimate of imports of food and consumer goods by the Zonguldak region. For this we need to know the imports as a percentage of Zonguldak personal consumption. This, in turn, will give us an indication of the self-sufficiency in consumer goods in the Zonguldak region. Furthermore, one ought to know the extent to which it is necessary for the Zonguldak region to import raw materials and semi-finished products since this involves payments going to other regions in the form of an expenditure leak.

It is reasonable to assume that the Zonguldak region is a small region and relies considerably on purchases of goods from other regions and abroad. It is often suggested that the smaller the size of the region the larger the marginal propensity to import. Professor T. Wilson[1] in his article states that the size of the marginal propensity to import (m) varies not only with the industrial structures of different areas relatively to the patterns of their expenditure but also with the size of the areas. He goes on to suggest that other things being equal, the marginal propensity to import will be smaller and the multiplier therefore, larger in an area big enough to sustain a reasonably diversified range of industries. The reverse is true for small regions where industrial structure is not complex and diversified. This is, of/

1. See T. Wilson, The Regional Multiplier, - A Critique. O,E.P. Vol.20, November, 1968, pp.388-389, and also D.B. Steele, Regional Multipliers in Great Britain, O.E.P. Vol.21, July, 1969, No.2., p. 268-274

of course, an important and relevant point in estimating the regional multiplier.

Thus, total leak through imports would inversely affect the regional multiplier. Here, a figure is needed to indicate the proportion of the value of Zonguldak region's income which is leaked via imports. Marginal propensity to import from abroad is found to be 20 percent for the national economy for the year 1966 (See Table 3). Let us assume that this marginal propensity to import is also the case in the Zonguldak region. To be more accurate, however, to this leak, the marginal propensity to import from other regions must be added. Because there is no information on inter-regional trade figures, for Turkey, one has to apply some kind of rule of thumb in view of the industrial structure prevailing in this region. Zonguldak is one of the depressed areas in Turkey where the industrial structure is not a diversified one to make it a self-sufficient in capital goods or raw materials. Mining and steel, and iron industries are the basic industries in this region. It has a large pocket of unemployment and agriculture is not a satisfactory field to make it self-sufficient in food and other consumer goods.

Very roughly, I shall assume that total leaks due to imports from abroad and other regions will be 30 percent on marginal propensity terms. This implies that out of every 100 T.L. increase in regional income 30 T.L. will be spent on imports from abroad and other regions.

TABLE 3

AVERAGE AND MARGINAL PROPENSITY TO IMPORT

Years	GNP Billion T.L.	Imports \$ Million (1)	Imports Billion T.L.	Average Propensity M/GNP	Marginal Propensity $\Delta M/\Delta GNP$
1964	69.9	537.4	4.8	7	-
1965	73.1	572.0	5.1	7	9.4
1966	79.5	718.0	6.4	8	20.3
Average Marginal Propensity to Import					15

Source: Calculated from the figures given in the Second Five Year Plan - Kalkinma Plani - Ikinci Bes Yil 1968-1972, Ankara, 1967, p.4.

Note: (1) These figures are converted into T.Lira on the basis of 1 \$ = 9 T.L.

Taking into account all these leaks the regional multiplier which is inversely related to total leaks becomes:

$$k_1 = \frac{1}{s + t + m}$$

$$k_1 = \frac{1}{.17 + .21 + .30}$$

$$k_1 = \frac{1}{.68}$$

$$\boxed{k_1 = 1.47}$$

This result implies that the total leak out of every 100 T.L. Increase in income will be 68 T.Liras. Total leak for Scotland on the basis of marginal propensity to leakages was found to be £66 out of £100 which gives a regional multiplier of 1.5[1]. The regional multiplier in Zonguldak region is lower than in Scotland and this is likely to be due to a rather high propensity to import from other regions and abroad. This also indicates that Scotland has a higher self-sufficiency in capital and consumer goods than Zonguldak.

So far, I have dealt with regional multiplier from the Zonguldak region view-point, but multiplier analysis can be used at sector as well as project level. It can be maintained that some sectors will have a greater impact than others on regional income and employment through their expansion or contraction.

Therefore, it may be useful to know the income multiplier effects of particular sectors and industries[2]. This is what I shall attempt to do in the subsequent sections. As I have mentioned earlier the Caycuma Paper Plant by its operation will generate an additional income through its multiplier effect. Since it is more difficult to estimate the employment multiplier of the project I shall confine my study to an estimate of income effect both at the Plant and in the timber industries located in Bolu and Kastomonu.

It should, however, be noted that this will be a rough estimate since the marginal propensities worked out for the Zonguldak region above, will be used. The/

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1. See K.J. Allen, The Regional Multiplier: Some Problems in Estimation. op.cit. in "Regional and Urban Studies - A Social Science Approach". ed. by J.B. Cullingworth and S.C. Orr, George Allen & Unwin Ltd., London, 1969, p.89.

2. K.J. Allen, Ibid., p.82.

The marginal propensities to leak in any region will vary according to sectors and industries. In other words, each industry will have different marginal propensities to leak, but for our example I shall assume that the propensities I have found above are also valid for the paper project.

It must be noted that the Paper Mill Project will have two income effects, one at the Plant and the other in the timber industry. Let us estimate these in turn:

A - for this purpose the first thing to do is to examine the value added per annum created by the Paper Mill. The Value Added Table includes the following items and figures:

TABLE 4

VALUE ADDED PER ANNUM OF THE PAPER MILL

		Thousand Lira
1.	Salaries and wages	9.700.000
2.	Interest	15.700.000
3.	Depreciation	21.700.000
4.	Taxes (Direct and indirect)	17.607.000
5.	Rents	-
6.	Profits	32.700.000
7.	Others	1.036.000
TOTAL VALUE ADDED		98.443.000

Note: For the figures see Chapter 7, Table 2.

The next step is to investigate which of the items included in the value added table may possibly leak from the Caycuma and Zonguldak region. It may seem reasonable to assume that because the Paper Mill Plant is a government Plant, all items of the value added will leak to other regions, the only exception being "salaries and wages". In other words, interest, depreciation, taxes and profits will leak from the region in one or another way. Profits, for instance, will go to the government or State Economic Enterprise (SEE) to be used out of the region for some other purpose. It is not likely that the government will spend this money in the region itself. Other/

Other items by their nature cannot be assumed to remain in the region as well.

Now, we are left with salaries and wages. As can be seen from Table 4, salaries and wages amount to 9,700,000 T.Liras and they constitute 9.8 per cent of the total value added of the Paper Plant. The small percentage of salaries and wages in the total value added might seem quite striking, but this may be expected from the paper project which is naturally a capital intensive industry.

The multiplier effect arising from the payments to workers will be k times the amount of wages and salaries:

$$= k \times 9,700,000 \text{ T.L.}$$
$$= 1.47 \times 9,700,000$$
$$= 14,259,000 \text{ T.L.}$$

The principle here is that the income of the workers by its expenditure, generates additional income and this by its expenditure generates further income. So the multiplier could be considered for infinite rounds, but to avoid this what is needed is simply to multiply the initial money injected in the Zonguldak region (wages and salaries) with k. It should be stressed that, when wages and salaries are injected into the Zonguldak region not all of it will be spent there. Some goes out in the form of leakages, i.e. savings, taxes and imports. But, these leaks are already taken into account in the magnitude and value of the multiplier (k = 1.47). Thus, (k x wages and salaries) will give us the income generated via the multiplier. The income effect of the Paper Plant Project at the Plant will amount to 14,259,000 T.Liras.

B. In addition to the income effect generated at the Plant the project also generates an additional income in the timber industries located in Bolu and Kastomonu, (suppliers of raw materials to the Paper Mill).

For this purpose, we must investigate the Paper Mill's expenditure on the purchase of raw materials and auxiliary raw materials. These can be found from the "annual operating costs" of the Paper Plant (See Table 5). The Expenditure on raw materials are:

(1)	Raw materials	50,627,000 T.L.
(2)	Auxiliary Raw Materials	11,780,000 T.L.
	TOTAL	62,407,000 T.L.

The /

The expenditure on raw materials and auxiliary materials (62,407,000 T.L.) will constitute the income for the timber industries which are located in Bolu and Kastomonu. Again, this income, through its expenditure, will lead to further income through the working of the multiplier. We have no information on the structure of the timber industry in Turkey to enable us to see what proportion of this value added will be spent on workers as wages and salaries. The timber industry in Turkey, beyond any doubt, is a labour-intensive sector, though there has been some considerable improvements in its mechanisation. The labour input in this industry is, of course, strongly subject to the degree of mechanisation. But, to simplify this study it may be assumed that the timber-industry is labour-intensive and out of 62,407,000 T.Liras income generated in the timber industries through the sales of raw materials, 50 percent is devoted to workers as wage payments. This is a rather arbitrary assumption, but in the absence of regional data in Turkey one has to introduce some kind of rough assumption.

Accordingly, the amount of income which the workers in the timber industry will receive becomes:

$$62{,}407{,}000/_2 \quad = \quad 31{,}203{,}500 \text{ T.Liras.}$$

The expenditure of 31,203,500 T.L. by workers in the timber industry will create additional income through the multiplier. This effect will be in the magnitude of

$$\begin{aligned} & k \times 31{,}203{,}500 \text{ T.Lira}, \quad \text{Thus,} \\ & = 1.47 \times 31{,}203{,}500 \\ & = 45{,}869{,}145 \text{ T.Liras} \end{aligned}$$

C - Total income effect of the paper mill project due to the multiplier will be the sum of project's value added + income effect at the Plant + income effect at the timber industry.

98,443,000	T.L.
14,259,000	T.L.
45,869,145	T.L.
158,571,145	T.L.

Thus, total income effect of the Caycuma Paper Project amounts to 158,571,145 T.Liras.

TABLE 5

ANNUAL OPERATING COST OF THE CAYCUMA PLANT

(At Full Capacity)

		Th. T.L.
1.	Raw Materials	50.627
2.	Auxiliary Raw Materials	11,780
3.	Transport of Raw Materials	4,150
4.	Auxiliary Materials	2,500
5.	Fuel, energy and Water	16,183
6.	Labour	6,711
7.	Salaries and Wages	3,025
8.	Depreciation	21,700
9.	Administrative Costs	1,206
10	Insurance and Others	1,036
11	Interest	15,789
12	Selling Costs	880
ANNUAL OPERATING COST TOTAL		125.597

Source: Bozkurt Benderlioglu, Planner at the SPO. A Private letter, December, 1969. Ankara, p.3

Because the multiplier is a figure indicating the relationship of final income to the initial injection the income multiplier of the Paper Mill becomes:

$$k_2 = \frac{158,571,145}{98,443,000}$$

$$\boxed{k_2 = 1.61}$$

Conclusion:

The income multiplier of the paper project does not seem to be high since the Plant is merely a capital intensive project, employing only a small number of workers (755 people). Besides, its raw materials, auxiliary raw materials and chemicals required in the kraft paper production, are obtained from other towns and industries. Clearly the higher the leakages the smaller the multiplier and likewise the smaller the leakages the higher the multiplier becomes. Further, it should be emphasised that the income multiplier of 1.61 is an approximate figure dependent on the aggregate assumptions of propensities to leak in the Zonguldak region. It can be argued that the marginal propensities to save, to pay taxes and, to import may be markedly different for the Paper Project.

Finally, I have only taken into account the income effect of the payments of salaries and wages. In actual fact, I have omitted the other value added items which surely may generate an additional income and thus increase the magnitude of the multiplier for the Paper Plant.

The fact that the regional multiplier is low implies that the solution of regional problems will be more difficult because of the higher leaks that go with a low multiplier. A low regional multiplier means that solving a regional problem (i.e. in terms of low incomes and/ high unemployment) is likely to be a long process[1]. Putting it differently, a high level of taxation and a high level of inter-regional trade may render the resolution of regional problems very difficult.

Second, a low regional multiplier may create some problems not only in the depressed areas but also for the nation. For instance, the idea of injecting money into a region and the high leaks from that region naturally means that much of the purchasing power goes into other regions. This in turn may create/

1. K.J. Allen, op.cit., p.94.

create excess demand and inflationary price increases in the latter regions. The fact that k = 1.47 for Zonguldak region implies that 68 T.Liras out of every 100 T.Liras increase in the region leaks to other regions.

Third, the regional multiplier could also provide some indication of the consequences of various types of policy and may at least give a rough approximation. It may also indicate new lines for regional policy, i.e. tax remissions could be an instrument to cut down on the large and autonomous leaks from taxation[1].

Finally, the multiplier might be used as a base for industrial incentives to firms moving into development areas - by providing larger incentives to industries with a high multiplier. It also gives support to the idea of inter-related industry complexes in the context of regional development.

Nevertheless, the regional multiplier analysis is not without some theoretical and practical limitation in its uses as a guide for regional policies. Despite the fact that it is considered as an important concept it can scarcely be a sole basis for forecasting or policy evaluation. The multiplier analysis deals with short term problems, yet there are more long term aspects which ought to be taken into account and in particular the accelerator effect of particular developments. In other words, the multiplier analysis does not consider investment arising from a particular injection of money[2]. For instance, if we consider a highway programme, the multiplier (k) would only take account of the income generated by building the road and not the industrial development which may follow as a consequence of the provision of transport facilities. Nor the industrial investment which may follow from increased income arising from its construction.

Though a number of regional multiplier studies have been made in Great Britain[3], there is still a considerable doubt about the significance of such analyses for providing some guidelines to certain policy measures. Professor T. Wilson[4] has drawn our attention to the danger of designing regional policy on the basis of regional multiplier studies. He points to the fact that a regional/

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1. Ibid, p.95

2. Ibid, p.95

3. For the regional multiplier studies in Great Britain, see G.C. Archibald, Regional Multiplier Effects in the U.K., O.E.P. Vol.19, March, 1967, No.1, pp.22-39; D.B. Steele, Regional Multipliers in Great Britain, O.E.P. Vol.21., July, 1969, No.2., pp.268-289.

4. See T. Wilson, The Regional Multiplier - A Critique, O.E.P., Vol.20, November, 1968, pp.374-393.

regional policy pursuing industrial development along lines that would result in a higher regional multiplier could be quite misleading.

As can be inferred from the multiplier formula one way of raising k is to raise the marginal propensity to consume and this could be expected to follow from a choice of labour-intensive industries. In such industries a larger share of payments to factors will acrue to labour and less to capital with the result of a lower propensity to save and larger multiplier, provided other things are equal[1].

It could be argued that it is a wrong policy to establish industries in line with regional multiplier effect in development areas. The key reason for supporting labour-intensive industries in the development areas is the belief that by doing so a more efficient use will be made of scarce factors. Nevertheless, this is a different problem from wanting to have labour-intensive industries for the sake of a large multiplier[2]. Therefore, regional multiplier can provide little guidance as to the kind of industrial structure that development policy might seek to encourage. Consequently, the idea of favouring investment projects with a larger multiplier should be treated with some scepticism.[3]

Apart from its theoretical limitations it may be misleading and incorrect to rely on regional multiplier estimates because it is based on simple assumptions that marginal propensity to save, marginal propensity to pay taxes and marginal propensity to import will remain constant throughout. Needless to remark, these coefficients may vary from year to year and from industry to industry and this limits the policy value of multiplier exercises such as the one introduced above.

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1. Professor T. Wilson states that "would it be sensible to try to entice industries of this kind to the development areas by means of larger financial inducements or to compel them to go there by sternly using controls of this end? It is hard to believe that such a policy would really make sense". Ibid. p.387.

2. Ibid. p.387.

3. To quote Professor T. Wilson: "... whether the regional multiplier afforded any guidance as to the kind of industrial structure that development policy might seek to foster. Is it sensible to favour projects likely to have a large multiplier effect? The answer has been in the negative". Ibid. p.392. For a good discussion on the limitations of Regional Multiplier Studies, See T. Wilson, The Regional Multiplier - A Critique, O.E.P. Vol.20, November, 1968, pp.374-392.

CHAPTER 9

No.2 CASE STUDY: KEBAN HYDRO-ELECTRIC PROJECT VS. THERMAL ALTERNATIVE

1. Introduction: The 1961 Report "Northwest Anatolia Power Priority Study" investigated 4 hydro-electric projects selected by the E.I.E. (Elektrik İsleri Etüd Idaresi)[1] as the most promising for early development. Among these projects Keban and Ciceroz were recommended.

Keban which is on River Firat (Euphrates) has been fully investigated from the geological standpoint and it was found that it had sufficient hydro-electric potential. Keban is 45 km. northwest of Elazig. The Murat and Firat (Karasu) main tributaries merging together about 10 km. upstream of the Keban Dam site make up the river Firat.

The purpose of the Keban hydro dam is to store and regulate water as the key facility on River Firat and generate electricity. The Keban project when developed to its fullest will produce 5 billion and 890 million kilowatt/hours of power (with 8 generators).[2]

The total generated power with the intiial facilities of 3 generating units of 155 MW each, will be 4 billion and o70 million kwh - per annum, where 205 million kwh. will be transformer and transmission line losses, leaving a net available power of 3 billion and 865 million kwh. in 1970. When the fourth 155 MW unit is added in 1970, annual power generation will reach 5 billion and 430 million kwh., but after allowing for transmission losses it will leave a net available power of 5 billion and 160 million kwh.[3]

It is pointed out in the General Report that there is no hydro-site in Turkey that combines the hydro-electric potential, the advanced stage

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(1) E.I.E. is the Electrical Research and Planning unit of the Ministry of

p. 300- footnote (3) should continue as:

> It is surprising to see that the Keban Power Plant with 8 units will generate an annual electric power that is a little more than it generates with 4 units. I have re-checked the source and found that the figures quoted in the thesis are correct. The only explanation given in the source in this respect is that one of the 8 generators will be kept for reserve during the operation of the power plant. See Ibid, pp. 3-4.

of geological study, and the proximity to the load centres that would provide a plausible alternative to the Keban project.(1) It is also stated in the Report that no combination of hydro-electric projects was considered as an economic alternative to Keban nor was such comparison undertaken.

Consequently, the only alternative proposed to the Keban hydro-electric was the "Thermal electric project" with a resource as large as Keban project. The Thermal alternative was supposed to require a number of smaller plants at various load centres. Of course, annual power generation of Thermal alternative is assumed to be similar to Keban with a net available power of 5 billion and 160 million kwh.. (For this energy the Thermal will also involve 4 generating units).

The General Report has pointed out that 110 MW of electric power will be developed in Keban-Elazig area by 1973. As a part of alternative Thermal plan, in order to meet such a local load, a thermal station (oil-burning) containing 2 units each with 60 MW was to be installed at Elazig at the same time as the Keban initial construction.(2) The remaining alternative thermal capacity was also considered to be oil-burning, but located somewhere on the sea coast. For the location of thermal alternative cities Mersin, Izmir and Izmit were investigated,(3) but the ultimate decision was placed on Izmit as an acceptable location for the remaining thermal capacity.

As far as the transmission system is concerned, it was found that the Keban area would need a transmission system extending to Elazig and beyond to other load centres. It was assumed that the local alternative plant would be installed at Elazig and the transmission line between Keban and Elazig would not be required. Therefore, the cost of this line has been charged

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(1) Besides Keban, projects such as Karakaya dam, Keferge dam and Karababa dam were also considered but all these alternatives did not represent as high potential as Keban. See E.I.E. Electric Power Resources Survey and Development. Ministry of Industry for Engineering and Economic Feasibility of Keban Dam and Hydro-electric Project of the River Firat Development. Ebasco Services Incorporated, New York, October 1963, pp.79-80.

(2) Ibid, p.81

(3) Since Gukurova region which includes Mersin will be considerably self-sufficient at the time Keban is completed, there will be no need for transmission link from Keban to Mersin. Thus Mersin was not considered as location for an alternative Thermal. Izmir, by the same token, was rejected as a location. Ibid, pp.81-82.

against Keban project in alternative cost comparisons.[1]

Secondly, no transmission costs are required for thermal capacity at Izmit since it would be located on the line Istanbul-Giceroz-Ankara wh.ch would be built simultaneously with the Giceroz project.

Whereas Keban hydro-electric project would require a second circuit Istanbul-Ankara, and a double circuit Ankara-Keban with substation, switching and capacitive facilities.[2] Thus in comparison with the thermal alternative, transmission costs charged against Keban are two circuits Keban-Ankara; a single circuit Ankara-Istanbul and a single lower-voltage circuit Keban-Elazig.[3]

II. ECONOMIC EVALUATION OF THE KEBAN HYDRO-ELECTRIC PROJECT AND THERMAL ALTERNATIVE AS PRESENTED BY THE E.I.E.

This section will be confined to the exposition of comparative evaluation of the two alternatives as worked out by the E.I.E., which is the Research and Planning Agency for the Ministry of Energy and Natural Resources. The economic evaluation of the two electric projects has been conducted on the basis of 4 generating units as well as on 8 generating units (each unit with 155 MW).

Since capital investment figures are broken down between foreign and domestic capital only in the Report given for 4 generating units, and since the economic evaluation method adopted on 4 and 8 generating units is basically similar, I have decided to concentrate on the economic evaluation carried out on the basis of 4 units in each alternative. Therefore, economic evaluation based on 8 generating units will not be dealt with in this chapter.

Before presenting the planners' project evaluation procedure, it may be useful to cite below the main principles they have adopted. As endorsed

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(1) E.I.E. Electric Power Resources Survey and Development. Engineering and Economic Feasibility of Keban Dam and Hydro-Electric Project of the River Firat Development. N. York, October 1963, p.81

(2) Ibid, pp.81-82

(3) All other lower-voltage tranmission that may be required to deliver power to load centres was assumed to be common to either alternative. Ibid, p.82. The thermal units were installed in accordance with the growth system load, having more or less the same percentage of reserve capacity as would be available in the hydro-plant. But hydro alternative included also an additional amount of capacity to provide for the losses on peak that would occur because of the length of transmission to load centres.

in the General Report - Power Resources Priority Study, Volume I,[1] these are:

(i) In economic comparison of alternatives the target to be met by one plan would also be met by the alternative plan.

(ii) It is assumed that hydro-projects will have a 50 year life and thermal projects a 35 year life.

(iii) Transmission lines and sub-stations are also to have a 50-year life.

(iv) The procedure adopted is capital-recovery factor incorporating sinking fund depreciation method.

(v) Interest rate charged on foreign capital and domestic capital will be $3\frac{1}{2}$ per cent and 6 per cent respectively.[2]

(vi) Finally, economic comparison of alternative projects will be undertaken on the basis of "without" and "with" taxes and duties. Such comparisons are usually required by the financing agencies.

(i) KEBAN HYDRO-ELECTRIC PROJECT:

a- CAPITAL INVESTMENT OF KEBAN: On the basis of 4 electric generating units, Keban project would require a capital outlay of $315.933 million dollars.[3] Out of this total, domestic investment will represent 214.948 million dollars, and foreign-exchange component 100.985 million dollars (see Table 1). Again, as can be seen from the Table, Generating Station will require a domestic capital of $185.070 million and Transmission System a domestic capital of $29.878 million. Total foreign-exchange, on the other hand, is distributed between the generating station and transmission system as $49.915 million and $51.070 million respectively.

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(1) E.I.E. General Report - Power Resources Priority Study, Vol.1, Dec. 1967. Stone and Webster, Appendix 2, pp.2-3.

(2) See Kemal Arkun, Private typed document, E.I.E. Feb. 1969, Ankara, p.1. After the fourth unit is installed the interest rate on foreign-exchange component will be 6.5 per cent. Ibid, p.1.

(3) The figures are all given on dollar basis.

Table 1. CAPITAL INVESTMENT OF KEBAN

$000'

	$000'
1. Generating Station	
(a) Foreign-exchange	49.915
(b) Domestic currency	185.070
2. Transmission System	
(a) Foreign-exchange	51.070
(b) Domestic currency	29.878

Source: Private typed document obtained from E.I.E., Ankara, June 1968, p.1.

It is clear that domestic component of capital outlay constitutes 68 per cent of the total, while foreign-exchange component is 32 per cent. This points to the fact that Keban hydro-electric project is heavily dependent on domestic capital and less on foreign capital.

b- ANNUAL COST: The criterion applied by the E.I.E. planners is "Total annual cost" rule which consists of (1) equivalent annual cost of fixed investment (Fixed Charges) and (2) annual operating and maintenance cost.

The "equivalent annual cost of fixed investment" which comprises sinking fund depreciation method can be written as follows:

$$R = p\left[\frac{i\ (1+i)^n}{(1+i)^n - 1}\right] = p\ \ (c.r.f.)$$

where p denotes initial investment, i rate of interest, and n life period of the project.(1)

A. FIXED CHARGES: By applying the capital-recovery factor to the Keban project's fixed investment, "equivalent annual cost" of the fixed

(1) By this formula investment can be converted into a series of equivalent annual payments. Using this formula the payment of amortization and interest rate can be considered as a single annual item. The factor (c.r.f.) is known as the capital recovery factor which is always equal to the sinking fund factor plus the interest rate. For Sinking Fund Method, see UN - Manual on Economic Development Projects. N. York 1958, pp.198-200; and also W. G. Ireson & E. L. Grant, Principles of Engineering Economy, The Ronald Press Comp., New York, 1964, pp.45-46.

investment can be calculated. Annual fixed charges are computed separately for domestic capital and for foreign exchange component of investments since the interest rate charged for the former is 6 per cent and the latter $3\frac{1}{2}$ per cent.

a) The annual fixed charges on the foreign exchange component of capital outlay is worked out by multiplying the foreign capital by the capital-recovery factor which corresponds to $3\frac{1}{2}$ per cent interest rate and to 50-year life. The capital-recovery factor is 0.04263. Thus:

$$FC_f = 49.915 \quad (\text{c.r.f.} - 3\tfrac{1}{2}\% - 50 \text{ years})$$

$$FC_f = 49.915\ (0.04263)$$

$$= \underline{\underline{2.128}}^{(1)}$$

b) Similarly, annual fixed charges on domestic capital is computed by multiplying the domestic capital with the c.r.f. for 6 per cent interest rate and for 50-year life period:

$$FC_d = 185.070\ (\text{c.r.f.} - 6\% - 50)$$

$$FC_d = 185.070\ (0.06344)$$

$$= \underline{11.741}^{(2)}$$

c) Annual fixed charges on transmission system are also calculated on the same basis by distinguishing domestic capital from foreign exchange component:

$$FC_f = 51.070\ (0.04263)$$

$$FC_f = \underline{\underline{2.177}}$$

and

$$FC_d = 29.878\ (0.06344)$$

$$= \underline{\underline{1.895}}$$

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(1) The actual figure is 2.127.8. For capital-recovery factor see W. G. Ireson, and E. L. Grant, Principles of Engineering Economy, 4th edition. The Ronald Press Comp., N. York, 1964, pp.545, Table E-8.

(2) The actual figure is 11.740.8, for c.r.f., see again Ibid, Table E-8.

B. OPERATION AND MAINTENANCE COST: $574.000

Operating and maintenance cost of the Keban project amounts to $574 thousand per annum. This item includes expenditures on labour and material and repairs both on generating station and transmission system. Taxes are not included in operation and maintenance costs since the comparison between the two alternatives was carried out on the basis of "without taxes".

If annual fixed costs A (a+b+c) and annual operating and maintenance costs (B) are taken together, this will give us the total annual cost of Keban project. As can be seen from Table 2, total annual costs of Keban amount to $18.515 thousand. The comparison of the two alternatives by the E.I.E. is presented in Table 2.

Table 2. Keban Hydro-Electric Project - Direct Comparison with Thermal Alternative (without Taxes)

$000'

	Keban HE project 4 Units of 155 MW	Alternative Thermal 4 Units at 150 MW
Generating Station		
1. Foreign Exchange	49.915	53.500
2. Domestic Currency	185.070	23.000
Transmission System		
1. Foreign Currency	51.070	-
2. Domestic Currency	29.878	-
ANNUAL COST		
A - FIXED CHARGES	17.941	4.261
Generating Station		
a) Foreign Exchange	2.128	2.675
b) Domestic Currency	11.741	1.586
Transmission System		
a) Foreign Exchange	2.177	
b) Domestic Currency	1.895	
B - OPERATION AND MAINTENANCE	574	22.307
Generating Station		
a) Labour and material	250	635
b) Fuel	-	21.672
Transmission System		
a) Labour and material	324	-
TOTAL ANNUAL COST	18.515	26.568

$$\text{Benefit-Cost Ratio} = \frac{26.568}{18.515} = 1.37$$

Source: E.I.E. Private typed document, July 1968. Ankara, p.1.

(ii) THERMAL ALTERNATIVE: Total capital outlay of the Thermal alternative amounts to $76.500 thousand, comprising $53.500 thousand in foreign exchange and $23.000 thousand in domestic currency (see Table 2).

Annual fixed charges of the Thermal project have also been computed on the same basis. Fixed charges on foreign-exchange component are found by multiplying the latter with the capital-recovery factor (c.r.f.) corresponding to 3½% interest and to 35 year-life period.

$$FC_f = 53.500 \times (0.05000)$$
$$FC_f = \underline{\underline{2.675}} \text{ thousand dollars}$$
$$FC_d = 23.000\ (0.06897)$$
$$FC_d = \underline{\underline{1.586}} \text{ thousand dollars}$$

The capital-recovery factor for foreign exchange component is 0.05000 and for domestic component of capital is 0.06897.(1)

Transmission system in this alternative does not involve any cost since the Thermal, as we pointed out in the "Introduction" does not require transmission lines. The reason for this is that the fuel-oil burning thermal stations would be built in the load centre of Izmit and Istanbul region. It is discovered that the existing transmission system can meet the transmission requirements of the Thermal alternative.(2)

Operation and maintenance item appears to be extremely high due to the fact that the thermal alternative would be burning fuel-oil which is rather expensive. There is no information to suggest that fuel-oil will be imported from abroad. Since Turkey is more or less self-sufficient in respect to fuel-oil production, I shall in the subsequent analysis assume that all fuel oil is provided domestically. Expenditure on fuel-oil will amount to $21.672 thousand dollars. Labour and material required for generating station is

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(1) For capital-recovery factor figures, see W. G. Ireson, and E. L. Grant, op.cit., p.545, Table E-8; and p.550, Table E-13.

(2) Kemal Arkun, Engineer and planner at E.I.E. - A private typed document, Feb. 1969, Ankara, p.3.

comparatively very small; though it is still more than double the corresponding figure in the Keban hydro-electric project.(See Table 2).

Fixed charges and the operation and maintenance costs: taken together these would give total annual cost of the thermal alternative which amounts to $26.568 thousand.

(iii) BENEFIT-COST RATIO: As can be seen from Table 2, the benefit-cost ratio is taken to be the ratio between the annual cost of thermal over the annual cost of Keban, i.e. 1.37.

The logic behind this evaluation is that the two alternatives with their 4-generating units will produce the same amount of electric power; and therefore the alternative with the least cost is considered more economical. Thus, Keban hydro-electric is selected since it is 1.37 times cheaper than the thermal project.

III

APPRAISAL OF THE ECONOMIC EVALUATION METHOD OF THE E.I.E.:

Keban hydro-electric and the thermal alternative have been evaluated and compared on the basis of "uniform annual cost" criterion since the two projects'benefits are assumed to be identical.

However, it must be pointed out that the grounds on which the E.I.E. planners' investment rule depended can be disputed from various aspects.

1) First of all, investment decision based on annual benefit-cost ratio is a misleading one so long as the alternatives have different lives. Given the fact that Keban involves a 50-year life and the thermal project a 35 year life, "annual costs" corresponding to their actual length of life period cannot form a sensible base for comparison. Therefore, life-periods of alternative projects must, first, be equated as to give equal years of service.

2) Second, in the application of "uniform annual cost" rule, calculations are made on the basis of market prices rather than social prices. For instance, fixed capital outlay as comprising foreign exchange component and domestic capital component are given on market prices. Whereas,for a sound economic evaluation which takes into account the imperfections in the market mechanism, all market prices (or measurable ones) should be substituted with social prices. Therefore, as we argued forcibly in the previous papers, corrections will be needed on:

a) foreign exchange component of capital outlay,
b) foreign exchange component of transmission investment,
c) foreign exchange component of variable costs (operating and maintenance cost),
d) market wage payments to unskilled workers,
e) interest rate which is taken on market prices.

The interest rate shold be corrected upwards so as to reflect the intrinsic value of capital. As can be seen from Table 2 and other available information, E.I.E. planners have not introduced foreign exchange correction nor correction on the part of wage payments made to unskilled workers. Since the two alternative projects are of capital-intensive character they do not involve a large labour cost; and therefore correction on wage rates would not likely have a decisive effect on the choice of projects. But the same thing cannot be said for the correction required on foreign exchange component of capital outlay. Foreign exchange correction has to be introduced, since this constitutes a very high proportion in capital investment and since official rate may overstate the value of national currency.

In our subsequent analysis we shall therefore introduce only foreign exchange correction on the foreign exchange components of capital in both projects. The wages item in the two alternatives are not broken down between technical personnel, administrators, and skilled and unskilled workers. It is thus not possible to correct for the wages paid to unskilled workers. Correction on wages will be omitted throughout our analysis due to this difficulty.

3) Third, though the two alternatives have different life-periods, present value (pv) calculations have not been applied. Consequently total costs and annual costs estimates have not been reduced to the present values. The right criterion to apply, as we strongly argued in the previous chapter, is the present value (pv) rule which takes into account the present value of total costs (Fixed cost + variable costs) and total benefits (direct and indirect benefits). It has been one of our conclusions throughout this study that pv is superior to other known investment criteria (i.e. internal rate of return, pay-off period, etc.) and is the most appropriate rule to apply in social benefit-cost analysis.(1)

4) Fourth, interest rates applied in the "annual cost" computations are market rates which were 6 per cent for domestic capital and $3\frac{1}{2}$ per cent for foreign capital.

It is fair to argue that the investment funds obtained from domestic and foreign sources do represent a higher rate of return than the actual interest rates would suggest. There are convincing reasons to argue that the interest rate charged on domestic capital is taken very low as the State Investment Bank's lending rate stands to be minimum 6 per cent and opportunity cost of capital in general over 10 per cent.(2)

(1) It must however be noted that pv rule is applied to the economic comparison based on 8 generating units in the two alternatives, since capital outlay and operation and maintenance cost are irregularly disbursed over the first 10 years. Comparison on 8 generators, however, will not be examined in this chapter.

(2) See, Gaycuma paper project. The State Planning Organization has applied 12 per cent discount rate in the pv computations of industrial projects. There is no reason why this rate should not be applied in electric projects.

It is true that in utility projects it is a common rule to apply relatively a lower discount rate, since most public-utility projects are overwhelmingly capital-intensive and they also generate diffused indirect benefits to the overall economy which are not included in benefit-cost analysis.

But one may think for a country like Turkey where there is an acute shortage of capital funds and also severe rationing on capital available, the interest rate to apply should reflect the opportunity cost of capital which is measured by the rate of return in the marginal project of the investment programme.

As far as foreign capital is concerned, the same argument may apply, though not to the same strength. It can be argued that the foreign capital involved is project-tied and it does not have any opportunity cost. In other words, if the foreign capital is only granted to those specific projects, i.e. Keban hydro-electric, then one may not be in a position to apply "shadow" interest rates. But for our further analysis, I shall take it that the foreign capital is not project-tied and it has an opportunity cost as higher than its actual rate.(1)

5) Fifth, the benefits side is not dealt with in the economic evaluation of Keban and Thermal alternatives. The primary benefits are assumed to be identical and the project with the lowest annual cost is considered acceptable.

But analysis carried out on the basis of only primary effects cannot be complete or a sufficient base for logical benefit-cost analysis. Especially when these investments happen to be in public utility services. No doubt, Keban hydro-electric project will provide a substantial amount of indirect benefits in respect to irrigation facilities, flood-control, navigation effects and technological spillovers (external effects) upon the nearby located mining industry.

In the evaluation of Keban electric project most of the indirect effects of the investment are mentioned in a "Private Report" prepared on

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(1) In our sensitivity analysis an opportunity cost of 6 per cent is considered for foreign capital; but this rate is later increased to 8 per cent and 10 per cent as there is no reason why the opp. cost of foreign capital should not be as high as the opp. cost of domestic capital.

Engineering and Economic Feasibility of Keban Dam and Hydro-electric Project,[1] but there has been no attempt to quantify these benefits and include them in the benefit-cost estimates. The indirect benefits which are considered in the Report are as follows:

INDIRECT BENEFITS: a) Irrigation benefits: Dr. Rust,[2] has prepared a Report to show the potential benefits to the area which could result from an irrigation system of which Keban Dam would be the initial step. In this report it is stated that, if an adequate scheme of irrigation is constructed for the Lower Firat-basin (Euphrates), there would be an increase in the national income from agriculture of 1443 million T Liras, per annum.[3] It is also reported that total area suitable for irrigation will be in the Lower Firat basin and this would be to the extent of 1.028.780 hectares.[4]

As far as Keban project is concerned there is no scheme proposed for diverting any water from the Keban reservoir for irrigation purposes.

I was told, during the interview I had with Kemal Arkun,[5] one of the E.I.E. planners, that there can be no direct irrigation benefit from Keban Dam, since plains which can benefit from irrigation are situated 250-300 km. downstream from Keban. In other words, the region which could be irrigated is the Lower Firat basin which includes Malatya, Mardin, Kiziltepe, Ceylonpinar, Viransehir and Urfa.

Even downstream the River Firat flows 200 metres below the irrigable land; and therefore it will be necessary to build another hydro-dam in the Lower Firat to provide irrigation facilities. For this purpose 2 hydro-dam alternatives are considered, one in Karababa and the other in Karakaya.

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(1) Report to E.I.E., Electric Power Resources Survey and Development, Engineering and Economic Feasibility of Keban Dam and Hydro-electric Project of the Firat River Development, Ebasco Services Inc., N. York, October 1963, pp. 98-100.

(2) Dr. Rust; Dept. of Agriculture, Univ. of Minnesota, ibid., p.87

(3) Report to E.I.E., Ibid, p.87

(4) A more realistic figure for irrigable land is given as 900.000 hectares. Ibid, p.93

(5) A private interview with Kemal Arkun, Feb. 1969, Ankara.

For all these reasons, no monetary value has been assigned to the Keban hydro-project as irrigation benefits. But it can be argued that the existence of physical and economic interdependence between Keban and other Lower Firat hydro-dams (i.e. Karababa or Karakaya) cannot be ruled out. The latter being built on the same river will be dependent on the water flow which can be regulated upstream by Keban project. For instance, the Keban HE can substantially increase the flow of the River during the irrigation season and thus can assist any present and future downstream diversions for irrigation purposes.

Thus Keban Dam by regulating water flow of the river can have a considerable effect upon the irrigation capacities of prospective lower stream hydro-dams. But so long as Karababa hydro-dam is not completed, such indirect effects cannot arise to be attributed to Keban Dam.

Moreover, when upstream Keban station has reservoirs of water storage this is likely to affect water flows downstream and hence the generating pattern of stations in that area.(1) It is reasonable to draw such linkages to the attention of the economic evaluator as these prospective benefits can be ascribed to Keban project.

b) Navigation and Flood Control: In the same Report it is pointed out that the only sizeable city located on the River Firat is Malatya. By the establishment of long reservoirs in these valleys movement of ships can be provided; but it is added that there will be no markets for goods and farm products along these bodies of water. The conclusion has been that use of these reservoirs for shipment of goods will be negligible because of navigation difficulties.

As far as flood control is in question, it is stated that "almost no benefit from reduction of floods in the Lower Firat can be credited to the Keban Dam and bydro-electric project",(2) since there are no cities or villages located along the lower reaches of Firat. Thus flood control has not entered the benefit-cost analysis.

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(1) Prest and Turvey maintain that if technological interdependence of this kind is not internalized by having both types of stations under one authority, it may have to be necessary to have compensatory arrangement, if resource misallocation is to be cut down. See A. R. Prest and R. Turvey, Cost-Benefit Analysis: A Survey, E.J., Dec. 1965, p.710.

(2) The Report, op.cit., p.98

However, it is also pointed out in the Report that "the effect of the Keban project will be to regulate the flow of the river, minimize all but the most severe floods and in general enhance the prospect of navigation in countries downstream".[1] From this second statement one can conclude that Keban project will have some indirect effects by avoiding floods in the downstream plains.

The major benefits which can stem from the hydro-project would be the losses averted. Losses can be in reference to different types of assets, i.e. property, farm crops and lives. In principle, the flood control effects of the project will be estimated on the basis of mathematical expectation of annual damage resulting from frequency of flood levels. Total damage would be the maximum annual amounts people would be willing to pay for flood control and protection.

Generally speaking the benefits include the following:[2]

1) The loss of income via damage to crops and property,
2) Avoidance of deaths by drowning,
3) Avoidance of temporary costs, e.g. evacuation of flood victims, emergency sandbag work, risks of sanitarian breakdowns, epidemics, etc.

Keban hydro-project, by regulating water flows, can be a first step to avert floods in the Lower Firat basin, though not in the upstream. It is reasonable to suggest that agricultural crops could be prone to a considerable damage and the cost of this can, rightly, be attributed to Keban project.

c) Recreation and fisheries: It is very rightly pointed out in the Report that the cost of equipment required for watersports or other recreational activities is so high that they are beyond the reach of the average worker.[3]

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(1) Ibid, p.98

(2) See A. R. Prest and R. Turvey, Benefit-Cost Analysis: A Survey, E.J., Dec. 1965, pp.708-709. The principle here is simply to estimate willingness to pay for flood protection by the communities in question. This is a roundabout device of measuring such benefits since market principles do not provide a short-cut solution.

(3) See, The Report, op.cit., p.99

The fact is that water sports or other recreational activities have not even developed to a noticeable extent at the seaside resorts by the Turkish high-income groups. It is plausible to argue then that use of Keban reservoir for recreational purposes may remain minimal for many years to come.

The Keban reservoir, however, can have a large potential economic value as a fishing ground for the local population. But there has been no attempt to estimate the amount of fish the reservoir might provide in the future. This effect could only be estimated after the completion of Keban Dam reservoir. This question no doubt calls for an intensive research in order to enter benefit-cost analysis.

d) Mining and Metallurgical development: The technological external effects of the Keban electric plant can be very significant on the copper-mining industry, which is situated in the area of Ergani, near Keban. The output from these mines are processed by an established smelter in Maden. A substantial increase in the output of these mines can be provided by facilitating ore concentration and refining with the low cost electric power provided from Keban hydro-electric plant.

It is quite logical to suggest that copper mining could enjoy tremendous expansion in output due to the availability of electric supply. This is a clear example of technological spillovers[1] (external effects) which can be measured by the incremental increase in physical output of copper-mining which are obtained from the inputs (electric-supply) of Keban hydro-electric plant. Thus the incremental increase in the production of copper ore should be ascribed to the Keban project as technological external benefits.

It is generally acknowledged that measurement should allow for major external effects of the technological variety, - that is the variety which alters the physical production possibilities of other producers. If these effects can be priced, they should be computed and added to the benefits

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[1] Technological spillovers are those which affect the physical outputs that other producers can get from their physical inputs; and also uncompensated effects on the satisfaction that consumers can get from their inputs. For Technological and Pecuniary Spillovers, see R. N. McKean, Efficiency in Government Through Systems Analysis. J. Wiley & Sons Inc., N. York, 1958, pp.134-146.

of the project in question. It must also be noted that the value of the incremental output, not the incremental value of the industry's total output, is what counts.

Further, one of the richest deposits of chrome ore is extracted in the East of Elazig.(1) At present this mineral is only exploited to a small extent. The chrome ore is exported to be processed. With a substantially low cost of electric supply from Keban plant Turkey could increase the value of ore by processing it domestically. Consequently this could exert a considerable increase in the foreign exchange earnings.

It is also revealed in the Report that from copper mining, cobalt and zinc are produced; from copper-refining, sulphuric acid is produced as a by-product which could be used in the production of superphosphate fertilizers which in turn could be beneficial to agriculture.

Because it has not been the practice in any other project to calculate indirect effects, there has been no attempt in this project either to measure technological spillovers.

One may, therefore, stress the importance of detailed analysis needed on mine reserves and qualities, domestic and foreign market prices, costs of products, sales conditions, etc.

The question of benefits does not end here. As far as nationalized industries are concerned, pricing policy has been the subject of an extensive controversy among economists. The question asked very often is that how far the prices actually charged reflect their true social value or costs to the economy. It is sometimes asked: should there be an attempt to discover how much users would be willing to pay if full cost pricing was adopted? Price elasticity of demand can be a useful device to apply in such circumstances. On these questions economists are moving in surroundings where arithmetic can be applied but where the temptation to take subjective value judgements are multiplying rapidly. It is in this field that the economic evaluation "must segregate into separate boxes those costs and benefits to which a monetary value may be ascribed, those which cannot be measured by money but

(1) The Report, op.cit., p.100

to which some numerical magnitude can be attributed, and those (empty boxes) where the attempt to impute any economic valuation at all must be renounced..."[1] Clearly, these boundary lines may be a function of the nature of the project, the availability of information and data and also the technical capacity of the economist.

The purpose of cost-benefit analysis is to measure the effect of the projects on the over-all economy so far as practicable. Some costs and benefits are more amenable to measurement than others and this raises the problem of valuation.

But as far as Keban hydro-electric project is in question, cost-benefit analysis is not used to their maximum limit as to express aforementioned indirect benefits in monetary values. For instance, if adequate data were made available by means of extensive research, Keban hydro-dam's effects on flood control, fishing and copper and chrome ore mining could have been estimated on practical assumptions.[2]

The benefit-cost analysis of Keban alternative, in contrast, has been limited to only primary economic effects and indirect effects are left outside the scope of the test. Therefore, the limitation of coverage in the Keban evaluation may represent a departure from a comprehensive benefit-cost analysis.

IV

SENSITIVITY ANALYSIS:

In the following section, I shall first assume that the "equivalent annual cost" criterion that is applied by the planners is the correct one,[3] but the choice of interest rates applied in the computations is not.

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[1] See N. Scott, Some Problems of Cost-Benefit Analysis of Social Investments, in "UN-Cost-Benefit Analysis of Social Projects, Rep.No.7, Geneva, April,1966,p.52.

[2] Besides, if indirect benefits are added to the hydro-electric plant, total benefits of Keban HE will greatly exceed the total benefits of the Thermal plants, and consequently the least annual cost comparison would have been meaningless.

[3] That is, economic comparison on the basis of their respective lives is the correct one.

As we have pointed out earlier, investment funds obtained from domestic and foreign sources may represent a higher rate of return than the actual interest rates would suggest. An opportunity cost equivalent to 8 per cent and 10 per cent may seem an appropriate approximation for the borrowed funds. This implies that a rate of return of this level should be considered marginal if hydro-electric and thermal alternatives are to be economically efficient.

For the purpose of evaluating alternative plans we first impute an interest rate of 6 per cent for foreign currency component (as compared to its previous rate of $3\frac{1}{2}$ per cent) and 8 per cent for the domestic capital. Later the imputed interest rate on the domestic component of capital outlay will be taken as 10 per cent while interest rate on foreign component remains constant.

These two comparisons will indicate to us how far the cost data of the planners' will be altered as a consequence of social interest rates. I shall here omit the effect of the shadow foreign exchange correction on the final choice of alternatives.

A - WITHOUT CORRECTING FOR LIFE-PERIODS

Given the above-mentioned simplified assumptions, the sensitivity analysis on the Keban HE and the Thermal projects can be carried out in the following manner:

KEBAN HE: At 8 per cent

	$000'
I. Fixed Investment	315.933
a) Domestic capital(1)	214.948
b) Foreign exchange(2)	100.985
II. Equivalent Annual Cost of the Fixed Investment: (At $i_d = 8\%$, $i_f = 6\%$)	
A. Fixed Charges (Domestic) = 214.948 (c.r.f.-8%-50)	
= 214.948 (0.08174)(3)	
= 17.569	17.569
B. Fixed Charges (Foreign) = 100.985 (c.r.f.-6%-50)	
= 100.985 (0.06344)(4)	
= 6.406	6.406

III. <u>Operation and Maintenance Costs:</u>(5) 0.574

(-Labour, material and others)

in Generating Station and Transmission Lines.

IV. <u>Total Annual Cost:</u> II(A+B) + III =

17.569 + 6.406 + 0.574

= 24.549 24.549

<u>Notes:</u> (1) Domestic Capital includes investment in generating station and Transmission system.

(2) Foreign exchange component also includes investment in Generating Station and Transmission system.

(3) 0.08174 is the capital-recovery factor which corresponds to 8 per cent interest and to 50 year-life.

(4) 0.06344 is the capital-recovery factor which corresponds to 6 per cent interest and to 50-year life.

(5) Taxes are not included in operating and maintenance costs.

<u>THERMAL ALTERNATIVE:</u> At 8 per cent

	$000'
I. <u>Fixed Capital Investment</u>	<u>76.500</u>
a) Domestic Currency	23.000
b) Foreign Currency	53.500

II. <u>Equivalent Annual Cost of the Fixed Investment:</u>

A. Fixed Charges (Domestic) = 23.000 (c.r.f.-8%-35)

i_d = 8%

= 23.000 (0.08580)

= 1973.4

B. Fixed Charges (Foreign) = 53.500 (c.r.f.-6%-35)

i_f = 6%

= 53.500 (0.06897)

= 3689.8

III. <u>Operation and Maintenance Costs:</u> 23.307

(Labour, Material and Fuel)

IV. <u>Total Annual Cost:</u> = II(A+B) + III

= 1973.4 + 3689.8 + 23.307

= <u>27.970</u>

From the above computations it follows that if the "equivalent annual cost" rule is applied on the basis of a shadow interest rate of 8 per cent for domestic capital and 6 per cent for foreign exchange component, the Keban alternative will still remain more economical than the Thermal alternative as the annual cost of the former is $24.549 thousand dollars and of the latter is $27.970 thousand dollars.

But when the same criterion is applied at the interest rate of 10 per cent for domestic capital and 6 per cent for foreign exchange component, the choice between the two alternatives will change in favour of the Thermal project. The computations of the total annual costs of both projects at 10 per cent interest rate are presented below (See Table 3 and 4).

Table 3. Total Annual Cost of the Keban HE project: At 10 per cent

	$000'
I. <u>Fixed Investment</u>	<u>315.933</u>
a) Domestic Currency	214.948
b) Foreign Exchange	100.985
II. <u>Equivalent Annual Cost</u> of the Fixed Investment:	
A. Fixed Charges (Domestic): 214.948 (crf-10%-50)	
$i_d = 10\%$	
= 214.948 (0.10086)(1)	
= 21.679	
B. Fixed Charges (Foreign): 100.985 (crf-6%-50(2)	
$i_f = 6\%$	
= 100.985 (0.06344)	
= 6.406	
III. <u>Operation and Maintenance</u>: (Labour, material and others)	0.574
IV. <u>Total Annual Cost</u> = II(A+B) + III	
= 21.679 + 6.406 + 0.574	
= <u>28.659</u>	

(1) For capital-recovery factors, see E. L. Grant and Ireson, W.G., Principles of Engineering Economy, 4th edition, The Ronald Press Comp., N. York, 1964. Table E-16, p. 552.

(2) Ibid, Table E-13, p. 550.

Table 4. Total Annual Cost of the THERMAL Alternative: At 10%

	\$000'
I. <u>Fixed Capital Investment</u>	<u>76.500</u>
a) Domestic Currency	23.000
b) Foreign Exchange	53.500
II. <u>Equivalent Annual Cost of Fixed Investment</u>	
A. Fixed Charges (Domestic) = 23.000 (crf-10%-35)	
i_d = 10 p.c.	
= 23.000 (0.10369)	
= 2384.8	
B. Fixed Charges (Foreign) = 53.500 (crf-6%-35)	
i_f = 6 p.c.	
= 53.500 (0.06897)	
= 3689.8	
III. <u>Operation and Maintenance Costs</u>	22.307
(Labour, material and fuel oil)	
IV. <u>Total Annual Cost</u> = II(A+B) + III	
= 2384.8 + 3689.8 + 22.307	
= <u>28.380</u>	

As can be seen clearly from Table 3 and 4, at 10 per cent interest rate total annual cost of the Keban HE amounts to 28.659 thousand dollars, while the annual cost of the Thermal alternative amounts to 28.380 thousand dollars. It follows that, so long as the shadow interest rate is assumed to be 10 per cent, the Thermal project becomes more economical.

It can also be inferred that generally at higher interest rates the alternative with small initial capital outlay and with a higher annual cost(1) becomes more admissible than the other alternative with the larger initial capital and with lower operating and maintenance cost.

B. <u>PRESENT WORTH RULE:</u> WHEN TWO ALTERNATIVES HAVE DIFFERENT LIVES

"Equivalent annual cost" criterion which is based upon the application of the capital-recovery factor method of computations may be

(1) Annual cost here refers to operating and maintenance cost, and not to the annual fixed charges.

considered to be an acceptable rule, but I am more inclined to use the pv rule, which is generally considered to be the most appropriate one for benefit-cost analysis. In this section, I shall be introducing present value calculations by converting the life periods of the two alternatives to an equal life-period. The methods needed for this conversion will be discussed and applied to the economic comparison of the Keban HE and the Thermal plant.

But it must be added that, in this section too, I shall assume away the correction needed on the foreign exchange component of capital. In other words, shadow foreign exchange rate will be taken up in the last section of this paper, as incorporated with the correction on the discount rate which may seem reasonable.

In what follows I shall carry out pv calculations on the basis of different social discount rates, such as 6 per cent, 8 per cent and 10 per cent. I have already mentioned that the low interest rate applied by the E.I.E. does not reflect the social opportunity cost of capital involved. As can be remembered, the discount rate applied by the SPO for the economic evaluation of the "Gaycuma paper and cellulose project" was 12 per cent.(1) This is the rate which is applied to all industrial projects which are undertaken by the State Economic Enterprises. Because domestic capital is provided by the same financing agency, that is the State Investment Bank, it is evident that an application of a discount rate as high as 10 per cent and even 12 per cent appears to be reasonable.(2)

When present value rule is used for economic evaluation of investments, a comparison of the short-lived and long-lived projects cannot make sense unless the two different life periods are converted to the similar number of years of service.

Therefore, there are two distinct methods for undertaking such comparison. a) The <u>first</u> method applied in comparing investment alternatives with different lives is to find the <u>least common multiple</u> of the estimated

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(1) See the Gaycuma paper project, Chapter 7

(2) Though there are arguments in favour of using a lower discount rate for public utility projects (i.e. USA uses a 6 per cent discount rate), Turkey with its disorganized capital-market and a rather high opportunity cost of capital cannot adhere to such a low discount rate.

lives of the two projects. For instance, if one project had a 10 year life and the other 25 year life, it would be necessary to consider a 50 year period with 5 life cycles for one alternative and 2 life cycles for the other.(1)

b) The second method is to carry out the present worth study for a perpetual period. Present worths for an assumed perpetual period of service are referred to, in practice, as "capitalized costs".(2)

A convenient simple assumption adopted in both methods is that replacement assets will repeat the costs that have been forecast for the initial cost.

Given this assumption, in what follows I shall be using these two methods in order to make the Keban HE comparable with the Thermal alternative. I shall apply the first method by using different rates of interest in order to see how far the choice is sensitive to a chosen rate of interest.

a) Comparison of Keban HE project with the Thermal Alternative by Using the Lowest Common Multiple Method:

There is no point in converting two or more alternative cash flow series into present worth and comparing the present worths unless the cash flow series are related to the same number of years.

For this purpose I shall assume that the lowest common multiple for the lives of both projects is 100 years. But it must be pointed out that this lowest common multiple does not correspond to an exact figure; it is an approximation, since Keban will be renewed twicewithin this 100-year period and the Thermal project slightly less than three times. Clearly, the Thermal plant will necessitate 105 years for three times of replacements. However, for the sake of simplifying my analysis, I have assumed that 100-year

(1)The lowest common multiple rule is not always as easy as that since the lives of alternatives do not sometimes lend themselves to an evenly divisible figure. For instance, taking our actual example of Keban with 50 years and the Thermal with 35 years, they would require a life period of 350 years until they both give equal years of service. This implies that the Keban project would require 7 life cycles and the Thermal 10 life cycles.

(2)See W. G. Ireson and E. L. Grant, Principles of Engineering Economy, The Ronald Press Comp., N. York, 1964, pp.99-100.

period is the lowest common multiple. Besides, as we shall see later during the application of the second method, there will be no significant difference between repeating costs for 100 years or forever.

Table 5. Present Value of Keban HE Project:
At i = 6 p.c., and n = 100 years

	$000'
1. First Capital Cost	315,933
2. pw of first disbursement for renewal in 50 years: 315.933 (pwf'-6%-50)(1)	
= 315,933 (0.0543	
= 17,155	17,155
3. pw of annual operating and maintenance over 100 years:	
= 574 (series pwf-6%-100)	
= 574 (16.618)(2)	
= 9538.7	9,538
4. Total pw of costs of Keban over 100 years(3)	342,626

(1) pwf' is the present value factor which corresponds to single payments.

(2) 16,618 is the series present value factor which corresponds to 6 per cent interest and to 100 years.

(3) If there is any scrap value after 100 years pw of the assets should be deducted from the total pw of disbursements so as to arrive at the pw of net disbursements for 100 years. Throughout our analysis scrap value is assumed away.

Table 6. Present Value of Thermal Alternative:
at i = 6 per cent, n = 100 years

	$000'
1. Total Fixed Investment	76,500
2. pw of <u>first</u> disbursement for renewal in 35 years = 76,500 (pwf'-6%-35)	
= 76,500 (0.1301)	
= 9,952	9,952
3. pw of <u>second</u> disbursement for renewal in 70 years	
= 76,500 (pwf'-6%-70)	
= 76,500 (0.0169)	
= 1,292	1,292
4. pw of annual operating + maintenance cost over 100 years:	
= 22,307 (series pwf-6%-100)	
= 22,307 (16.618)	
= 370,697	370,697
5. Total pw of costs of Thermal over 100 years:	458,441

From the above pv calculations, it becomes clear that on the basis of 6 per cent interest rate the choice will be in favour of Keban HE project. As can be seen from the tabulated results (Table 5 and 6), pv of total costs of Keban are $342.626 thousand dollars as compared to $458.441 thousand dollars in Thermal alternative.

It is also evident that the choice is relatively insensitive to the estimated cost of the renewal assets in Keban project. Even if disbursement for the renewal asset 50 years hence should be doubled, the total present worth of Keban would only be increased by $34.310; thus Keban hydroelectric project would still be more economical than the Thermal project.

It can be concluded that, on the basis of pw rule which is applied to cover 100-year period, the Keban project is admissible so long as we apply a discount rate of 6 per cent.

It is a common practice in project analysis to express total pw disbursements in terms of annual costs; thus the total present value of Keban and the Thermal alternative can be converted into annual costs by multiplying them by the capital recovery factor (c.r.f.) corresponding to 6 per cent and to 100 years.

1) Annual Cost, Keban: $342,626 (crf-6%-100)
= $342,626 (0.06018)
= $ 20,619

2) Annual Cost, Thermal = $458,441 (crf-6%-100)
= $458,441 (0.06018)
= $27,588

As far as annual costs are concerned, Keban project would still be more attractive than the Thermal alternative. Incidentally, it must be remembered that the choice of alternatives would be the same whether the choice has been taken on the basis of total pw of costs or annual costs as long as the same discount rate is applied in both computations for the same period of lives.

II. Now, as far as 8 per cent discount rate is chosen for the pw calculations for the two alternatives, the result would become as presented below:

Table 7. Present Worth of Keban Project: At 8% Discount Rate
i = 8 p.c., n = 100 yrs.

Keban	$000'
1. Fixed Investment	315,933
2. pw of first disbursement for renewal in 50 years:	
= 315,933 (pwf'-8%-50)	
= 315,933 (0.0213)	
= 6,729	6,729
3. pw of annual disbursements over 100 yrs.:	
= 574 x (series pwf-8%-100)	
= 574 x (12,494)	
= 7,171	7,171
4. Total pw of costs of Keban	329,833

Table 8. Present Worth of Thermal Project: At 8 per cent D.R.

i = 8 p.c., n = 100

Thermal	$000'
1. Fixed Investment	76,500
2. pw of first disbursement for renewal in 35 yrs.:	
= 76,500 x (single pwf'-8%-35)	
= 76,500 (0.0676)	
= 5,171	5,171
3. pw of second disbursement for renewal in 70 yrs.:	
= 76,500 (single pwf'-8%-70)	
= 76,500 x (0.0046)	
= 0,351	0,351
4. pw of annual disbursements over 100 yrs.:	
= 22,307 x (series pwf-8%-100)	
= 22,307 (12.494)	
= 278,703	278,703
5. Total pw of costs of Thermal over 100 yrs.:	360,725

Again, as can be seen from the pw calculations based on an 8 per cent discount rate, the Keban HE project still remains more acceptable than the Thermal project. The total pw of costs of Keban are $329.833 thousand dollars as compared to the total pw of costs of Thermal of $360.725 thousand dollars.

The total pv of costs of Keban and the Thermal alternative can, again, be converted into annual costs by multiplying these above figures by the capital-recovery factor for 8 per cent interest and for 100 years. Thus:

1. Annual Cost, Keban HE: $329,833 (crf-8%-100)
   = $329,833 x (0.08004)
   = $26,399

2. Annual Cost, Thermal: $360,725 x (crf-8%-100)
   = 360,725 (0.08004)
   = $28,872

It is evident that at 8% discount rate, on annual basis too, the Keban project is more economical and must be selected.

III. However, it is very interesting to notice that when the present value computations are carried out at 10 per cent discount rate the choice changes in favour of Thermal and not the Keban project any longer.

The results of our pw calculations at 10 per cent discount rate and 100 years are presented below:

Table 9. PW of Keban HE project: At 10% Discount Rate

n = 100

	$000'
1. Fixed Investment	315,933
2. pw of first disbursement for renewal in 50 years:	
= 315,933 x (single pwf'-10%-50)	
= 315,933 (0.0085)	
= 2685.4	2,685
3. pw of annual disbursements (o+m) over 100 years:	
= 574 (pwf-10%-100)	
= 574 (9.999)	
= 5,739	5,739
4. Total pw of costs of Keban HE over 100 yrs.:	324,357

Table 10. PW of Thermal Alternative: At.10 per cent Discount Rate, n=100

	$000'
1. Fixed Investment	76,500
2. pw of first disbursement for renewal in 35 yrs.:	
= 76,500 (single pwf'-10%-35)	
= 76,500 (0.0356)	
= 2,723	2,723
3. pw of second disbursement for renewal in 70 years:	
= 76,500 (single pwf'-10%-70)	
= 76,500 (0.0013)	
= 99.4	99
4./	

Table 10 (contd.)

4. pw of annual disbursements (o + m) over 100 yrs.:	
= 22,307 (series pwf'-10%-100)	
= 22,307 (9.999)	
= 223,047	223,047
5. Total pw of costs of Thermal	302,369

It must be noted that the choice is relatively insensitive to the estimated cost of the renewal asset in Thermal project. For instance, if the estimated disbursement for the renewal asset 35 years and 70 years hence should be doubled, the total present worth for Thermal would be increased by only \$5,644; and the Thermal project would still be considerably more economical than the Keban HE project.

When total pw of costs of Keban and the Thermal are converted into annual cost basis the result still favours the Thermal project.

1. Annual Cost, Keban: \$324,357 (crf-10%-100)
   = \$324,357x(0.10001)
   = \$32,438
2. Annual Cost, Thermal: \$302,369 (crf-10%-100)
   = \$302,369 (0.10001)
   = \$30,239

In the next section, for illustrative purposes, I shall introduce the second method which is usually called "capitalized cost" and mostly used by engineers in public utility projects.[1]

b) THE "CAPITALIZED COST" METHOD IN COMPARING TWO ALTERNATIVES WITH DIFFERENT LIVES:

Two alternative projects each with different life span can also be compared by computing present worth of perpetual service for both projects.

[1] See Ireson & Grant, pp.101-102

This is an assumption commonly used in order to provide comparison.

Following this method we can now calculate the present worths of Keban HE project and the Thermal alternative. I shall compute the "capitalised costs" of the two projects by using a 10 per cent discount rate. This will show us if there is any considerable difference between the "capitalized cost" method and the "lowest common multiple" method we have used before.

Table 11. PW of Keban project: At 10 per cent

	$000'
1. Fixed Investment	315,933
2. pw of infinite series of renewals:	
= 315,933 (sff-10%-50) ÷ 0.10	
= 315,933 (0.00086)(1) ÷ 0.10	
= 271.7 ÷ 0.10	2,717
3. pw of annual disbursements:	
= 574 ÷ 0.10	
= 5740	5,740
4. Total Capitalized Cost	324,390

Table 12. Capitalized Cost of Thermal alternative: At 10%

	$000'
1. Fixed Investment	76,500
2. pw of infinite series of renewals	
= 76,500 (sff-10%-35) ÷ 0.10	
= 76,500 (0.00369) ÷ 0.10	
= 282.2 ÷ 0.10	2,822
3. pw of annual disbursements	
= 22,307 ÷ 0.10	
= 223,070	223,070
4. Total Capitalized Cost	302,392

(1) sff represents sinking fund factor, and can be expressed as $\frac{i}{(1+i)^{n}-1}$, see, United Nations-Manual on Economic Development Projects, New York, 1958, pp132-36.

As can be noticed from Tables 11 and 12, "capitalized cost" method which takes into account the perpetual service of both projects gives a similar result to the above-mentioned "lowest common multiple" method, where at 10 per cent discount rate the Thermal project is more economical and acceptable.

It must be noted that the figures for the present worths of perpetual service in Keban and Thermal are only very slightly greater than the previous figures for the present worths of 100 years' service. As a matter of fact, the $\not{S}$21,998 advantage for Thermal plan in capitalized cost is not much more than the $\not{S}$21,988 advantage in present worth of 100 years' service.

It can also be concluded that from the viewpoint of present worth the difference between 100 years and forever (infinite renewal) is very small.

What is done in this method is that $\not{S}$76,500 thousand dollars at the end of 35 year period is multiplied by the sinking fund factor (s.f.f.) to convert it to $\not{S}$282,2, a uniform annual figure throughout the 35 year period. Thus $\not{S}$76,500 thousand at the end of every 35th year is equivalent to $\not{S}$282,2 a year forever. The present worth of this infinite series in Thermal alternative is then $\not{S}282{,}2 \div 0.10 = \not{S}2{,}822$.

The choice between the Lowest Common Multiple method and the Capitalized Cost method would depend on circumstances the investment evaluation would face. If it is easy to compute the lowest common multiple of lives of alternative projects, this method would suffice. But because of difficulties in finding the lowest common multiple for the lives of alternatives, it is sometimes advisable to resort to "capitalized cost" method which we have applied above.

V

SENSITIVITY ANALYSIS: As Correction on Foreign-exchange and Discount Rates are Introduced

In this section I shall bring into the analysis the so far omitted factor, that is the shadow price of foreign exchange correction as applied on the foreign exchange component of fixed investments in both alternatives.(1) The foreign exchange correction incorporated with the correction on the discount

(1) Throughout these analyses, I have assumed that Turkey has sufficient domestic fuel resources to meet the fuel demand of the Thermal stations. Therefore, Thermal's operating and maintenance costs do not involve imported fuel-oil for the operation. I was not able to find any information to reverse this assumption.

rate can be quite illuminating in indicating how far the choice between the Keban and the Thermal alternative is sensitive to variations in the two parameters.

In section III I have carried out the sensitivity analysis on the basis of market prices, the only exception being the social discount rate. But here I shall first correct for the foreign exchange components by using a social price of foreign exchange of 0.33 per cent above the official rate.[1] This is the foreign exchange penalty which is generally applied by the SPO in all industrial projects (i.e. the Gaycuma paper project). It is therefore very appropriate to examine first the effect of this social price of foreign exchange on the choice between alternatives K and T.

Secondly, it must be added that the variations used in the parameter of social discount rate will again be 6 per cent, 8 per cent and 10 per cent, as we applied in the preceding sections. As we argued elsewhere the social discount rate to be applied should be raised at least to 10 per cent or even 12 per cent so as to maintain uniformity in the overall investment projects. For the sake of conducting sensitivity analyses on the alternatives I am discussing, I intend to use these three sets of social discount rates.[2]

Third, the method I shall apply in the economic comparison will be the present value based upon "the lowest common multiple method" by assuming again a 100-year period for the two alternatives.

It will be shown that the social valuation of the attractiveness of either alternative depends on the values attached to a number of parameters which come from value judgements, social policies and behavioural patterns observed in the entire economy. Thus, the estimation of these parameters lies outside the scope of the professional activities of an individual project

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[1] E.I.E. planners have not introduced foreign exchange correction in their economic evaluation since this has not been the common practice followed by them. See the private typed document from E.I.E. by K. Arkun, Feb. 1969, Ankara.

[2] It is recently stated in the "Typed Report" I obtained from the E.I.E. that new hydro and thermal electric projects will be evaluated on the basis of 8 per cent discount rate. Private typed report by Kemal Arkun, Feb. 1969, Ankara, p.4.

formulator. This is not surprising because in social benefit-cost analysis all the costs and benefits are evaluated in terms of their effects on the objectives and the welfare of the whole society. Therefore, information about the social objectives, performances of the various scarce resources in the economy, the governmental policies, etc. should be brought into the future.

In the following section the sensitivity analysis will be carried out with respect to the following parameters: the social rate of discount i, the shadow price of foreign exchange z, and the life of the project n.

The present value will be computed for the following variations in the parameters:

i = 0.06, 0.08, 0.10
z = 0.33, 0.50, 0.60, 0.80, 1.00
n = 50, 35.

All possible combinations of these parameter values can be calculated for pv and sensitivity analysis, but this would involve unnecessary work for results which may not be interesting.

Therefore, I have chosen only the above variations in the parameters ih order to indicate the sensitivity of investment choice to variations in the social discount rate i, and variations in the shadow price of foreign exchange as ranging from 33 per cent to 100 per cent.

1) First, the foreign exchange component of capital outlay in the two alternatives is corrected on the basis of a shadow foreign exchange rate of 33 per cent above the official rate. In oher words, when this social price of foreign exchange is applied, exchange rate will increase to $1 = 12 Turkish liras as compared to its actual rate of $1 = 9 T.L.

When a shadow price of 0.33 is used for correcting the foreign exchange components of project K and T, total capital investment of Keban will increase to 349.257 thousand dollars and of Thermal to 94.155 thousand dollars (see Tables 13 and 14).

2) Second, by applying now the social discount rate of 6 per cent, 8 per cent and 10 per cent the pv of total costs of the two alternatives is computed. The pv of total costs of Keban and the Thermal as calculated on the basis of 6 per cent, 8 per cent and 10 per cent are presented in the Appendix to this chapter.[1] However the results of the above pv computations are tabulated in Table 15.

(1) See, Appendix A.

Table 13. Keban Project - Capital Investment as Corrected For Foreign Exchange z = 0.33

	$000'
A. Generating Station	
1. Domestic Investment	185,070
2. Foreign Currency	49,915
a) 0.33 x (Foreign exchange)	16,471
B. Transmission System	
1. Domestic Currency	29,878
2. Foreign exchange	51,070
a) 0.33 x (foreign exchange)	16,853
TOTAL INVESTMENT	349,257

Table 14. Thermal Alternative: Capital Investment as Corrected for Foreign Exchange z = 0.33

	$000'
A. Generating Station	
1. Domestic Currency	23,000
2. Foreign Exchange	53,500
a) 0.33 x (Foreign exchange)	17,655
B. Transmission System	
1. Domestic Currency	-
2. Foreign Currency	-
TOTAL INVESTMENT	94,155

Table 15. Present Value of Total Cost Comparison of Keban and the Thermal Alternative

for i, and z.

$000'

	KEBAN HE		THERMAL ALTERNATIVE	
i \ z	1.0	1.33	1.0	1.33
0.06	342.6	377.7	458.4	478.6
0.08	329.8	363.8	360.7	379.6
0.10	324.3	357.9	302.3	320.6

As can be seen from Table 15, when pv calculations are based on the generally accepted shadow price of foreign exchange (0.33 p.c.), the following conclusions can be drawn:

(i) First, if a social discount rate of 6 per cent is used in pv calculations, the Keban HE project would still qualify for selection as the total pv of costs of Keban would be $377,7 thousand dollars as compared to the Thermal's $478,6 thousand dollars. As far as investment choice is concerned there is no difference in this case, between applying the market exchange rate or social exchange rate.

(ii) Second, at a social discount rate of 8 per cent the Keban HE would still be more economical, but not as much as before, since the gap between the pv of total costs of Keban and the Thermal narrows considerably. (Compare Keban's $363.8 thousand dollars with the Thermal's $379.6 thousand dollars).

(iii) At a 10 per cent social discount rate, Keban HE loses its advantage so as to give way to the selection of the Thermal project. Compare Keban's pv of total costs of $357,9 thousand dollars with the Thermal's $320,6 thousand dollars. It must, however, be pointed out that the Thermal will be the choice even if z is taken as the official exchange rate. But the advantage of Thermal becomes larger when z is taken as 0.33 per cent (on official exchange rate the difference between the two total costs will be $22 thousand dollars, while if z = 0.33 taken as a price the difference will be $37,3 thousand dollars).

(iv) One may then conclude that the choice between the Keban HE and the Thermal is quite sensitive to the chosen social discount rate as well as to the social price of foreign exchange.

The effect of the latter parameter on the sensitivity will be more noticeable when we compute pv for other variables in z.

Tables related to foreign exchange correction introduced on the capital investment for various values of z and the pv comparisons of both alternatives as corresponding to different z values are presented in the Appendix at the end of this chapter.

However, the range of variations in pv of the projects due to changes in i and z are summarized and shown in the following Tables (Tables 16 and 17). Figures 1 and 2 present these results in a diagrammatic form. Each line in a diagram represents the variations in pv due to changes in z for a particular value of i.

Table 16. Present Value Calculation of Total Cost of Keban HE: for various values of i and z

$000'

i \ z	1.0	1.33	1.50	1.60	1.80	2.0
0.06	342,6	377.7	395,8	406,5	427,8	449,0
0.08	329,8	363,8	381,4	391,7	412,3	432,9
0.10	324,3	357,9	375,2	385,4	405,8	426,2

Table 17. Present Value Calculation of Total Cost of the Thermal Alternative: for various values of i and z.

$000'

i \ z	1.0	1.33	1.50	1.60	1.80	2.0
0.06	458,4	478,6	489,1	495,2	507,5	519,8
0.08	360,7	379,4	389,4	395,1	406,6	418,0
0.10	302,3	320,6	330,1	335,6	346,7	357,8

Results are self-explanatory, but a short summary of the results may be helpful.

1. As can be seen from Tables 16 and 17 at 6 per cent and 8 per cent rate of discount Keban is more economical, but as soon as the social rate of discount rises to 10 per cent Keban project loses its attractiveness and the Thermal project with a shorter life and smaller initial capital becomes more economical.

A high rate of discount makes the pv of costs of a project with a distant future (Keban HE) appear less attractive as compared to the short-life project.(Thermal). In other words, the higher the social rate of discount the more attractive the Thermal project becomes. And the lower the social discount rate the more the Keban HE becomes attractive.

2. The social rate of discount affects the choice also through its relationship with the shadow price of foreign-exchange z. Generally, the higher shadow price of foreign exchange the more attractive the Thermal alternative appears to be. This is because Keban HE involves a larger amount of scarce foreign exchange for generating stations and transmission networks.

One can state categorically that, if the social discount rate is 8 per cent and provided that z is not over 60 per cent, the Keban HE is admissible. But as soon as z is increased to 0.80 per cent, Keban will not qualify for selection.[1]

The Thermal alternative, on the other hand, is not qualified for selection if the social discount rate is 6 per cent and 8 per cent, except when z happens to be taken higher than 60 per cent. For instance, if the social price of foreign exchange z is 80 per cent above the official rate when 8 per cent discount rate is used, the Thermal will be 5,7 thousand dollars cheaper than the Keban project for the same values. Hence, z = 1.60 is the cut-off point for the superiority of the Keban project as far as 8 per cent rate of discount is chosen.

3. At 10 per cent discount rate Keban HE will be rejected for any value of social price of foreign exchange z. Whereas the Thermal alternative will be eminently qualified for selection for any value of z. (Compare the pv of the two alternatives for any value given to z). It can also be concluded that worthiness of the Keban project is negatively correlated to the scarcity of foreign exchange.

If we take into account the foreign exchange value adopted by the SPO in project evaluation (i.e. z = 0.33 per cent), we notice that the Thermal's pv of total costs will be 37,3 thousand dollars lower than the Keban project.

4. The preseent value pv, of the Keban HE is more sensitive to variations in the shadow price of foreign exchange z than to the rate of social discount rate i.

The Thermal alternative, on the other hand, is less sensitive to the price of foreign exchange and more sensitive to increasing i.

For example, when z = 1.50 the pv of the Keban project will drop from 395,8 thousand dollars to 375,3 thousand dollars, provided i increases from 6 per cent to 10 per cent. Whereas for the same value of z, the pv of the Thermal will drop from 489.1 thousand dollars to 330,1 thousand dollars. The drop in the pv of the Keban HE will be 20,6 thousand dollars while the drop in the pv of the Thermal will be 159,0 thousand dollars (Compare Table 16 with 17).

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[1] As may be remembered, this is contrary to the result we obtained in the previous analysis where at 8 per cent (without correction for z), Keban was more attractive.

It can be concluded that for a given value of z the pv of Keban is only slightly sensitive, when the social rate of discount increases from 6 to 10 per cent; and for a given value of i the pv of Keban is extremely sensitive to increase in z.

The contrary is true for the Thermal alternative. For a given value of z the pv of the Thermal is quite sensitive when the social rate of discount increases; and for a given value of i, the pv of the Thermal is relatively less sensitive. (Compare the present values in Table 17, vertically and horizontally).

NET BENEFITS: Tables 16 and 17 show the pv computations of total costs of Keban and the Thermal alternative for a 100-year life period and for various values in parameters i and z. Table 18 and Figure 3, on the other hand, indicate the net benefits of Keban in terms of the costs of the Thermal alternative.

In actual fact the total costs of the Thermal alternative can be logically assumed to be the benefits obtained by not undertaking the total cost of the Thermal alternative. Under this logical assumption, net benefits of the Keban HE will be simply the pv of total cost of Keban minus the pv of total costs of the Thermal.

Table 18. Net Benefits of the Keban HE: at various values for z and i

$000'

i \ z	1.0	1.33	1.50	1.60	1.80	2.0
0.06	+115,8	+100,9	+93,3	+88,7	+79,7	+70,8
0.08	+ 30,9	+ 15,8	+ 8,0	+ 3,4	- 5,7	-14,9
0.10	- 22,0	- 37,3	-45,1	-49,8	-59,1	-68,4

It is generally accepted principle to measure benefits by the cost-saving realized by not having built an alternative station.(1) Thus, a simple comparison of the two capital costs and operating costs will give us the right answer so long as the level and the time pattern of the electric-power of each alternative is the same. This standard way of measuring benefits has been simply adapted to our case study, as can be seen in Table 18 and Figure 3.

(1) See A.R. Prest and R. Turvey, Benefit-Cost Analysis: A Survey. E.J., December 1965, pp.709-710.

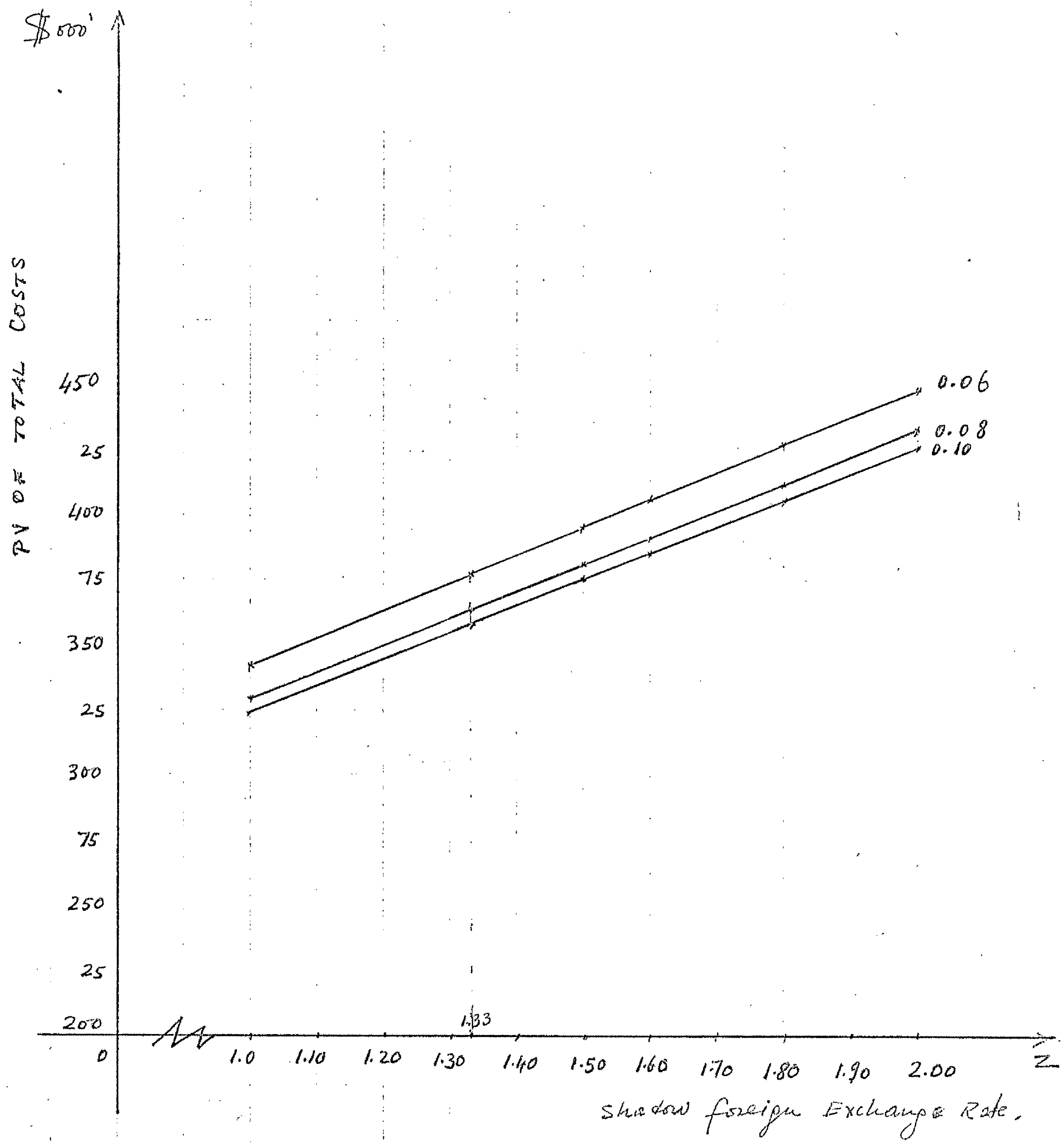


FIGURE 1 - PRESENT VALUE OF TOTAL COSTS OF KEBAN HE

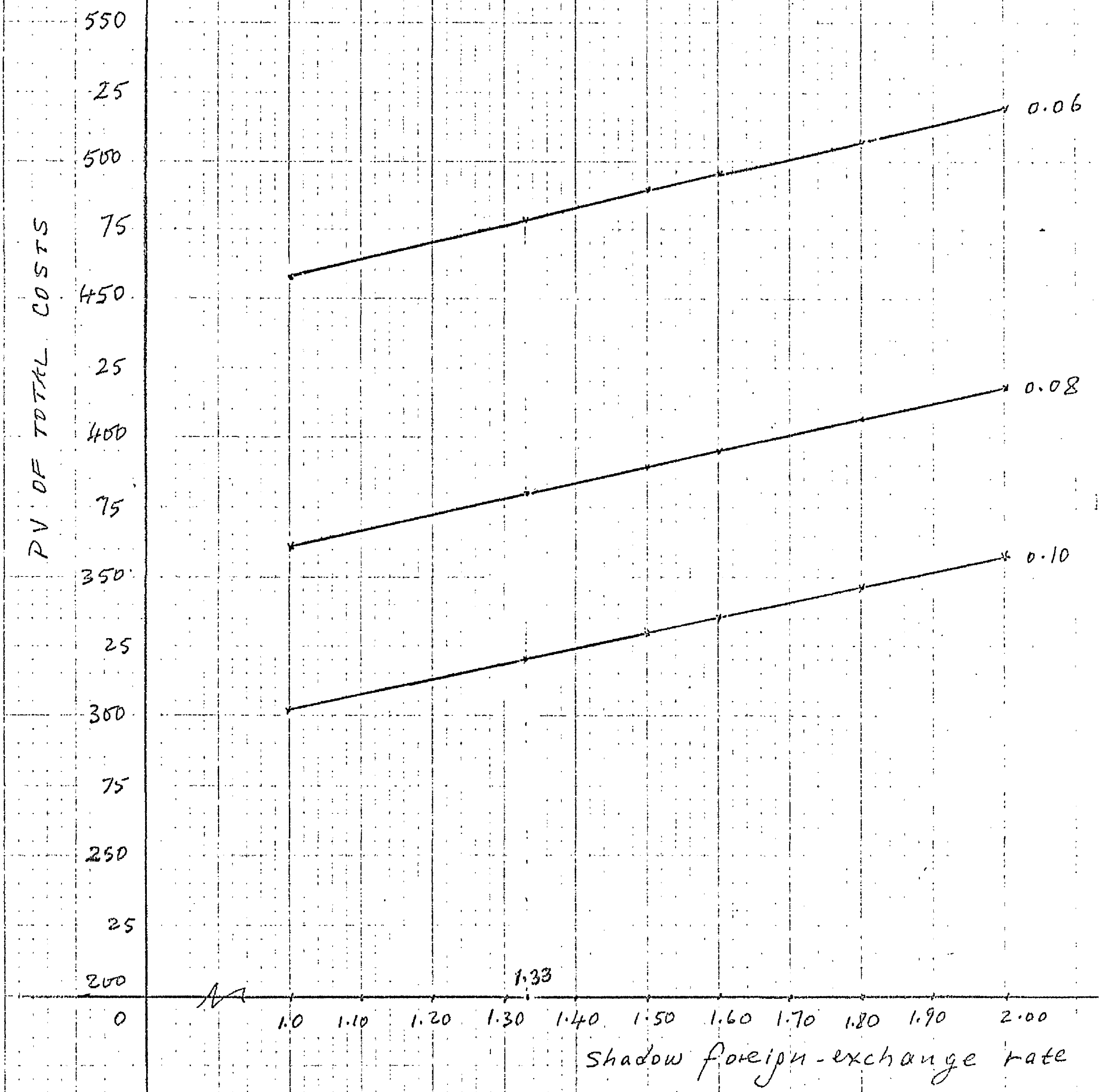


FIGURE 2 – PRESENT VALUE OF TOTAL COSTS OF THE THERMAL ALTERNATIVE

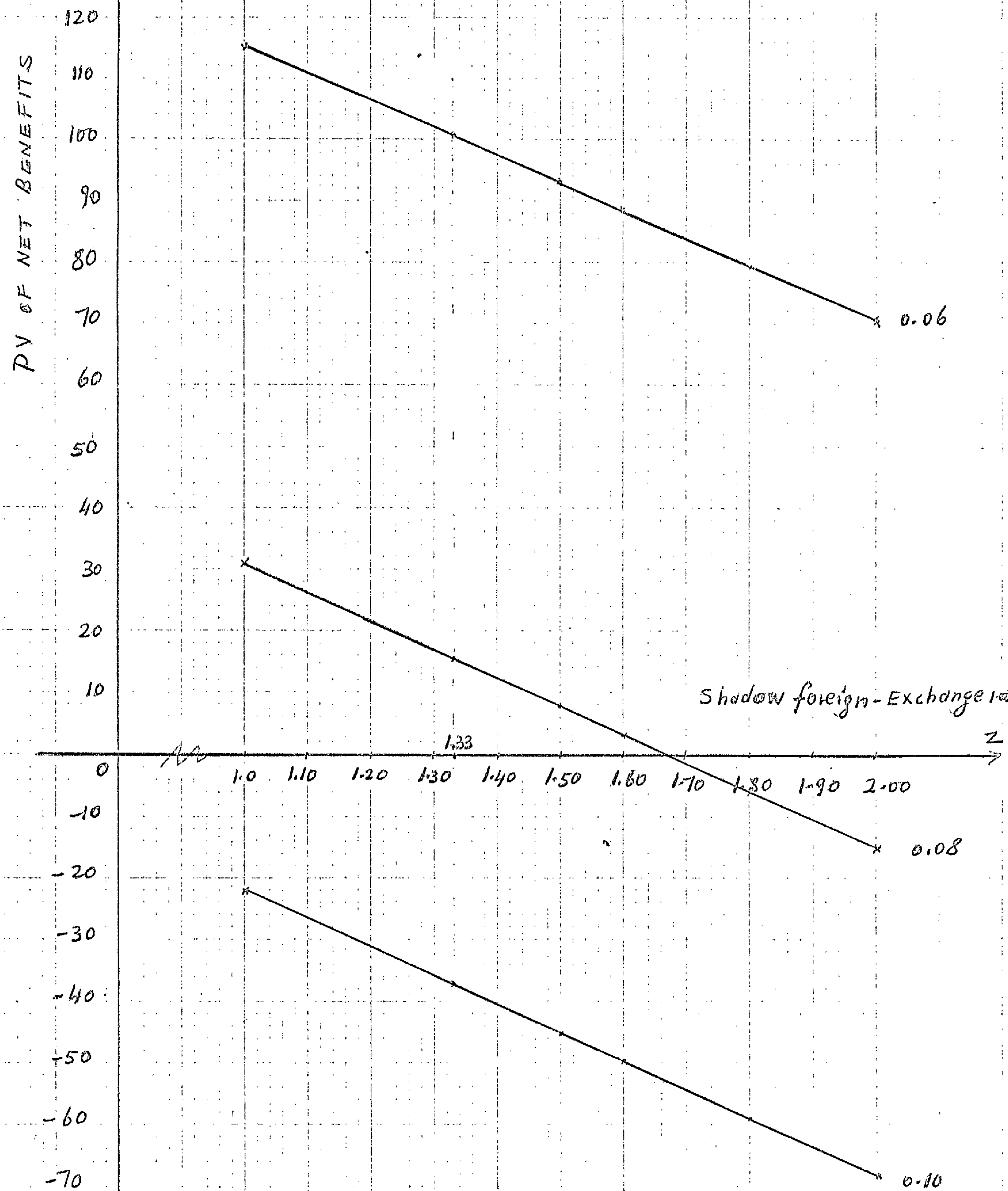
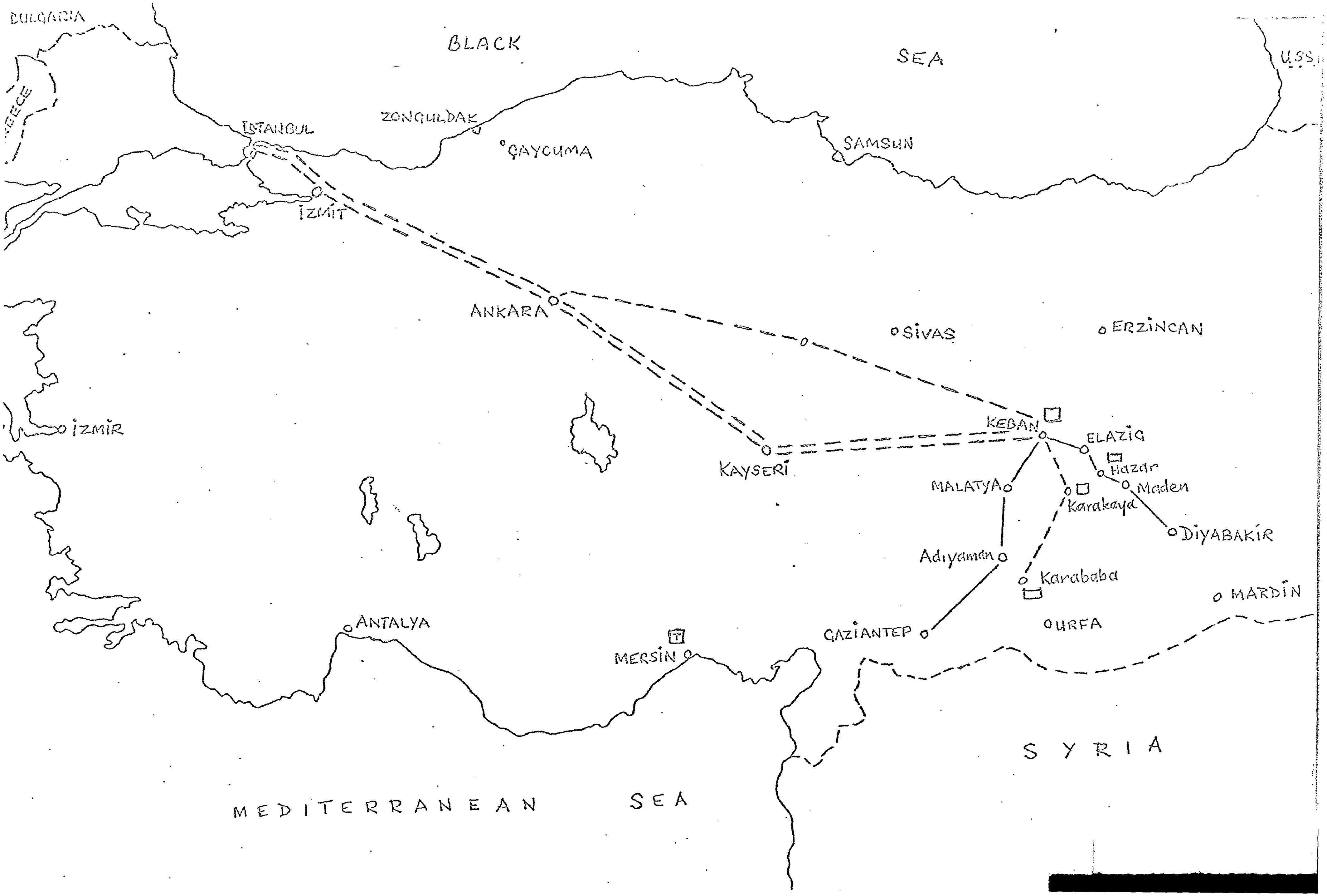


FIGURE 3 - PRESENT VALUE OF NET BENEFITS OF THE KEBAN HYDRO-ELECTRIC



BULGARIA
GREECE
BLACK
SEA
U.S.S.
İSTANBUL
ZONGULDAK
ÇAYCUMA
SAMSUN
İZMİT
ANKARA
SİVAS
ERZİNCAN
İZMİR
KEBAN
ELAZIG
Hazar
Maden
KAYSERİ
MALATYA
Karakaya
DİYABAKİR
Adıyaman
Karababa
MARDİN
ANTALYA
GAZİANTEP
OURFA
MERSİN
SYRIA
MEDITERRANEAN
SEA

The following conclusions are quite clear from Figure 3.

First, at 6 per cent social discount rate net benefits of Keban decline sharply as the social price of foreign exchange increases. Second, at 8 per cent rate of discount net benefits of Keban diminish as soon as z approaches 1.80 and thereafter the Thermal project becomes the choice. Third, at 10 per cent of discount rate the Thermal alternative qualifies for selection for any value of social price of foreign exchange z. The higher z, the more attractive the Thermal becomes as compared to the Keban HE.

VI-Conclusion In the preceding analysis I have taken certain values for the parameters i and z. These estimates were based on the available empirical data as well as on some guesswork. Because we cannot rely very much on these estimates, it is worthwhile to experiment with alternative values of these parameters. Such experimentations perhaps reveal the relative importance of these parameters on the results of this evaluation.

If a little variation in the value of some parameter, say the shadow price of foreign exchange (z), makes a great difference to the evaluator's conclusion about the project, then one might be very careful about estimating this parameter. On the other hand, if results are fairly insensitive to the variations in some parameter, the evaluator can feel confident about his conclusion, even if there is room for doubt about the exact value of this estimate.

Though on certain assumptions, by applying the pv rule we were able to compare the two alternative projects with different lives, the investment decision and choice of projects should not be based merely on such calculations.

The question here is to consider what may happen after the end of the life of the shorter-lived alternative. Generally speaking, a forecast that the replacement structure in the second 35 years (i.e. see Thermal) project will have much higher annual costs than the initial structure is favourable to project with longer life (i.e. Keban HE).

But, if there is a prospect that a replacement structure with much lower annual costs will be available this should be given weight in the present choice as a factor favouring project with shorter life (Thermal).

In other words, prospects for price increases and for extra costs incident to replacement are favourable to the selection of longer-lived alternative. On the other hand, prospects for technological improvements, changes in service requirements and price reductions are favourable to the selection of shorter-lived alternative (Thermal).

APPENDIX A

Capital Investment as corrected for the Shadow Exchange Rate, Z.

AND

Present value comparison of both alternatives on the basis of different values of shadow-exchange rate Z, and Social Discount rate, i.

TABLE 1 - Keban hydro-electric project; capital investment as corrected for shadow exchange rate, Z.

$ 000'

Capital Outlay		Foreign-exchange Penalty		Capital investment as corrected for Z
Domestic	Foreign(1)	Z	Additional Premium	Total
1	2	3	4=(2x3)	5=(1+2+4)
214.948	100.985	0.33	33.324	349.257
214.948	100.985	0.50	50.492	366.425
214.948	100.985	0.60	60.591	376.524
214.948	100.985	0.80	80.788	396.721
214.948	100.985	1.00	100.985	416.918

(1) Foreign capital is the sum of the foreign-exchange components of investments in Generating Station and transmission lines.

TABLE 2 - Thermal alternative: capital investment as corrected for shadow exchange rate, Z.

$ 000'

Capital Investment		Foreign-exchange Penalty		Capital investment as corrected for Z
Domestic	Foreign-exch.	Z	Additional Premium	Total
1	2	3	4=(2x3)	(1+2+4) = 5
23.000	53.500	0.33	17.655	94.155
23.000	53.500	0.50	26.750	103.250
23.000	53.500	0.60	32.100	108.600
23.000	53.500	0.80	42.800	119.300
23.000	53.500	1.00	53.500	130.600

NOTE: Item 5, total capital Investment figures which are corrected for the various values of shadow foreign-exchange rate, are used for the PV computations needed to compare economically the Keban project with the Thermal alternative.

TABLE 3 - Present value of total cost of Keban H.E.
For N = 100   i = 0.06   Z = 0.33

$ 000'

1.	Total fixed investment	349.257
2.	PW of first disbursement for renewal in 50 years: 349.257 (pwf' - 6% - 50) = 349.257 (0.0543) = 18.964	18.964
3.	PW of Annual cost (O+M) over 100 years: 574 (series pwf - 6% - 100) = 574 (16,618) = 9.538	9.538
4.	Total PW of cost of Keban H.E.	377.759

TABLE 4 - Present value of total cost of Keban H.E.
For N = 100   i = 0.06   2 = 0.50

$ 000'

1.	Total fixed investment	366.425
2.	PW of first replacement in 50 years: = 366.425 (pwf' - 6% - 50) = 366.425 (0.0543) = 19.896	19.896
3.	PW of annual cost (Op+Main) over 100 years: = 574 (series pwf - 6% - 100) = 574 (16,618) = 9.538	9.538
4.	Total PW of cost of Keban H.E.	395.859

TABLE 5 - Present value of total cost of Keban H.E.
For n = 100 i = 0.06 Z = 0.60

$ 000'

1.	Total fixed investments	376.524
2.	PW of first replacement in 50 years: = 376.524 (pwf' - 6% - 50) = 376.524 (0.0543) = 20.445	20.445
3.	PW of annual cost (Op+M) over 100 years: = 574 (pwf - 6% - 100) = 574 (16.618) = 9538	9.538
4.	Total PW of cost of Keban	406.507

TABLE 6 - Present value of total cost of Keban H.E.
For n = 100 i = 0.06 Z=0.80

$ 000'

1.	Total fixed investment	396.721
2.	PW of first replacement in 50 years: = 396.721 (pwf' - 6% - 50) = 396.721 (0.0543) = 21.541	21.541
3.	PW of annual cost over 100 years: = 574 (pwf - 6% - 100) = 574 (16,618) = 9.538	9.538
4.	Total PW of cost of Keban H.E.	427.800

TABLE 7- Present value of total cost of Keban H.E.

For n = 100 i = 0.06 Z = 100

		$ 000'
1.	Total fixed investment	416.918
2.	PW of first replacement in 50 years: = 416.918 (pwf' - 6% - 50) = 416.918 (0.0543) = 22.638	22.638
3.	PW of annual cost over 100 years: 574 (pwf - 6% - 100) = 574 (16,618) = 9.538	9.538
4.	Total PW of cost of Keban H.E.	449.094

TABLE 8 - Present value of total cost of Keban H.E.

For n = 100 i = 0.08 Z = 0.33

		$ 000'
1.	Total fixed investment	349.257
2.	PW of first replacement in 50 years: = 349.257 (pwf' - 8% - 50) = 349.257 (0.0213) = 7.439	7.439
3.	PW of annual cost over 100 years: = 574(series pwf - 8% - 100) = 574(12,494) = 7.171	7.171
4.	Total PW of cost of Keban H.E.	363.867

TABLE 9 - Present value of total cost of Keban H.E.

For n = 100 i = 8% Z = 0.50

		$ 000'
1.	Total fixed investment	366.425
2.	PW of first replacement in 50 years: = 366.425 (pwf' - 8% - 50) = 366.425 (0.0213) = 7.804	7.804
3.	PW of annual cost over 100 years: =574 (series pwf - 8% - 100) = 574 (12,494) = 7.171	7.171
4.	Total PW of cost of Keban H.E.	381.400

TABLE 10 - Present value of total cost of Keban H.E.

For n = 100 i = 0.08 Z 0.60

		$ 000'
1.	Total fixed investment	376.524
2.	PW of first replacement in 50 years: = 376.524 (pwf' - 8% - 50) = 376.524 (0.0213) = 8.019	8.019
3.	PW of annual cost over 100 years: = 574 (series pwf - 8% - 100) = 574 (12,494) =7.171	7.171
4.	Total PW of cost of Keban H.E.	391.714

TABLE 11 - Present value of total cost of Keban H.E.
For n = 100 i = 8% Z = 0.80

		$ 000'
1.	Total fixed investment	396.721
2.	PW of first replacement in 50 years: = 396.721 (pwf' - 8% - 50) = 396.721(0.0213) = 8.450	8.450
3.	PW of annual cost over 100 years: = 574 (series pwf - 8% - 100) = 574 (12,494) = 7.171	7.171
4.	Total PW of cost of Keban H.E.	412.342

TABLE 12 - Present value of total cost of Keban H.E.
For n = 160 i = 0.08 Z = 1.00

		$ 000'
1.	Totoal fixed investment	416.918
2.	PW of first replacment in 50 years: = 416.918 (pwf' - 8% - 50) = 416.918(0.0213) = 8880.3	8.880
3.	PW of annual cost over 100 years: = 574 (series pwf - 8% - 100) = 574 (12,494) = 7.171	7.171
4.	Totoal PW of cost of Keban H.E.	432.969

TABLE 13 - Present value of total cost of Keban H.E.

For n = 100 i = 0.10 z = 0.33

		$ 000'
1.	Total fixed investment	349.257
2.	PW of first replacement in 50 years: = 349.257 (pwf' - 10% - 50) = 349.257 (0.0085) = 2.968	2.968
3.	PW of annual cost over 100 years: = 574 (series pwf - 10% - 100) = 574 (9.999) = 5.739	5.739
4.	Total PW of cost of Keban H.E.	357.964

TABLE 14 - Present value of total cost of Keban H.E.

For n = 100 i= 0.10 z = 0.50

		$ 000'
1.	Total fixed investment	366.425
2.	PW of first replacement in 50 years: = 366.425 (pwf' - 10% - 50) = 366.425 (0.0085) 3.114	3.114
3.	PW of annual cost over 100 years: = 574 (pwf-10%-100) = 574 (9.999)	5.739
4.	Total PW of cost of Keban H.E.	375.278

TABLE 15 -present value of total cost of Keban H.E.

For n = 100 i = 0.10 z = 0.60

		$ 000'
1.	Total fixed investment	376.524
2.	PW of first replacement in 50 years: = 376.524 (pwf' - 10% - 50) = 376.524 (0,0085) = 3.200	3.200
3.	PW of annual cost over 100 years: = 574 (pwf - 10% - 100) 574 (9.999)	5.739
4.	Total PW of cost of Keban H.E.	385.463

TABLE 16 - present value of toal cost of Keban H.E.

For n = 100 i = 0.10 z = 0.80

		$ 000'
1.	Total fixed investment	396.721
2.	PW of first replacement in 50 years: = 396.721 (pwf' - 10% - 50) = 396.721 (0.0085) = 3.372	3.372
3.	PW of annual cost over 100 years: = 574 (pwf - 10% - 100) = 574 (9.999) =5.739	5.739
4.	Total PW of cost of Keban H.E.	405.832

TABLE 17 - PV of total cost of Keban H.E.

For n = 100 i = 0.10 z= 1.00

		$ 000'
1.	Total fixed investment	416.918
2.	PW of first replacement in 50 years: = 416.918 (pwf' - 10% - 50) = 416.918 (0.0085) = 3.543	3.543
3.	PW of annual cost over 100 years : = 574 (pwf - 10% - 100) = 574 (9.999) = 5.739	5.739
4.	Total PW of cost of Keban H.E.	426.200

TABLE 18 - present value of total cost of Thermal Project

For n = 100 i = 0.06 z = 0.33

		$ 000'
1.	Total fixed investment	94.155
2.	PW of first disbursement for replacement in 35 years: = 94.155 (Single pwf' - 6% - 35) = 94.155 (0.1301) = 12.249	12.249
3.	PW of second disbursement for renewal in 70 years: =94.155 (Single pwf' - 6% - 70) = 94.155 (0.0169) = 1.5912	1.591
4.	PW of annual disbursements over 100 years: = 22.307 (series pwf - 6% - 100) = 22.307 (16.618) 370.697	370.697
5.	Total PW of costs of Thermal	478.692

TABLE 19 PV of total cost of Thermal

For n = 100   i = 6%   z= 0.50

	$ 000'
1. Total fixed investment	103. 250
2. PW of first disbursement for renewal in 35 years:	
= 103.250 (single pwf' - 6% - 35)	
= 103.250 (0.1301)	
= 13.4328	13.432
3. PW of seconddisbursement for renewal in 70 years:	
= 103.250 (single pwf' - 6% - 70)	
= 103.250 (0.0169)	
= 1.7449	1.744
4. PW of annual disbursements over 100 years:	
= 22.307 (pwf - 6% - 100)	
= 22.307 (16.618)	
= 370.697	370.697
5. Total PW of costs of Thermal	489.123

TABLE 20 - PV of total cost of Thermal

For n = 100 i = 6% z = 0.60

	$ 000'
1. Total fixed investment	108.600
2. PW of first disbursement for renewal in 35 years:	
= 108.600 (single pwf' - 6% - 35)	
= 108.600 (0.1301)	
= 14.128	14.128
3. PW of second disbursement for renewal in 70 years:	
= 108.600 (single pwf' - 6% - 70)	
= 108.600 (0.0169)	
=1.8353	1.835
4. PW of annual disbursement over 100 years:	
= 22.307 (pwf - 6% - 100)	
= 22.307 (16.618)	
= 370.697	370.697
5. Total PW of costs of Thermal	495.260

TABLE 22 - PV of total cost of Thermal project

For n = 100 i = 6% z = 0.80

		$ 000'
1.	Total fixed investment	119.300
2.	PW of first disbursement for renewal in 35 years: = 119.300 (single pwf' - 6% - 35) = 119.300 (0.1301) = 15.5209	15.520
3.	PW of second disbursement for renewal in 70 years: = 119.300 (single pwf' - 6% - 70) = 119.300 (0.0169) = 2.016	2.016
4.	PW of annual disbursements over 100 years: = 22.307 (pwf - 6% - 100) =22.307 (16.618) = 370.697	370.697
5.	Total PW of costs of Thermal	507.533

TABLE 22 - PV of total cost of Thermal project

For n = 100 i = 6% z = 1.00

		$ 000'
1.	Total fixed investment	130.000
2.	PW of first disbursement for renewal in 35 years: = 130.000 (single pwf' - 6% - 35) = 130.000 (0.1301) = 16.913	16.913
3.	PW of second disbursement for renewal in 70 years: = 130.000 (single pwf' - 6% - 70) = 130.000 (0.0169) = 2.197	2.197
4.	PW of annual disbursement over 100 years: = 22.307 (pwf - 6% - 100) = 22.307 (16.618) = 370.697	370.697
5.	Total PW of costs of Thermal	519.807

TABLE 23 - PV of total cost of Thermal

For n = 100 i = 8% z = 0.33

$ 000'

1.	Total fixed investment	94.155
2.	PW of first disbursement for renewal in 35 years: = 94.155(single pwf' - 8% @ 35) = 94.155 (0.0676) = 6.3648	6.364
3.	PW of second disbursement for renewal in 70 years: = 94.155 (single pwf' - 8% - 70) = 94.155 (0.0046) = 0.4331	0.433
4.	PW of annual disbursements over 100 years: = 22.307 (series pwf - 8% - 100) = 22.307 (12.494) =278.703	278.703
5.	Total PW of costs of Thermal	379.655

TABLE 24 - PV of total cost of Thermal

For n = 100 i = 8% z = 0.50

		$ 000'
1.	Total fixed investment	103.250
2.	PW of first disbursement for renewal in 35 years: = 103.250 (single pwf' - 8% @ 35) = 103.250 (0.0676) = 6.979	6.979
3.	PW of second disbursement for renewal in 70 years: = 103.250 (single pwf' - 8% - 70) = 103.250 (0.0046) = 0.4749	0.474
4.	PW of annual disbursements over 100 years: = 22.307 (pwf - 8% - 100) =22.307 (12.494) = 278.703	278.703
5.	Total PW of costs of Thermal	389.406

TABLE 25 - PV of total cost of Thermal

n = 100 i = 8% z = 0.60

		$ 000'
1.	Total fixed investment	108.600
2.	PW of first disbursemtn for renewal in 35 years: = 108.600 (single pwf' - 8% - 35) = 108.600 (0.0676) = 7.3413	7.341
3.	PW of second disbursement for renewal in 70 years: = 108.600 (single pwf' - 8% - 70) = 108.600 (000046) = 0.4995	0.499
4.	PW of annual disbursements over 100 years: =22.307 (pwf - 8% - 100) = 22.307 (12.494) = 278.703	278.703
5.	Total PW of costs of Thermal	395.143

TABLE 26 - PV of total cost of Thermal

For n = 100   i = 8%   z = 0.80

		$ 000'
1.	Total fixed investment	119.300
2.	PW of first disbursement for renewal in 35 years: = 119.300 (single pwf' - 8% - 35) = 119.300 (0.0676) = 8.0646	8.064
3.	PW of second disbursement for renewal in 70 years: = 119.300 (single pwf' - 8% - 70) = 119.300 (0.0046) = 0.548	0.548
4.	PW of annual disbursement over 100 years: = 22.307 (pwf - 8% - 100) = 22.307 (12.494) = 278. 703	278.703
5.	Total PW of costs of Thermal	406.615

TABLE 27 - PV of total cost of Thermal

For n = 100 i = 8% z = 1.00

		$/000'
1.	Total fixed investment	130.000
2.	PW of first disbursemtn for renewal in 35 years: = 130.000 (single pwf' - 8% - 35) = 130.000 (0.0676) = 8.788	8.788
3.	PW of second disbursemtn for renewal in 70 years: = 130.000 (single pwf' - 8% - 70) = 130.000 (0.0046) = 0.598	0.598
4.	PW of annual cost (o & m) over 100 years: = 22.307 (pwf - 8% - 100) = 22.307 (12.494) = 278.703	278.703
5.	Total PW of costs of Thermal	418.089

TABLE 28 -mPV of total cost of Thermal

For n = 100 i = 10% z = 0.33

	$ 000'
1. Total fixed investment	94.155
2. PW of first disbursement for renewal in 35 years:	
= 94.155 (single pwf' - 10% - 35)	
= 94.155 (0.0356)	
= 3.3519	3.351
3. PW of second disbursement for renewal in 70 years:	
= 94.155 (single pwf' - 10% - 70)	
= 94.155 (0.0013)	
= 0.1224	0.122
4. PW of annual disbursemtns (o & m) over 100 years:	
= 22. 307 (series pwf - 10% - 100)	
= 22.307 (9.999)	
= 223.047	223.047
5. Total PW of costs of Thermal	320.675

TABLE 29 - PV of total cost of Thermal

For n = 100 i = 10% z = 0.50

		$ 000'
1.	Total fixed investment	103.250
2.	PW of first disbursement for renewal in 35 years:	
	= 103.250 (single pwf' - 10% - 35)	
	= 103.250 (0.0356)	
	= 3.675	3.675
3.	PW of second disbursement for renewal in 70 years:	
	= 103.250 (single pwf' - 10% - 70)	
	= 103.250 (0.0013)	
	= 0.1342	0.134
4.	PW of annual disbursements over 100 years:	
	= 22.307(pwf - 10% - 100)	
	= 22. 307 (9.999)	
	= 223.047	223.047
5.	Total PW of costs of Thermal	330.106

TABLE 30 - PV of total cost of Thermal

For n = 100 i = 10% z = 0.60

		$ 000'
1.	Total fixed investment	108.600
2.	PW of first disbursement for renewal in 35 years:	
	= 108.600 (single pwf' - 10% - 35)	
	= 108.600 (0.0356)	
	= 3.866	3.866
3.	PW of second disbursement for renewal in 70 years:	
	= 108.600 (single pwf' - 10% - 70)	
	= 108.600 (0.0013)	
	= 0.141	0.141
4.	PW of annual disbursements over 100 years:	
	= 22.307 (pwf - 10% - 100)	
	= 22.307 (9.999)	
	= 223.047	223.047
5.	Total PW of costs of Thermal	335.654

TABLE 31 - PV of total cost of Thermal

For n = 100 i = 10% z= 0.80

		$ 000'
1.	Total fixed investment	119.300
2.	PW of first disbursement for renewal in 35 years:	
	= 119.300 (single pwf' - 10% - 35)	
	= 119.300 (0.0356)	
	= 4.247	4.247
3.	PW of second disbursement for renewal in 70 years:	
	= 119.300 (single pwf' - 10% - 70)	
	= 119.300 (0.0013)	
	= 0.155	0.155
4.	PW of annual disbursements over 100 years:	
	= 22.307 (pwf - 10% - 100)	
	= 22.307 (9.999)	
	= 223.047	223.047
5.	Total PW of costs of Thermal	346.749

TABLE 32 - PV of total cost of Thermal

For n = 100 i = 10% z = 1.00

		$ 000'
1.	Total fixed investment	130.000
2.	PW of first disbursement for renewal in 35 years: = 130.000 (single pwf' - 10% - 35) = 130.000 (0.0356) = 4.628	4.628
3.	PW of seconddisbursement for renewal in 70 years: = 130.000 (single pwf' - 10% - 70) = 130.000 (0.0013) = 0.169	0.169
4.	PW of annual disbursements over 100 years: = 22.307 (pwf - 10% - 100) = 22.307 (9.999) = 223.047	223.047
5.	Total PW of costs of Thermal	357.844

Appendix B.

INTERNAL RATE OF RETURN OF THE
KEBAN AND THE THERMAL ALTERNATIVE

Introduction:

As was pointed out in Chapter 9, total benefits of the two alternatives are not given, nor are they brought into the economic evaluation of these projects. Benefits being identical, the E.I.E. planners have confined their evaluation method to the comparison of total annual costs of the two alternatives. Simply, the least costly project was selected for implementation.

Annual gross revenue and net profit data, are only given, as estimates, in one of the preliminary brochures published by D.S.I. in 1964. It is stated in this document that, if 1962 selling price, that is 8.94 kurus - per/kwh, is taken as the electric-power selling rate at consumer centres, the annual gross revenue will amount to 461,820,000 T. lira. Annual net proft, which is obtained by deducting operating and maintenance cost, and depreciation from the gross revenue, will amount to 272,357,000 T. L. (1)

But, there is here a very importat point which needs to be made clear, before we start computing the internal rate of return of the Keban project, That is, the accounting Net Profit given above (272,357,000 T.L.) is a wrong concept to employ in internal rate of return calculations. In deriving accounting net profit, depreciation is included in the annual cost of the Project. It is however, wrong to include depreciation in costs, since this particular cost is already fully allowed for by counting the initial investment as a negative cash flow at the time it takes place. (2)

Therefore, for internal rate of return, we cannot take the accounting profit of the Keban as representing cash flows since it indicates profits after depreciation. Thus, what we need for internal rate of return, is the annual cash flow which is simply gross revenue minus annual operating cost and maintenance. From the Table, presented in Chapter 9, we know, that, operating and maintenance cost of the Keban H.E., is $ 574.000 dollars. If this sum, is

(1) This preliminary price, is perhaps, changed now, but for simplifying my analysis, I shall assume that, the above price is valid. For the gross Annual Revenue and net profit figures, see, DSI, Keban Hydro-Dam and Electric Project, 1964, p.3.

(2) For the treatment of Depreciation in Internal Rate of Return, see, P.D. Henderson, Notes on Public Investment Criteria in the U.K., Bulletin of the Oxford University Institute of Economic Statistics. Vol. 27, Feb. 1965, p. 59; also, see A.J. Merrett & A. Sykes, The Finance and Analysis of Capital Projects, Longmans, 1965., p. 43. He States:"Cash receipts, or positive cash flows, comprise the incremental cash in flows, such as profit rent and depreciation." p. 43

converted into Turkish lira (at 1 $ = 9 T.L.), we obtain 5.166.000 T.L. as operating and maintenance costs.

On the assumptions that the Gross annual revenue is 461.820.000 T.L. and operation and Maintenance cost is 5.166.000 T.L. annual cash flows (receipts) becomes;

ACF = 461.820.000 - 5.166.000 T.L.

ACF = 456.654.000 T. Lira

This is the annual cash flow of the project which we need to use in the internal rate of return calculations.

Because the Thermal project and Keban H.E. have identical electrical capacities, it is fairly logical to assume that the annual gross revenue of the Thermal will be similar to that of the Keban Hydro-Electric Project. But it must be pointed out that annual net cash flows of the Thermal will depend on the annual cost which includes operation and maintenance cost.

The following assumptions need to be made in the computations of internal rate of return:

1. First, the above-mentioned figure (456.654.000 T.L.), will be taken as representing the relevant annual cash flows;

2. Second, annual cash flows will be assumed to remain constant throughout the life of the project;(3)

3. Third, as was pointed out in the earlies chapters, (Chapters 3 and 6), for internal rate of return computations, market prices will be used and not social prices as contrary to the case in social present value (SPV) rule. Similarly, the capital investment of the respective alternatives ought to be taken, on the basis of incorrected market prices. Thus foreign-exchange correction which I have introduced on the foreign-exchange component of total investment will not be necessary here.(4)

As can be remembered, the rate of return of any Project is the disoount rate at which the present value of net cash flow is zero. This rate will be

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(3) This is a widely-used assumption taken in PV and internal rate of return calculations.

(4) As can be seen, I am concerned here with the private internal rate of return and not social internal rate of return.

calculated by a trial-and-error method.

I - KEBAN HYDRO-ELECTRIC PROJECT: INTERNAL RATE OF RETURN.

It must be noted that, to find the internal rate of return of a project, it is first necessary to estimate the trial DCF rate (5) Frequently a simple inspection of the cash flow series will tell us whether to start by guessing a fairly low rate or a fairly high one. In general, it is necessary to take the average of the annual net cash flows and use this average to work out the trial DCF rate as if the project were an annuity.

But in our Case Study, the average will not be needed, since the annual net cash flows are constant. Then, the simple rule is to divide the capital cost of the project by the annual net cash flow and find from the present worth factor Tables,(6) the nearest DCF rate to be used for interpolatine method: Thus, in our Case Study:

$$\frac{\text{Capital Cost I}}{\text{Annual Cash Flow B}} = \frac{\$\ 315.933.000 \times 9\ (7)}{456.654.000}$$

$$\frac{I}{B} = \frac{2.843.397.000}{456.654.000} = 6.2$$

The nearest DCF rate for a 50 year annuity of 6.2, is 16 per cent; the present worth factor of which is 6.2462(8). Hence, 16 per cent should be used as the first trial discount rate and this is done in Table 1 and 2 where the net present value (NPV), is found to be + 6.123.960 T.L. (See Table 2)

This suggests that the DCF rate should be somewhat higher than 16 per cent. Therefore , the other trial discount rate, to be on the safe side, will be taken as 18 per cent.

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(5) DCF rate is nothing but internal rate of return. This well-known confusion must be averted now.

(6) For series present worth factor (pwf) tables, see Merrett & Sykes, The Finance and Analysis of Capital projects. Longmans, 1963 Appendix B

(7) The capital cost of the Keban project which is given in U.S. \$, is converted into T.L. at official exchange rate of 1 \$ = 9 T.L.

(8) See Appendix Table B, in Merrett & Sykes p. 160.

Now, the internal rate of return oomputation can be carried out in the following manner:

A. - The Net Present Value of the Keban H.E. at 16% discount rate:

1) Present value of annual net cash flows:

= 456,654,000 x (pwf - 16% - 50)

= 456,654,000 (6,2462)

PV_{b_1} = 2,849,520,960 T. lira

2) Capital investment of the Keban project which is given as \$ 315,933,000, must be converted to T. lira because the annual benefits are given in T. lira.

I = 315,933,000 x 9

I = 2,843,397,000 T.lira

3) The net present value (NPV) of the Keban project at 16% discount rate, will be the PV of annual cash flows minus the capital investment I, thus:

NPV = 2,849,520,960 - 2,843,397,000

$NPV_{i=16}$ = 6,123,960

TABLE 1 - PV of annual cash flows of the Keban H.E.:
At i = 16% and i = 18%

T.L.

Years	Annual net (a) cash flows T.L.	Present worth factor (pwf) at i = 16%	PV of cash flows i = 16%	Present worth factor (pwf) i = 18%	PV of cash flows i = 18%
1	456,654,000	(pwf - 16% - 50)		(pwf - 18% - 50)	
2	456,654,000				
•	•				
•	•				
•	•				
•	•			(5,5541)	
•	•				
•	•				
•	•				
50	456,654,000 x	(6,2462)	= 2,849,520,960		2,534,429,700
TOTAL			2,849,520,960		2,534,429,700

Note: a) The annual cash flow figures of each year need to be multiplied by the respective single present worth factors (pwf) for interest rates of 16% and 18%. But, since annual cash flows are regular series, the PV of annual cash flows over 50 years will simply be annual cash flows multiplied by the series pwfs. This, is 6,2462 for 16% interest and 5,5541 for 18% interest. For the pwfs, see the Tables, in Appendix Table B, in Merrett & Sykes, op. cit. p. 160.

B. - Net Present Value (NPV) of the Keban project at i = 18%:

1) Present value (PV) of annual cash flows over 50 years and at 18% discount rate:

= 456,654,000 (pwf - 18% - 50)

= 456,654,000 (5,5541)

PV_{b_2} = 2,534,429,700 T. lira

2) The initial capital investment of the Keban H.E. project:

I = 2,843,397,000 T.lira

3) The net present value (NPV) of the project at i = 18%

NPV = 2,534,429,700 - 2,843,397,000

$NPV_{i=18}$ = - 308,967,300

The above PV computations explain that the DCF return lies between 16% and 18%. As is seen, I have calculated above, the PV of the net cash flows at both rates and subtracted the initial capital cost of 2,843,397,000 T. lira, to find the NPVs of the project at these two rates. The results of these PV calculations, are tabulated in Table 2.

TABLE 2 - PV of cash flows of the Keban H.E.: at i = 16% and i = 18%

Years	Project Annual Cash Flows T.L.	16% Series present worth factor (pwf)	Discounted Cash Flows at i = 16%	18% Series present worth factor (pwf)	Discounted cash flows at i = 18%
	1	2	3 = 1 x 2	4	5 = 1 x 4
0	- 2,843,397,000		- 2,843,397,000		- 2,843,397,000
1	456,654,000				
2	456,654,000				
.					
.					
.					
.				(5,5541)[(b)]	2,534,429,700
50	456,654,000	(6,2462)[(a)]	2,849,520,960		
Net Present Value			+ 6,123,960		- 308,967,300

Note: (a) Series present worth factor (pwf), which corresponds to 16% interest and to 50 years life period.

(b) Series pwf for 18% interest and for 50 year life period. Appendix Table B, in Merrett & Sykes, op. cit. p. 160.

C. - INTERPOLATION[9] METHOD TO WORK OUT DCF RATE

At the correct DCF rate, the calculated net present value is zero, but we have one positive net present value of T.L., + 6,123,960 and one negative net present value of T.L., - 308,967,300. The correct internal rate of return (or DCF) is somewhat between 16% and 18% and this can be found by simple interpolation.

Net PV at 16%:	+ 6,123,960
Subtract NPV at 18%:	- 308,967,300
Difference in net present value	315,091,260

Thus, the correct internal rate of return must lie $\frac{6,123,960}{315,091,260}$, of the way between 16% and 18%, so the internal rate of return becomes:

$$r_1 = 16\% + \frac{6,123,960}{315,091,260} \quad (18\% - 16\%)$$

$$r_1 = 16\% + 0.019 \times (2)$$

$$r_1 = 16\% + 0.038$$

$$r_1 = 16.03$$

11. - THE THERMAL ALTERNATIVE: Internal Rate of Return

Following the above method, one can easily compute the internal rate of return of the Thermal Alternative.

As we have mentioned earlier, annual gross revenue of the Thermal, will be similar to that of Keban H.E. since both projects will be producing the

(9) In calculatin DCF return we use simple proportional interpolation. Strictly speaking this is not correct, but proportional interpolation gives such an approximately near result that it is generally not worth the effort to be more accurate. It must be noted that, for interest rates separated by 1% (i.e. 3% and 4%) the possible error from linear interpolation is relatively small. But this error can become larger when PVs are computed for rates separated by 5% (i.e. 15% - 20%). But errors introduced by a linear interpolation are too small to have appreciable influence on the decision-making on investment projects.

For more details on Interpolation Method, see W.G. Ireson and E.L. Grant, "The Principles of Engineering Economy," op. cit. pp 119-127; and A.J. Merrett & A. Sykes, 'Capital Budgeting and Company Finance', Longmans, 1966 pp 10-16.

same amount of electric power and also sell at the same rate per kwh. Thus, gross annual revenue will be 461,820,000 T. lira, as it was for the Keban Hydro-Electric.[10]

But the annual cash flow of the Thermal will, naturally be different than Keban H.E. because annual cost, comprising operation and maintenance costs in Thermal, is different. In order to find the annual net cash flows (not accounting profits), we must subtract annual operating and maintenance cost (O + M) from the gross annual revenue of 461,820,000 T. lira. Annual operating and maintenance cost of Thermal is given as $ 22,307,000, as can be seen from the Table in Chapter 9.[11] Then, annual cash flows of the Thermal Alternative becomes:

ACF = Gross annual revenue - Annual cost (operating and maintenance costs)

= 461,820,000 (T.l.) - $ 22,307,000 x 9[12]

= 461,820,000 (T.l.) - 200,763,000 T.l.

ACF = 261,057,000 T. lira

This net annual cash flow figure, is what we need for computing the PV of cash flows over a 35 year period.[13] To aid our internal rate of return calculations, it is necessary to find the trial DCF rate by dividing the initial capital cost by the average annual cash flow of the Thermal.

$$\text{Trial DCF rate} = \frac{I}{ACF} = \frac{\$\ 76{,}500{,}000 \times 9}{261{,}057{,}000}\ ^{(14)}$$

$$= \frac{688{,}500{,}000}{261{,}057{,}000}$$

Trial DCF rate = 2.63

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(10) Information on the Thermal project is quite limited, but the above assuption seems to be a logical one to allow us to compute its annual cash flows and consequently its rate of return.

(11) Total annual cost of the Thermal is $ 26,568,000, but this includes fixed charges, (depreciation), E.E.I., A Private Typed Document, July, 1968. p.1.

(12) Annual operating and maintenance cost is given in U.S. dollars and should be converted into T. lira at the official exchange rate of 1 $ = 9 T.l.

(13) As may be remembered, this is the lifespan of the Thermal project; See Chapter 9.

(14) Capital investment of the Thermal is converted into T.L. at official exchange rate of 1 $ = 9 T.L.

This means that the trial rate of discount can be taken to be 38%, where the present worth factor(pwf) for 35 years is 2,6315 (15)

A - Net Present value of Thermal Alternative at 38% discount rate:

1) PV of annual cash flows over 35 years at i = 38%

= 261,057,000 x (pwf - 38% - 35)

= 261.057.000 (2,6315)

= 686,579,910 t.l.

2) PV of capital investment of the Thermal

I = $ 76,500,000 x 9

I = 688,500,000 t.l.

3) The NPV, which is the difference between PV of annual cash flows and capital cost:

$NPV_{i=38}$ = 686,579,910 - 688,500,000

$NPV_{i=38}$ = - 1.920.090 t.l.

B - In order to obtain a positive value for the NPV of the project, we must now, apply a trial rate which is a little lower than 38%. Let us take 36% NPV of the Thermal Project at i = 36%:

1) PV of annual net cash flows over 35 years:

= 261,057,000 x (pwf - 36% - 35)

= 261,057,000 (2,7777) (16)

= 723,127,890 T. lira

2) Investment cost of the Thermal

I = 688,500,000 T.l.

3) The NPV of the Thermal Alternative at 36% rate of discount, will be the present value PV, of net cash flows minus the initial capital cost. Thus,

$NPV_{i=36}$ = 723,127,890 - 688,500,000

$NPV_{i=36}$ = + 34,627,890 T.l.

(15) For present worth factor, see, Appendix Table B, in Merrett & Sykes. "Capital Budgeting and Company Finance", Longmans, 1965, p. 164.

(16) Present worth factor(pwf) for 36% interest and for 35 years. See, Appendix Table B in Merrett and Sykes op.cit. p. 164.

C - INTERPOLATION METHOD: To find DCF Rate

Now, we have one positive net present value of + 34,627,890 t.l., and one negative net present value of - 1,920,090 t.l. The internal rate of return of the Thermal is then somewhat between 36% and 38% and this can be computed by interpolation.

NPV at i = 36%	=	+ 34,627,890
NPV at i = 38%	=	- 1,920,090
TOTAL		36,547,090

Therefore, internal rate of return of the Thermal Alternative becomes:

$$r_2 = 36\% + \frac{34,627,890}{36,547,980} (38\% - 36\%)$$

$$r_2 = 36\% + 0.94 \times (2)$$

$$r_2 = 36\% + 1.88\%$$

$$r_2 = 37.88\%$$

CONCLUSION:

1) It is worthstressing that, the remarkable difference in the internal rate of return of the Keban H.E. and of Thermal Alternative (16% v. 37%), is due to the fact that the latter has a shorter life than the former and its initial cost is considerably much lower than of the Keban.

A simple comparison between internal rates of return of projects with different lives cannot be meaningful, unless something is done to bring them to a similar life period. Thus, the replacement of the Thermal alternative for another 15 years (to bring it to 50 year life), should be taken into account. It should be noted that this is not an easy task, while we are considering internal rate of return rule. This difficulty of comparing two mutually exclusive projects with different lives is one of the major objections raised against the internal rate of return criterion. For this reason I have used PV computations as they are a more helpful and meaningful apparatus to apply, in project comparisons.

2) The above results on internal rates of return should not be taken at face value; they should be accepted with some qualifications. This stems from

the fact that the two alternatives have different life spans. With some reservations it can be concluded that the Keban H.E. project will also be rejected on the basis of internal rate of return rule. But, it can also be argued that, an infrastructure project with a high capital intensity should not be judged only according to its direct benefit flows. If the indirect benefits are estimated and found to be an appreciable compnent of the annual benefit flows, the Keban H.E. could perhaps emerge as an attractive project.

As I have emphasised in Chapter 9, the indirect benefits of the Hydro-Electric project are not included in the benefit-cost analysis of E.I.E., though some of these effects might have been quite important.

3) If indirect benefits are excluded from the benefit-cost analysis, on the basis of direct benefits alone, the Keban H.E. appears to be an unacceptable project, both of PV and intœrnal rate of return criteria.

It is fair to conclude that the Thermal is more profitable on the basis of the two criteria I have considered, and it should have been selected in place of the Keban H.E. project.

4) It seems that the S.P.O. planners, have accepted the Hydro-Electric project without (even) measuring the indirect benefits of the project. Perhaps these effects were only indicated in qualitative terms. This, however, can be dangerously misleading and can lead to waste of resources.

CHAPTER 10.

CONCLUSION

As in Keynes's words "without theory we are lost in the woods", I feel that the theoretical investment criteria expounded in the second part of this thesis are not irrelevant in the allocation of investment resources and in the selection of investment projects, programmes and plans.(1)

Needless to add that some conceptual and operational difficulties are inherent in all these criteria in so far as quantitative precision is concerned. Various proliferations and sometimes rough assumptions have got to be made in applying them to actual cases. But even so, as guides to investment planning decisions, they are much better rules than ad hoc methods of investment allocation currently applied in planning practice.

With the economic planning technique just started in Turkey, to achieve certain goals there is a strong possibility that economic criteria will be widely applied to various investment decisions that have to be made. After all, the best investment planning is that which achieves objectives of development policy within the constraints and limits of scarce resources and time. It has therefore been the main object of this study to find out the theoretical investment criteria adopted in Turkey and critically examine the project evaluation technique pursued during the formulation of the First Five-year plan.

More specifically, my purpose in this study was essentially to provide answers to the following questions:

1) To see to what extent the planning technique adopted in Turkey has been a feasible one.

2) To what extent did the discussion of investment criteria produce any enlightenment as far as Turkish First plan is concerned?

3) To expose the shortcomings of the Project evaluation technique adopted in Turkey, and also to indicate which criteria among all those discussed is the most relevant and suitable to Turkish conditions.

4) To see if there are further statistical data problems for a better planning technique and project evaluation.

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(1) By project is meant the smallest unit of investment activity that can be carried out independently of other projects; an investment programme is a coordinated set of projects; an investment plan is an integrated set of programmes.

It was shown in Part II that the commercial profitability criterion which is based on market prices is imperfect and may lead to misallocation of resources. It was therefore concluded that the planning agency responsible for investment appraisal would need to introduce social investment criteria that are based on accounting prices rather than market prices. It was also emphasized that the private profitability criteria need to be replaced by better investment rules, in so far as evaluation is to be made from the society's point of view.

To this end, I have discussed some of the most common investment criteria in great detail; and some were only briefly mentioned. The investment criteria I have introduced have included capital-turnover criterion, social marginal productivity (SMP) criterion and finally social present value (SPV) criterion. Other criteria, namely marginal per capita reinvestment criteria, marginal growth contribution and time series criteria are not analysed in detail since they are not meant to be formal criteria (at least at micro-level) and they can be taken care of by the application of social present value (SPV) rule by manipulating the discount rate it requires.

But the former set of criteria are extensively analysed and the conditions in which they are applicable were pointed out. There is no need to elaborate more on each individual criterion that I have critically surveyed in the thesis. However, there are many important issues and implications which derive from each criterion and these, I believe, could be a useful guide for project evaluation.

This is what Part II of this thesis has attempted to achieve. The basic principles discussed in Part II have provided a complete frame in the light of which I have attempted to conduct two Case Studies taken from the Public Sector (Part III).

Although Turkey has succeeded in running the economy along the lines of planned economic development via rational planning and government steering, her First Five-Year Plan (1963-67) was by no means inclusive of every aspect of national planning.

The composition of an investment programme and its priority system reveal the future developmental needs of Turkey which is on the verge of transformation, but it lacks the systematic allocation of investment resources.

Despite the fact that the SPO had attempted at that time to prepare an input-output model, this had constituted a great challenge to the planners, and consequently with its unreliable data was not taken as a basis for sectoral production projection or investment decision (for input-output analysis, see Chapter 5). On the contrary, investment decisions were based on personal experiences, subjective judgements and separate sector studies.(1) The approach in short was simply a departmental approach which was based upon the collection of projects from various sectors. This approach, of course, has failed to provide either a rational allocation of resources or consistency among sector programmes.

There is some evidence to suggest that investment projects included in the plan are not all re-appraised and selected according to a formal investment priority system; but the SPO has taken for granted the decision of the Ministries in order to justify the inclusion of projects in the Investment Plan.

There was also no overall assessment of the priority considerations that will bring out the relationship existing between the projects and the economy (the only exception being the industrial projects presented by the SEE). The SPO, which should re-appraise and scrutinize investment projects has accepted these projects on the responsibility of the individual government departments. It is a fact that many projects submitted by the individual ministries were included in the plan, without being appraised and selected according to national costs and benefits or any investment priority system which takes into account various interdependencies between individual decisions. The SPO later had simply aggregated the individual projects (those which are based on different criteria) into sectoral and national plan, without seeking some kind of consistency among individual projects.

First, it can be argued safely that proposed investment projects may not be mutually consistent and balanced or studied in the light of overall repercussions on the whole economy. The result, of course, will be a serious balance of payments disequilibrium with a heavy inflationary pressure.

Secondly, without a general and uniform investment criterion, there is a danger that planners at various government departments will trot

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(1) Y. Küçük, The Macro-model of the Plan, in "Planning in Turkey", M.E.T.U., pub. No.9, Ankara, 1967, pp.78-79

out their pet projects and schemes. The plans as a result will be uneven in quality and based on a variety of perhaps conflicting criteria. The problem here is mainly one of consistency among projects and efficiency in the selection of projects.

Turkey, with the exception of industrial projects proposed by the S.E.E., has not utilised the modern investment criteria, which I have discussed in Part II. The criteria adopted during the First Plan period varied between the simple commercial profitability criterion (as used by SEKA in Case Study No.1), social present value (SPV) (as introduced by SPO) and "equivalent annual cost" criterion (by E.I.E. in Case Study No.2). This point will be discussed later, when reference will be made to the weakness of project evaluation technique adopted in the Case Studies 1 and 2.

As far as sectoral programming techniques is concerned the following points can be made:

(a) The basic statistical information needed for construction of an input-output model was dispersed more than scarce;

(b) The input-output table which was prepared and partially applied was a simple one, but at least had shown a considerable interdependence among production sectors despite Turkey's heavy reliance on imports. Changes in the input coefficients are likely to be great over time because of the establishment of new industries, the substitution of domestic production for imports, the adoption of new techniques and rapid changes in the future composition of output. The importance of such factors in formulating an input-output model have become clearer in the minds of planners.

(c) There is a great need for further improvement in the quality and quantity of available data and statistics for the preparation of a more complex input-output table (1). By the application of economic models the

(1) It is very encouraging to see that the Second Five-Year Plan (1968-72) is prepared with more sophistication. The macro-model was based on more reliable data and was advanced by including more variables, more scarce factors, (i.e. skilled labour) and more sectors. All sector-planning was prepared on the basis of more complex input-output techniques. See J. Tinbergen, "Methodological Background of the Plan," in"Planning in Turkey", M.E.T.U. (Edited by S.Ilkin and E. Inanc,)Faculty of Administrative Sciences, pub. No.9, Ankara, 1967, p.77

weaknesses in available statistics and data will come to light and this might entail continuous improvement of them.

d) By and large, it can be said that the programming technique was basically simple, but this simplicity was due to non-availability of required data and technical capacity.

At sectoral programming stage some word must also be said about the importance of inter-industry matrix analysis.

Inconsistencies and imbalances in forecasting output targets and investment targets can only be avoided by resorting to an advanced inter-industry matrix model. This model should take into account not only inter-industry flows but also relations among different stocks and between stocks and flows. Very broadly, such a model is useful for the following reasons:

(i) such models in development programming can provide the planners with an accurate test of adequacy of available resources and helps in the allocation of resources for the achievement of the desired production levels.

(ii) inter-industry models can also provide for each sector estimates of production and import levels which are consistent with the estimates of final demand.

(iii) they are also useful in checking overall requirements of a given development programme against the availability of such factors as man-power, capital and foreign exchange.[1]

But it must also be pointed out that these models too can have some serious shortcomings which may belittle the whole practical usefulness. (see Chapter 5). These models may have limited applicability, if there are structural changes in technology, shifts in the structure of intermediate demand, substitution of domestic production for imports and technical sub-stitutability of imports needed for the production of the same commodity are taking place.

In order to overcome these limitations inter-industry relations have to be formulated in the more general framework of linear programming.

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[1] See H. B. Chenery and P. G. Clark, Inter-industry Economics, John Wiley & Sons, Inc., New York, 1962. Chapters 4, 5 and 6 (pp.81-164).

This will aid the planners in finding the most economical way of achieving a given set of objectives and to determine the efficiency of alternative programmes.(1) In connection with production techniques and investment priorities a linear programming model can help development planners to include several alternative techniques of producing the same commodity as well as alternative uses of the same resources.

II.

In what follows I shall stress the basic shortcomings of the project evaluation method applied in Turkey during the formulation of the First Plan.

a. From the two case studies I have discussed in Part III it can be seen that different evaluation systems and investment criteria were applied in Turkey. As can be remembered from the preceding chapters (esp. chapters 6, 7 and 9) the State planning organisation (SPO) had resorted to the social present value (spv) criterion in industrial projects while other government planning agencies - namely SEKA and E.I.E. applied "annual accounting rate of return" and "equivalent annual cost" criterion respectively.

It can be concluded that there has been no uniformity in the application of investment criteria nor in the project evaluation technique. The fact that each planning agency was left free to choose its own operational investment criteria can be regarded as an exceedingly misleading approach for resource allocation and formulation of development programmes.

It can be argued that the SPO - Central planning agency - and other more specialised planning agencies (i.e. E.I.E.) should cooperate and integrate

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(1) In a linear programming model two solutions can be worked out. In one formulation, resources including foreign exchange are given and net national product is to be maximised. In the other formulation targets for expansion of national income and limitations on its composition are specified. The maximum amount of foreign borrowing consistent with these objectives are taken as a test of efficiency. If practical difficulties in linear models (i.e. uncertainty, non-linearities and data problem) can be overcome, building up a programming matrix and its solution can provide answers to such questions as the respective levels of investment and the rate of growth of consumer and capital goods industries; the optimum combination of industries and maximum rate of expansion which corresponds to the goals of development policy. It is an ideal solution to the problem of economic development, but it is extremely difficult. For linear programming technique see H. B. Chenery, Development Policies and Programs, UN Economic Bulletin for Latin America, March 1958, pp.60-72. ; H. B. Chenery, Comparative Advantage and Development Policy in "Surveys of Economic Theory" - Growth and Development. American Economic Assoc. and the Royal Economic Society, Vol.II, Macmillan, St. Martin's Press, New York, 1965, pp.137-153; also see H. B. Chenery and P. G. Clark, Inter-Industry Economics, op.cit., pp.82-135.

their different approaches to project evaluation in order to preserve consistency and improve the quality of selected projects.

However, this important point has not been sufficiently considered by the SPO in the First Five-Year Plan period, though some effort was made lately to arrange a joint conference by the SPO and State Investment Bank (SIB) in order to discuss and coordinate the various investment criteria applied by different government agencies and the state economic enterprises.(1)

b. Another weakness of the Turkish project appraisal technique is the inconsistency between the project appraisal technique applied by the SPO and E.I.E. The former used "shadow" prices for certain inputs such as foreign exchange and unskilled labour while the latter agency did not consider "accounting prices" in any way at all. (See Keban HE project - Chapter 9). A partial application of accounting prices may cause serious misallocation of scarce resources among difficult sectors and projects. As a result, there will be a heavy drain on scarce resources where they are underpriced and less drain when they are overpriced.

In addition to these, the discount rate applied in social benefit cost analysis was not a unified one. This point can be seen from the fact that the SPO applied a discount rate of 12 per cent in the Gaycuma paper project, while the E.I.E. applied a 6 per cent rate of discount in the Keban hydro-electric project. There is some evidence which suggests that the SPO had considered various factors in determining the social discount rate (see Chapter 8), but the same cannot be said for the discount rate applied by the E.I.E. planners. The latter planning agency, as evidence reveals, used entirely the borrowing rate of interest (market) without giving due consideration to the social opportunity cost of capital.(2)

A choice of a unified rate of discount is of vital importance in social benefit-cost analysis, and this should have been initially solved by

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(1) These conference lectures are published in "DPT ve Devlet Yatirim Bankasi Ortak Yayini - " Yatirim Projelerinin Hazirlanmasi ve Değerlendirilmesi" Cilt I, Cilt II, ve Cilt III, SPO, Ankara, 1968.

(2) It must however be added that adjustments of benefits and costs are necessary to allow for (1) time, (2) risk and uncertainty and (3) the social opportunity cost of capital resources employed. Following this, benefit and cost streams can be assessed with the aid of a relevant criterion.

the SPO and government agencies undertaking project appraisal. Clearly, a variety of interest rates may lead to the selection of unprofitable and inferior projects (at least from society's point of view). This, in fact, has been demonstrated in our case study No.2 (Chapter 9) where, when discount rate i was increased to 10 per cent the choice has become in favour of Thermal project instead of Keban hydro-electric. The importance of social prices in benefit-cost analysis was extensively discussed in Part II of this thesis; therefore it seems unnecessary to reproduce this point here once again.

c. It is a common practice in social cost-benefit analysis to consider also the indirect and secondary benefits and costs that might arise from a particular project.

As far as the Gaycuma paper plant project is concerned, some of the indirect benefits are included in the social benefit-cost analysis. As may be remembered (see Chapter 7) these benefits included benefits arising from foreign exchange savings, benefits to consumers in terms of price reductions and benefits to unskilled workers employed by the investment project.

But external or spillover effects of the Gaycuma paper project on other sectors (i.e. forestry, transport, cement etc.) have not been taken into account, nor have they even been mentioned. Spillovers have been defined by R. N. McKean as "impacts of actions by some decision-making unit upon the activities of others, impacts which are not directly felt by the first group."(1) For such a case study only those which alter the community's production function are relevant and this can usually be taken as excluding those due to relative price changes. Therefore, those secondary benefits and costs which consist principally of changes in income (or output) in the forestry industry which will provide the required raw materials, and income increase in transport and cement industry due to unutilized capacity existing previously, should be given monetary considerations.

This is a province of social cost-benefit analysis in which Turkey has a long way to go. This charge against project appraisal becomes even more pronounced in the evaluation of the Keban hydro-electric project by the E.I.E.

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(1) See R. N. McKean, Efficiency in Government Through Systems Analysis. John Wiley & Sons Inc., 1858, p.134

Since the latter project is a multi-purpose project, its indirect and secondary benefits become more significant. Yet it is surprising to note that the spillovers effect of the Keban HE project on flood-control, irrigation, navigation, fishing and technological spillovers on the nearby mining industry (in Maden) are completely ignored and there has been no attempt to estimate any of them. They are only listed in a special report in order to provide qualitative judgement.

d. Total benefits, as comprising primary and indirect benefits (in Gaycuma paper project) are computed on static assumptions such as no changes in prices of inputs used (including shadow prices), no changes in prices of output and no changes in discount rates. All these assumptions make the economic evaluation of the SPO a rather simple one. Changes in all these prices in the future need to be taken into consideration for a dynamic and more accurate evaluation.

At least sensitivity analysis in respect to changes in the above parameters could be used as an effective and useful exercise. But such a technique has not been used by the SPO nor by the E.I.E.

The time element is very important in project evaluation. Theoretically, the benefits and costs for each and every year of the project's life should be calculated. This in practice poses so large an additional work-effort that the issue is generally reduced to an investigation of whether there are any good reasons for not assuming the benefits and costs <u>constant</u> throughout the life of the asset.

For the Case Study No.1 the significant factor is whether the market or demand for paper and cellulose products will change over time as to affect the scale of production and the selling price of the Gaycuma paper plant, or whether the cost of factors of production will show a significant upward or downward trend. These are factors related to the future and any attempt to estimate these will present as many inaccuracies as neglecting it does since (1) nobody is certain what the growth will be 20 years hence and (2) even if they were it does not mean that it would have a proportional effect upon the benefit and cost streams, due to the mainly unknown future effect upon operational costs.

It is therefore on a practical level that the problem is usually solved by assuming that the benefits and costs remain constant throughout the life of the project. Correspondingly this is what has been assumed in both Gaycuma paper project and Keban hydro-electric project.

e. The present value method is more desirable from a theoretical point of view in that it takes into account variations in the time path of returns from a capital investment. In the present value (pv) rule both costs and returns over the whole life of the investment are reduced to a single figure, the present day value. Discounting to present day is based on the assumption that capital is productive. The rate of interest used in this method is not the rate of interest obtainable at the local commercial banks, in the money market or from local money-lenders, but is a shadow price which indicates the marginal rate of return on capital, i.e. the opportunity cost of capital.

There has been a long controversy over the use of a positive rate of discount to determine present day values (see Chapter 8).[1] All these arguments, however, do not obviate the need for rates of discount in planning. They can be used to argue against adopting the rate of interest prevailing in the market whatever that might be.

As I have argued throughout this thesis, the best criterion to apply in Turkish conditions is the social present value (spv) which can take into account all indirect and secondary benefits, social prices of outputs and factor inputs as well as the present value of the returns on capital invested. It is a forward step to see that the SPO has utilised the spv criterion to some limited degree. But the evaluation technique adopted in the application of this criterion does not seem very satisfactory.

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(1) In determining the discount rate, it is necessary to take into account the social time preference rate, but also to consider the social opportunity cost of capital. But, unfortunately, the market is not perfect and the question at what rate to discount has led to much controversy. Some of the theoretical issues have been discussed in Chapter 8 of this thesis. But for a practical study the complexity leaves one with the choice of assuming either (1) that the two rates are in reality equalled but that market imperfections do not permit of their identification, or (2) that it is the market imperfections themselves which prevent the two rates from being brought into equality. If the latter is the case, then one is in trouble for, in addition to the problem of measurement, one has to decide upon the basis of a value judgement which of these two rates to adopt. If it is the first, then all that has to be done is measure the rate which is believed to most closely approximate to the market rate.

The 12 per cent discount rate that is adopted by the SPO is a minimum rate as far as the social opportunity cost of capital is concerned. In view of the acute shortage of capital and disorganised market conditions the argument of using social opportunity cost of capital becomes a strong one, and I feel that the discount rate should be raised a little higher in order to reflect the marginal productivity of capital in the next best investment opportunity. This is very important since this way only very profitable projects will be selected and inferior ones be rejected.(1)

Besides, after reducing the benefits and capital costs to the present value, a benefit-cost ratio is formed and the admissibility of the Gaycuma project is decided upon this ratio. As I have pointed out in the earlier chapters, benefit-cost ratio alone could be deceptive since it does not tell us much about the scale of contribution of the project in question to national income, balance of payments and employment which are the major objectives of the plan.

The choice of which criterion to adopt has led to much theoretical controversy, but from a purely practical point of view the issue is much simpler and really revolves around the choice to be made between either the ratio of the present value of benefits and cost streams or their difference.

In the Gaycuma paper project (Chapters 6-7) the specific goals and constraints must be taken into account before deciding which criteria to apply. In other words, if there is no effective budget constraint and the Gaycuma paper project is the only project evaluated, then there is no element of choice to be made in such a situation. In such a case, all that is required is some measure of the extent to which the benefits exceed the costs and from this obviously either of the two criteria would be theoretically acceptable. At the practical level the ratio is in fact to be preferred for the simple reason that the figure for the difference in the pv of benefits and costs is perhaps operationally meaningless.

(1) In practice, however, actual studies have either avoided the issue (that is the controversy on discount rate) altogether by discounting at various rates or have adopted the average yield on long-term government stock.

But, in normal cases, cost-benefit analysis is concerned with the ranking of a relatively large number of desirable projects and selection of the best set of projects consistent with the budget constraint.

Similarly, if the Caycuna Project is one of the large number of proposed projects within the given budget constraint, then the investment criteria should favour the net present value, by which is meant the present value of benefits minus present value of costs. In the latter case (which is plausible) it seems more feasible to establish detailed tables indicating various projects' net present value, benefit-cost ratio, internal rate of return and separate figure for primary and indirect effects, etc. This exercise could be extremely useful in the final selection of investment projects. This may avoid hasty decisions on the selection of projects which could be harmful to the fulfilment of plan targets.

f) The evaluation technique of the E.I.E. too is weak in not basing its evaluation on social present value rule. The Keban HE project and its thermal alternative are compared merely by "equivalent annual cost" criterion without having given necessary consideration to social prices of inputs and outputs.

Besides, since the two projects' life span is different, a meaningful comparison can only be made by bringing them to the same life period. This requires that they should be compared for an infinite period under some legitimate assumptions. This, however, can only be made by the help of social present value (SPV) criterion, where this approach has been clearly demonstrated with Case Study, No.2 (Chapter 9).

But this does not imply that an evaluation should not test the selection of projects by applying different criteria; on the contrary for a sound evaluation this becomes necessary. For this purpose I have demonstrated in Chapter 9 that the choice of Keban HE is a wrong one, on the basis of internal rate of return as well. As far as direct benefits are concerned, I have found that the Keban HE project represents a 16 per cent and the thermal alternative a 37 per cent rate of return (internal rate). Thus on both criteria, namely the SPV and internal rate of return criteria, the Thermal Project becomes attractive. Thus, it can perhapsbe argued that the E.I.E. chose the Keban Hydro-electric project on some "impressionistic" basis irrespective of strictly economic considerations.

(g) It is often necessary to bring in some kind of sensitivity analysis in social benefit-cost analysis.

The project appraisal technique in Turkey does not seem to be extended to an extent which would bring such analyses into their evaluation system. This appears to be a serious drawback in the Turkishproject evaluation method.

The importance of sensitivity analysis has been clearly shown in Chapter 9, where the choice between the Keban HE and the Thermal project has been found to be extremely sensitive to the choice of parameters involved in social present value computations. For instance, I have found that the choice of projects is fairly sensitive to variations in the social price of foreign-exchange z, and social discount rate i. At a discount rate of i = 0.10 per cent and social price of foreign-exchange z = 0.33 per cent the Keban HE loses its attractiveness and the choice becomes in favour of the Thermal alternative (1).

This points to the fact that social prices of inputs (i.e. capital, foreign exchange) must be determined with great care before a final decision is reached. It is also important to note that sensitivity analysis can be extremely helpful to planners in indicating to them what weight they should attach to each parameter in the social present value calculations. These parameters may be taken to include variations in social discount rate, social price of foreign exchange, social wage rate and probably changes in the life period of the project. It is also preferable to see how the outcome would be affected by changes in a number of the more important assumptions made about costs, sales volume, prices received for output and the life of the project (2).

(h) Alternative projects with different scale of production, with a different production technique and with different location have not been made available during the First plan period.

The Caycuma project for instance is examined in isolation without comparing it with other technical alternatives with different location.

(1) It must be emphasised that, if the variables adopted by the SPO to the Caycuma Project are taken as basis - i = 12 per cent, and z = 0.33 the choice becomes even more in favour of the Thermal project.

(2) On this point see: Investment Appraisal, Great Britain, National Economic Development Council, NEDC, 1967, p.13.

Though Keban HE project (Case Study No.2) has been compared with the Thermal alternative, there has hardly been provision of a wide range of choices. The Keban HE should have been compared with a number of technical alternatives possible. For example, two small-scale hydro-dams vs. Keban HE or coal-burning thermal alternative vs. Keban HE, etc.

Such plausible and useful alternatives have not been considered, nor are brought into the province of social benefit-cost analysis in Turkey. This is perhaps so, for the simple reason that the SPO or other planning agencies did not have already prepared project designs at the time of the First plan or that there was not a sufficient number of experts to conduct research on the probabilities of having alternative projects (1).

It is safe to argue that scarce resources, particularly capital and foreign exchange, cannot be efficiently allocated in the absence of such alternative projects. An ultimate result would be a misallocation of resources, whereas it is arguable that at a higher level of decision-making, a large number of alternative investments would widen the area of choice and hence improve efficiency (2).

There is also no evidence to indicate that, at project level, interdependencies among projects, particularly between productive and social overhead projects have been given adequate attention. This criticism

(1) It is stated that "at the beginning of the planned period, there did not exist a sufficient number of adequate prepared investment projects incorporating realistic alternatives. In fact in 1962 the large industrial projects mentioned above...did not even exist in idea form and the preparation of feasibility reports had just begun to be discussed", and it is also added that "implementing the Plan and conducting project research at the same time has evidently proved to be an exceedingly difficult task, leading to frequent bottlenecks of various kinds". For this statement, see N. Olcen, (planner at the SPO), A Follow-up study: the Implementation of the Investments foreseen in the First Five-Year Plan, in "Planning in Turkey", M.E.T.U., June, 1967, pp.279-287. I was also told by one of the planners at the SPO that there was an accute lack of project designs and proposals at the time the First Plan was formulated. A private interview with C. Cinar, SPO, Ankara, January 1969.

(2) J. Tinbergen has pointed out that there was an acute difficulty in obtaining private projects as well as public projects. He also concludes that, despite the fact that several hundred public projects were collected, these did not provide "a sufficiently representative picture of invest-ment possibilities". See J. Tinbergen, Methodological Background of the Plan, in "Planning in Turkey", M.E.T.U., Faculty of Admin. Sciences, Pub. No.9, Ankara, 1967, p.76.

becomes very strong when it is learned that only a few Sector Projects were available or prepared for an economic evaluation. Despite the fact that investment allocation was appropriated to the various sectors, many projects were not in existence and thus they were prepared and appraised simultaneously, so that the investment programme could be completed in as short a time as possible (1). Nor during this first comprehensive planning experience in Turkey was there consistency and interdependence among the investment decisions of individual ministries and other government departments.

There is the problem of coordination of different parts of the plan at this stage. For example, total investment in transport may be consistent with a range of different manufacturing programmes. But when a particular manufacturing plan is created some part of the overall transport bill must be allocated to quite specific transport facilities complementary to the particular industrial project.

The task of the SPO planners here is one of coordination and communication. The SPO planners can do two important things; first they can explain as fully as possible to the sectoral planning groups the overall strategy of the plan and place the planning of their own sector in perspective; second, they can give detailed guidelines for project evaluation and choice of projects (2). Sectoral planning groups whose investments are interdependent should have joint meetings from time to time to ensure that their plans are not widely divergent and also minimise the amount of effort needed later in reconciling divergences which may arise.

(i) Non-uniformity in project appraisal has been another serious shortcoming of the First Five-Year Plan. Private sector investment projects, which constitute more than 50 per cent of industrial investment, have not been evaluated according to the social investment criterion. In other words, these projects were examined by a special group at the SPO (Encouragement and Implementation Commission) who had not applied accounting prices as was the case with the public industrial projects. Instead market prices were applied as they stood at the time though there was some estimate of value added, foreign exchange savings or earnings (3). The private projects come

(1) A private Interview with C. Cinar, Planner at the SPO, Ankara, Jan. 1969

(2) B.V.Arkadie, and C.Frank, Economic Accounting and Development Planning, Oxford Univ. Press, New York, 1966, pp.371-372

(3) A private interview with B. Benderlioglu, a planner in sectoral programming at the SPO, Ankara, 30th January, 1969.

to the SPO in order to benefit from the "Encouragement Measures" introduced by the government. These measures included, (a) investment allowances, (b) customs duty exemption which could vary between 80 - 100 per cent, or (c) payments of customs duties on an instalment basis (1).

The essential qualities required in private projects were whether the project was of import-substitution nature, whether it was of export-promoting nature, whether it was creating competition (2) or whether it was utilising domestic raw materials. Ultimately the private projects which satisfy all necessary requirements and which are approved by the SPO will receive first priority from the credit and financial institutions. However, one could not expect that all good projects came before the SPO for economic evaluation, since many of them belong to the private sector (3).

(j) At this final stage, that is the project evaluation stage, success has heavily depended upon extensive documentation and statistical data. In almost all developing countries the collection and selection of good projects is the most difficult and delicate problem any planning bureau has to face. Collecting data and information on projects requires the co-operation of a number of technical experts specialised in different fields such as geologists, engineers, social experts, economists etc. It is however the economist who has to appraise and evaluate projects, depending on the specific data and information of the other experts.

Turkey was not exempt from all these difficulties during the formulation of the First Plan. As Tinbergen, (4) has pointed out, most

(1) Ibid.

(2) If the product is exported, tax rebate is subtracted from its export value. Also production taxes are deducted if they are exported. However, this depends on the type of products which are to be produced by the project. B. Benderlioğlu, A Private Interview, SPO, Ankara, Jan. 1969.

(3) Memoranda for project preparation were sent to both public and private sectors. Project designs are re-examined during the annual programmes. Projects which are over 5 million TL. are expected to come back to the SPO for re-examination, otherwise they are evaluated and admitted by the investment agency in question. A private interview with B. Benderlioglu, Jan. 1969.

(4) See J. Tinbergen, Methodological Background of the Plan, in "Planning in Turkey". M.E.T.U., pub. No.9, Ankara, 1967, pp. 75, 76, 77.

figures collected for projects were not reliable and data on cost and output figures were scarce. To these, scarcity of experts can also be added. Consequently, early project appraisals were extremely simple. Therefore, the economic appraisal cannot really be said to be reliable and the ranking of projects will be greatly influenced.

A good appraisal and evaluation will require (a) a collection of all necessary data and statistics with great uniformity, (b) the data collected must be relevant to those aspects of projects which are essential for the final decision of selection.

In general data needed for project evaluation will be of two kinds: first, the planners need to have sufficient data concerning the objectives of the development policy of the government. Second and equally important, data on scarce factors of production are needed for the evaluation of the project in question.

In Turkey, project evaluation forms were prepared and distributed with the idea of obtaining information on the above factors in as uniform a way as possible. Some of these data were obtained from Ministries, State Economic Enterprises, Banks, Union of Chambers of Commerce and also by arranging visits to regional areas in order to acquire ideas.[1] But the information collected was not in fact adequate for a refined evaluation of projects.

As far as the objective is to evaluate projects effectively, information and data must be collected on resource requirements (both construction and operating stages), returns, technological alternatives, market size,[2] location of projects, methods and source of financing the investment, shadow prices of productive factors and products.[3] All these factors need to be

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(1) J. Tinbergen, op.cit., p.75; and B. Benderlioglu, A Private Interview, January 1969, Ankara.

(2) Demand and supply data in value and physical terms are required for project analysis. Cost-benefit analysis calls for the estimates of present and future demand for both commodities and services. This can be done by extrapolation of past trends, experience of other countries or by analysing the economic variables determining the future demand for the commodity or the service to to be produced.

(3) The first thing in appraising a given project is to work out the input-time curve for all kinds of inputs, i.e. raw materials, labour, fuel, water etc. The main items of inputs must be distinguished as deliveries from domestic production and imports.

known beforehand for a sound project evaluation.

The achievement of future output, income, employment and balance of payments targets will depend on the actual evaluation method and actual implementation of the proposed projects at the planned time. It is needless to remark that systematic and uniform investment criteria will enhance the quality and accuracy of investment decisions which, in turn, will determine the success of the overall investment programme and overall economic objectives. One can go along with Chenery and Tinbergen to assert that use of economic criteria will perhaps improve the formulation of development plans and sectoral projections and finally appraisal of policy alternatives in particular. Application of investment criteria instead of ad hoc investment decisions can avoid the establishment of an overall investment programme which could result in major bottlenecks such as inflation and balance of payments deficit or both.

As far as project evaluation is concerned the sectoral planning group should follow the following principles:

(i) First they should make a distinction between capital and recurrent cost, foreign and domestic capital, labour, intermediate product and other costs during their project evaluation.

(ii) Second, shadow prices rather than market prices should be applied in calculating both costs and returns. If existing costs data without the necessary refinement and adjustment is used there will be a heavy strain on the resources which are underpriced, while overpriced resources (i.e. labour) will be left idle. The ultimate result of non-adjustment in cost elements is that the aggregate yield of the project will fall short of the maximum that could have been obtained from the available resources. Thus, it is necessary to adjust cost data in order to restrain the use of underpriced factors and encourage the use of those which are overpriced.

Here it is always better to have calculations in terms of market prices and adjusting later for differences between market and shadow prices. Distinction between different types of costs is useful since the shadow price relating to capital cost is likely to be different from the shadow price relating to recurrent costs. Shadow price for foreign exchange would necessitate an adjustment upward, while shadow price for unskilled labour downwards.

(iii) Third, guidelines given by the SPO to sectoral planners should specify that both monetary and non-monetary returns to various projects should be considered. The time distribution of the expected benefits of the project over its anticipated life and within the period of the plan should be taken into account. For an adequate evaluation a given investment project needs to be analyzed in the context of its waiting period, growing period, stationary period, declining period and exhaustion period.(1) Time concepts are essential and their consideration in plan preparation will avoid many unexpected events.

Non-monetary returns, as a rule, should not be used to justify any project, but they should be stated fairly specifically. Since they are difficult to evaluate, they could perhaps be listed separately and described in qualitative terms.

(iv) Fourth, in comparing projects within any sector a common basis of project evaluation should be used. Ideally, the same method of project evaluation should be used in all sectors to enable planners to make a comparison of projects among sectors.(2) However, practical difficulties are so great that different methods will have to be used in different sectors.

(v) Finally, it must be noted that once an initial set of project plans has been drawn up, the planning process is not complete; re-valuation of projects will be necessary for several reasons. Checks for overall consistency must be carried out by the state planning organisation (SPO). Projects should be combined for each sector to see whether they imply a greater amount of capital, a greater amount of foreign exchange and skilled manpower than originally expected at the initial stage of analysis. In order to correct these imbalances, either

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(1) In considering the output (or benefit) effect of a given investment one discovers 5 dissimilar but interrelated time concepts. These are: a) waiting period; period in which the project yields no return; b) growing period; period in which yields of the project increase up to its maximum; c) stationary period, period during which the yields resulting from the investment are retained at their maximum level under regular maintenance but no renewal; d) declining period, period during which the yields of the project are reduced to nothing through wear and tear; e) exhaustion period, period during which the investment project is retained at its zero level returns.

(2) The social present value (spv) rule can even be used at sectoral level in the following manner: 1) either each sector planning group can be given a target in terms of value added by that sector to be achieved by the end of the planning period. They can be asked here to minimise the cost (i.e. on annual basis or present day values) of achieving that target rate of value added. Or, 2) each sector planning group can be allocated a specified amount of capital, and then they can be asked to maximise total net returns (i.e. returns/

a) target rates of growth for various sectors can be lowered to bring about a balance, or

b) shadow prices of those resources which are relatively scarce can be re-adjusted upwards and those abundant can be adjusted downward.

In either of these cases sectoral planning committees will be required to re-evaluate their project plans in the light of new directives from the SPO. By using higher shadow prices on the scarce resources the sector planners will be asked to economise on the use of scarce resources. Ultimately a new set of project plans can perhaps include more projects which use less of the scarce resources and more of abundant resources. Thus, re-evaluation under new guidelines should continue until a mutually consistent and optimal set of project plans have been reached.

III

So far I have concentrated on the various shortcomings of the planning methodology and particularly the project appraisal mechanism applied in the First Five-year Plan.

Though it had many defects the First Plan was the first comprehensive planning approach adopted in the country. It has paved the way for a planned economic and social development in Turkey.

Evaluation of industrial projects on the basis of the social present value rule can be considered as a forward step in planning experience in Turkey. The method used at project stage at the beginning was simple, but the project evaluation method is not static, rather it is progressing. Investment evaluation is being improved by introducing more alternative projects with different scales of production, different production techniques and different location.(1)

(contd.) returns less costs either on annual basis or pv basis) on their allotted amount of capital. The problem is then to calculate for each project the net benefit-capital cost ratio. Sectoral planning groups can then maximise net returns on allocated capital by choosing projects which have high net benefit-capital cost ratios.

(1) Investment projects with different locations and different scales of production started reaching the SPO only in the secondhalf of the First Plan period. Since project design and preparation was a new concept in Turkey, government investment agencies in the earlier years could not come up with investment alternatives. In the first three years (1963-65) most of the original projects were altered and improved by 50 to 100 per cent before they were finally/

The comprehensive planning approach has also paved the way to collection of more uniform and systematic data required for sectoral programming (i.e. input-output model) and project appraisal.

The success of subsequent Five-Year Plans will largely be a function of political independence of the state planning organisation and also a function of the uniformity in the application of social investment criteria in project appraisal. For this purpose the Central Planning Agency will, of course, need a large number of qualified planners who are empowered with considerable expertise and freedom in investment evaluation.

(contd.) finally included. After 1965 however, project preparation has improved due to project evaluation forms introduced by the SPO. Bozkurt, Benderlioglu, A Private Interview, Jan.-Feb. 1969, SPO, Ankara.

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