Monographs in the Economics of Development

No. 9

AN ANALYSIS OF THE LONG-RUN PROSPECT OF ECONOMIC DEVELOPMENT IN PAKISTAN

JOHN C. H. FEI

in collaboration with Irshad Ahmad, A.N.M. Azizur Rahman, M. Irshad Khan, Rafique A. Khan, and S. M. Naseem

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THE INSTITUTE OF DEVELOPMENT ECONOMICS
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Foreword

This monograph was prepared by the Economic Planning Section of the Institute under the direction of Dr. John C.H. Fei. It constitutes the major product of the Planning Section's study of the nature of consistency requirements of a growing economy. An earlier report on an input-output table for Pakistan appeared in the Spring issue of *The Pakistan Development Review*. Both of these studies are related directly to Pakistan and Pakistan data are used, however an effort has been made to treat the subject with enough generality that the method and arguments employed have relevance for other countries undertaking development plans.

Dr. Fei was an adviser at the Institute from January 1960 through July 1961. His collaborators are staff members of the Institute.

Karachi,
April 1962

Henry J. Bruton,
Joint Director,
Institute of Development Economics

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INTRODUCTION

It is the purpose of this monograph to examine certain key issues in the planning for the long-run economic development of Pakistan. We shall mean by "long-run" somewhere between 20 to 30 years. In other words, the long-run prospect in this sense is the consecutive running of 4 to 6 five-year plans, beginning with the year 1955 when the *First Five Year Plan* was introduced. Perhaps, we need not defend this long-run viewpoint and long-run interest. For, it is intuitively obvious that the economic consequences of the short-run year-to-year or even five-year planning can be meaningfully evaluated only in a long-run perspective with well-defined long-run objectives.

The major economic objective of long-run planning, like short-run planning, is an increase in per capita income through an expansion of the productive efficiency of the workers. As is well known, this can be accomplished by continuous investment in the various production sectors. Thus, the primary concern of this paper is a study of the long-run prospect of the accumulation and allocation of investment funds in the context of an economy which seeks economic development through planning.

What we consider to be the key issues related to the accumulation and the allocation of the investment fund in the long-run may be grouped under six headings:

i) Per capita income growth and the distribution of manpower among the industries.

ii) Output consistency of the various domestic production sectors and the foreign-trade sector.

iii) Allocation of investment funds to, and the balanced growth of, the different sectors.

iv) The feasibility and social acceptability of the balanced-growth path.

v) Agricultural productivity.

vi) The effect of the availability of foreign aid on long-run growth path.

We shall consider each of the above issues in a separate section. However, one should realize that these issues are not isolated and independent events. Instead, there exists an involved and complicated interdependence among them. In fact, it is not an exaggeration to say that it is only through investigating the logical nature of this interdependence that an economist can grasp the development problems in its totality. Needless to say, in order to accomplish this task, certain simplifying assumptions will have to be made to reduce the problem (of interdependence) into manageable proportion. These assumptions will be made clear as we proceed.

The issues, which we have just listed, are, by no means, all the major issues of economic planning. However, it is fairly obvious that every one of the issues which we have listed is of crucial importance for a comprehensive study of planned economic growth. What we hope to construct is a theoretical framework, with the aid of which the feasibility of the long-run growth along a socially acceptable path (to be defined later), may be investigated. This problem will be rigorously formulated as a model of quantitative dynamic economic planning.

The theoretical framework will be presented "abstractly" in the sense that, we hope, it will be applicable to all underdeveloped countries which share, with Pakistan, certain common characteristics, such as:

i) Rapid increase of population relative to natural resources endowment.

ii) A predominantly agricultural economy with low productivity.

iii) Scarcity of employment opportunities in the industrial sector.

These characteristics are neither independent nor exhaustive. However, they do seem to mark off a significant portion of the underdeveloped world for which our theory is meant to be applicable. We shall make reference to Pakistan as a specific application of our theory.

The method that we shall employ is the method of quantitative dynamic economic analysis. We shall project long-run growth paths containing a system of economic magnitudes (labour force, input-outputs, imports, exports, *etc.*) which are assumed to satisfy a system of well-defined economic relations (consumption relations, production relations, *etc.*) These projected long-run growth paths may be regarded as *economic plans for real resource allocation* in the long-run growth process. In this paper, we are *not* concerned with the institutional mechanism (*e.g.*, "free market", "controlled economy") through which the plans can be implemented. Our analysis is meant to provide an outline of real resources planning which is independent of the economic system (*e.g.*, "capitalism", "socialism").

SECTION I

PER CAPITA INCOME GROWTH AND THE DISTRIBUTION OF MANPOWER AMONG INDUSTRIES

One of the well-established long-run trends of a growing economy is that, as per capita income increases through time, the proportion of the total labour force engaged in agricultural production gradually declines. This may be indicated by the scatter diagram (Diagram 1) in which the per capita income and the proportion of economically-active population engaged in agricultural production for recent years are shown for various countries. The proportion employed in the agricultural sector declines from roughly 70-80 per cent in the poorer countries to the level of 10 or even 6 per cent in the most highly developed countries such as the United States and the Great Britain. Thus, as a country becomes wealthier, employment in the agricultural sector declines relatively.

The same conclusion can be established by looking at the historical experience of industrially-advanced countries with respect to the distribution of population among industries in the process of their development. The time series of Diagram 2 tells the story of the United States. It is seen that in the space of 140 years, the agricultural population has declined from 75 per cent of the total to less than 10 per cent of the total, an average drop of about 10 per cent (*of the percentage*) every 20 years.

The above inductive evidences can be easily substantiated by deductive reasoning. As a country becomes wealthier (*i.e.*, as per capita income increases), there is a tendency for consumption demand to shift from "necessary goods" to "comfort goods", and then to "luxury goods" in that order. It is common knowledge that this represents relatively more and more industrial goods and fewer agricultural goods, percentagewise, in the consumer's budget. This, so called "Engel's Law", is truly one of the most reliable economic relations which has been observed and verified in the long run.

The relevance of all this to long-run planning is obvious. If long-run planning is to be successful, the country must industri-

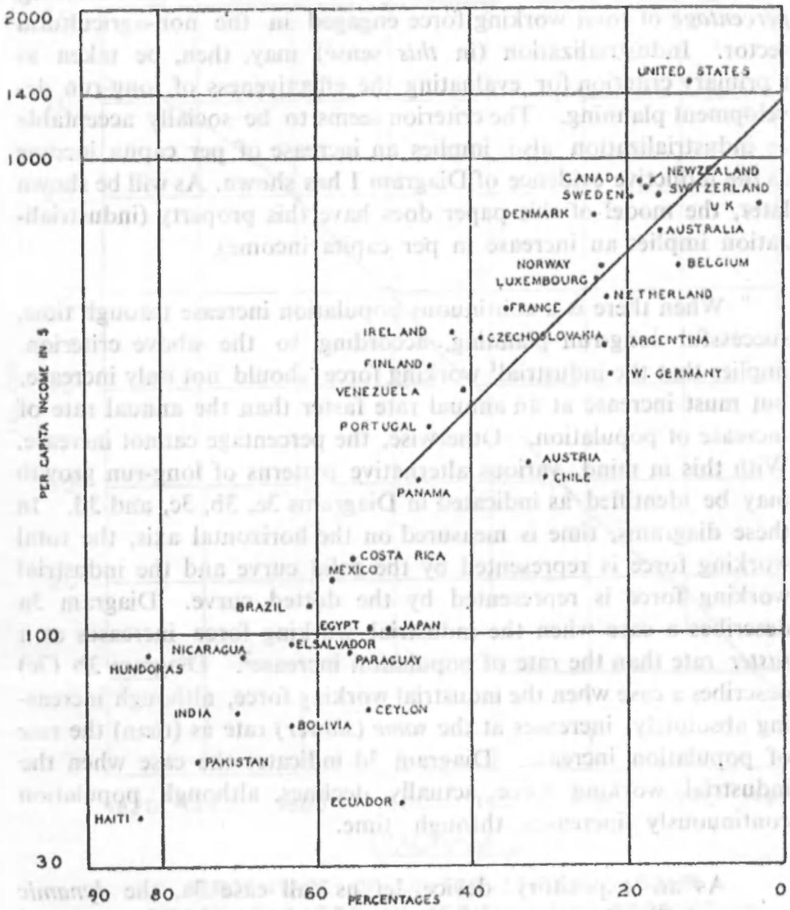

DIAGRAM I

PERCENTAGE OF ECONOMICALLY ACTIVE POPULATION IN AGRICULTURE

SOURCES: (a) DEMOGRAPHIC YEAR BOOK 1955, UNITED NATIONS, PP 510 - 573; (b) NATIONAL AND PER CAPITA INCOME IN SEVENTY COUNTRIES, UNITED NATIONS, P 14. PER CAPITA INCOME IN U.S DOLLARS.

alize. We can measure this degree of industrialization, as first approximation, by the proportion of the total working force engaged in the non-agricultural sector. In this paper, we shall use the word "industrialization" in this sense, *i.e.*, in the sense of an *increasing percentage* of total working force engaged in the non-agricultural sector. Industrialization (in *this* sense) may, then, be taken as a primary criterion for evaluating the effectiveness of long-run development planning. The criterion seems to be socially acceptable as industrialization also implies an increase of per capita income as the inductive evidence of Diagram 1 has shown. As will be shown later, the model of this paper does have this property (industrialization implies an increase in per capita income).

When there is a continuous population increase through time, successful long-run planning, according to the above criterion, implies that the industrial[1] working force should not only increase, but must increase at an annual rate faster than the annual rate of increase of population. Otherwise, the percentage cannot increase. With this in mind, various alternative patterns of long-run growth may be identified as indicated in Diagrams 3a, 3b, 3c, and 3d. In these diagrams, time is measured on the horizontal axis, the total working force is represented by the solid curve and the industrial working force is represented by the dotted curve. Diagram 3a describes a case when the industrial working force increases at a *faster* rate than the rate of population increase[2]. Diagram 3b (3c) describes a case when the industrial working force, although increasing absolutely, increases at the *same* (*slower*) rate as (than) the rate of population increase. Diagram 3d indicates the case when the industrial working force actually declines, although population continuously increases through time.

As an expository device, let us call case 3a, the *dynamic case*; case 3b, the *stagnant case*; case 3c, the *slow-death case*; and case 3d, the *sudden-death case*. In this order, the four cases represent a decreasing order of social desirability. The model which we

1. Since we shall formulate a model with two production sectors, "industrial" and "non-agricultural" are used interchangeably.

2. In this paper, we have assumed that the total working force is a fixed percentage of the total population. As will be pointed out in the Appendix, this percentage, for Pakistan, is 31.3 per cent.

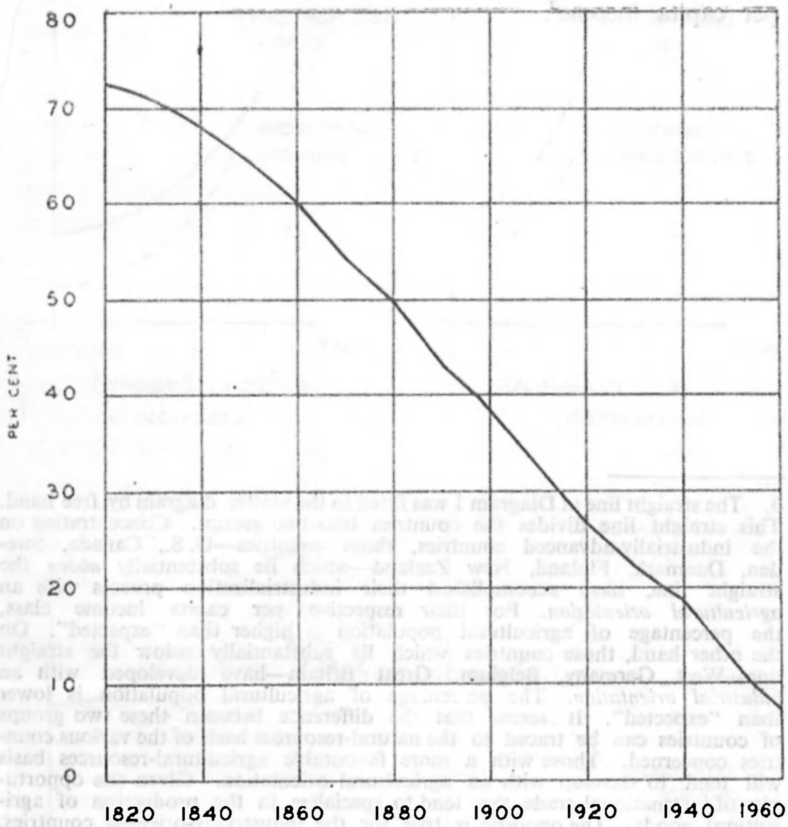

DIAGRAM 2

PERCENTAGE OF UNITED STATES LABOUR FORCE ENGAGED IN AGRICULTURAL PRODUCTION

DATA SOURCE: HISTORICAL STATISTICS OF U.S. (COLONIAL TIMES TO 1957) (SERIES D 57-61: INDUSTRIAL DISTRIBUTION OF GAINFUL WORKERS, P. 74). FOR LATER YEARS NOT COVERED BY THIS SOURCE, THE TIME SERIES IS OBTAINED BY A SIMPLE EXTRAPOLATION.

shall construct will lead to growth paths which can be classified into these four categories. Furthermore, the dynamic case (case 3a) will be shown to be the only case which is socially acceptable in the long run as it is the only case compatible with any increase of per capita income[3].

3. The straight line in Diagram 1 was fitted to the scatter diagram by free hand. This straight line divides the countries into two groups. Concentrating on the industrially-advanced countries, those countries—U. S., Canada, Sweden, Denmark, Finland, New Zealand—which lie substantially *above* the straight line, have accomplished their industrialization process with an *agricultural orientation*. For their respective per capita income class, the percentage of agricultural population is higher than "expected". On the other hand, those countries which lie substantially below the straight line—West Germany, Belgium, Great Britain—have developed with an *industrial orientation*. The percentage of agricultural population is lower than "expected". It seems that the difference between these two groups of countries can be traced to the natural-resources basis of the various countries concerned. Those with a more favourable agricultural-resources basis will tend to develop with an agricultural orientation. Given the opportunity of international trade, they tend to specialize in the production of agricultural goods. The opposite is true for the industrially-oriented countries. This finer difference of "agricultural orientation" vs. "industrial orientation" should not distract us from the primary characteristics, namely, the degree of industrialization is positively correlated with per capita income. Although, Pakistan must have a dynamic growth path, there is a margin of doubt as to how fast the industrial working force should increase when the possibility of international trade is taken into consideration. Here the answer depends upon an estimation of the natural-resources basis of Pakistan in comparison with the rest of the world. The general impression (not substantiated by statistical investigation) is that on this score, Pakistan is not very favourably endowed with natural resources. The conclusion is that Pakistan must develop with an *industrial-orientation* in the long run. This implies that the rate of expansion of industrial working force should not only be higher than the rate of increase of population but must be even higher than the "average" underdeveloped country with a similar rate of population increase.

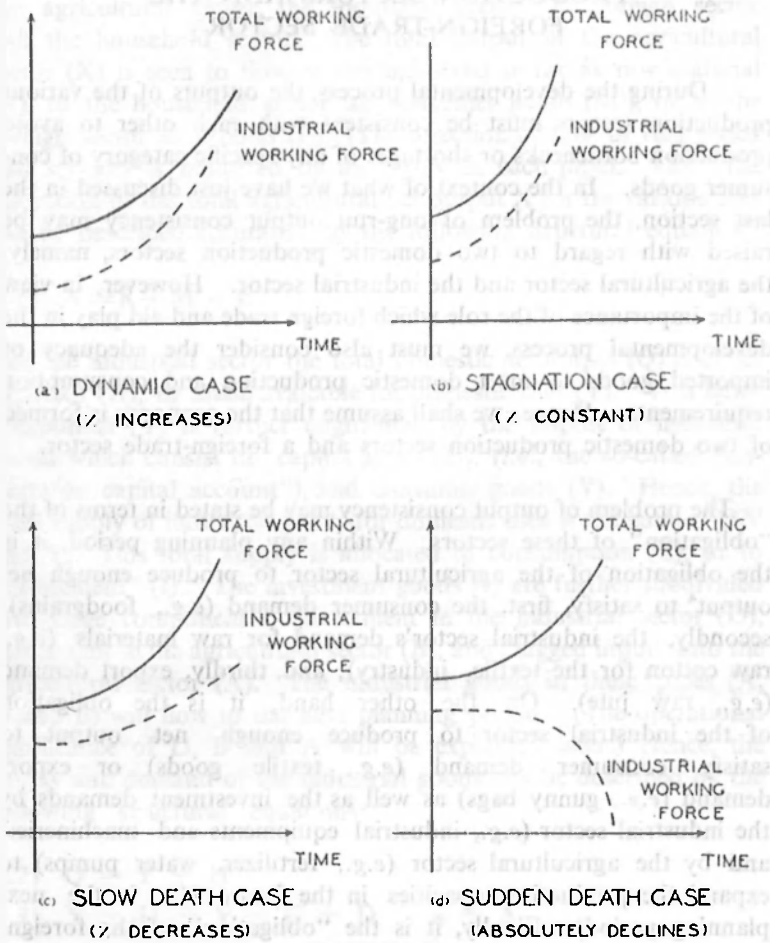

DIAGRAM 3

ALTERNATIVE PATTERNS OF LONG-RUN GROWTH

WITH RESPECT TO DISTRIBUTION OF LABOUR FORCE

SECTION II

OUTPUT CONSISTENCY OF THE VARIOUS DOMESTIC PRODUCTION SECTORS AND THE FOREIGN-TRADE SECTOR

During the developmental process, the outputs of the various production sectors must be consistent with each other to avoid production bottlenecks or shortages of any specific category of consumer goods. In the context of what we have just discussed in the last section, the problem of long-run output consistency may be raised with regard to two domestic production sectors, namely, the agricultural sector and the industrial sector. However, in view of the importance of the role which foreign trade and aid play in the developmental process, we must also consider the adequacy of imported goods to meet domestic production and consumption requirements. Hence, we shall assume that the economy is formed of two domestic production sectors and a foreign-trade sector.

The problem of output consistency may be stated in terms of the "obligation" of these sectors. Within any planning period, it is the obligation of the agricultural sector to produce enough net output[4] to satisfy, first, the consumer demand (*e.g.*, foodgrains); secondly, the industrial sector's demand for raw materials (*e.g.*, raw cotton for the textile industry); and, thirdly, export demand (*e.g.*, raw jute). On the other hand, it is the obligation of the industrial sector to produce enough net output to satisfy consumer demand (*e.g.*, textile goods) or export demand (*e.g.*, gunny bags) as well as the investment demands by the industrial sector (*e.g.*, industrial equipments and machineries) and by the agricultural sector (*e.g.*, fertilizer, water pumps) to expand the productive capacities in the future (*i.e.*, in the next planning period). Finally, it is the "obligation" of the foreign-trade sector to supply the needed imported raw materials for the industrial sector (chemicals, and spare parts), the imported capital goods (machines), and the consumer goods (drugs and medicines).

4. By "net" output of a sector is meant the output of a sector available for use by the other sectors. We should neglect the fact that a sector may use its own output as an input (*e.g.*, the coal produced by the industrial sector may be used by the steel industry in the same sector).

The above production requirements may be illustrated more clearly with the aid of the "flow chart" of Diagram 4. There are four sectors in the flow chart as represented by the four circles: the agricultural sector, the industrial sector, the foreign sector and the household sector. The total output of the agricultural sector (X) is seen to flow to the industrial sector as raw material (R), to the household sector as consumer goods (M'), or to the foreign sector as exports (E). (The direction of flow of real goods and services is indicated by an arrow in each pipe). Thus, the allocation of the total agricultural net output X for the various uses can be described accurately by the following structural equation[5].

2.1) $X = R + M' + E$

For the industrial sector the total domestic net output (Q) is either exported (H), or made available for domestic uses (Y). This latter component (Y) is further augmented by the import of industrial goods which consist of capital goods (U), (*i.e.*, the so-called "imports on capital account"), and consumer goods (V). Hence, the total supply of industrial goods for domestic uses is the sum of U,V and Y. This total supply is allocated to consumption (C), or to "investment" (I). The investment goods (I) are further subdivided into three components: Investment in the industrial sector (D), investment in the agricultural sector (B), and "lagged input" into the agricultural sector (A). The industrial goods in these pipes (A, D and B) will flow to the next planning period. (The operational significance of D, B and A will be explained later.) Hence, the supply and demand of the industrial goods can be described by the following structural equations:

2.2) $Q = Y + H$

2.3) $Y + U + V = C + D + B + A$

Let us now consider the relation between the foreign sector and the domestic sectors. On the one hand, the exported agricultural goods (E) and industrial goods (H) flow into the foreign sector

5. For those who are familiar with the standard methodology of economics, we are now beginning to describe the structural and behaviouristic equations of our model.

(the total export is E + H). On the other hand, the foreign sector supplies various categories of imports which include, in addition to U (import on capital account) and V (import of industrial consumer's goods) mentioned above, imported raw materials for the industrial sector (Z) and imported foodgrains (F). (The sum V + Z + F is often called "import on current account". However, this aggregative concept will play no analytical role in our analysis). Thus, the total import is U + Z + V + F. The difference between total imports (U+Z+V+F) and total export (E+H) is the import surplus (G) which may be also interpreted as foreign aid in the current planning period. Thus, the structural equation describing the accounting relations between imports and exports is

2.4) $G = (U + Z + V + F) - (E + H)$

For the household sector, we see from Diagram 4, that it consumes agricultural goods of M (domestically-produced M' and imported F)[6] and industrial goods (C). The household supplies labour and other services to the agricultural and industrial sectors. Relative to the purpose of our study, we have explicitly specified the total labour force (P) which is being allocated either to the industrial sector (W) or to the agricultural sector (L). Thus, the relevant accounting equation for the household sector is:

2.5) $P = W + L$

Thus, we see that the formal structure of our model contains 21 economic variables which can be classified in the following way:

1) *Agricultural Sector*

i) Total agricultural output (X),
ii) agricultural raw material used as inputs by the industrial sector (R),
iii) agricultural output used for domestic consumption (M'),
iv) export of agricultural goods (E),
v) consumption of agricultural goods (M).

6. The equation M=M'+F is not written explicitly because we shall assume F=O (*see*, equation *2.11*) so that M=M'.

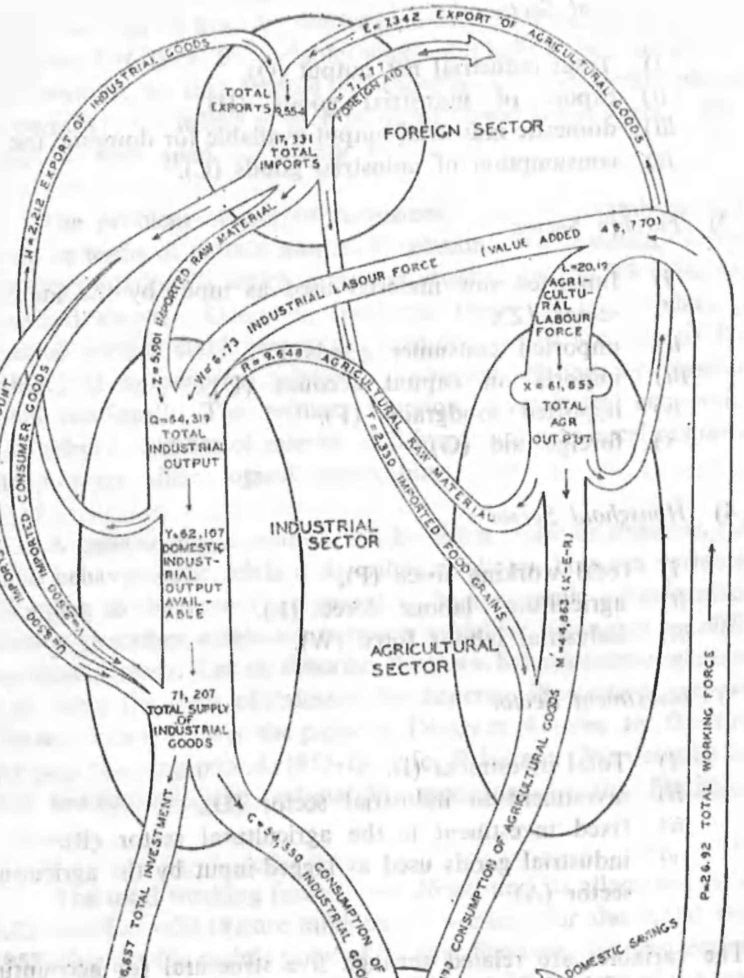
FOREIGN SECTOR
E = 2342 EXPORT OF AGRICULTURAL GOODS
H = 2,212 EXPORT OF INDUSTRIAL GOODS
TOTAL EXPORTS
IT, 331 TOTAL IMPORTS
FOREIGN AID
Z = 5,001 IMPORTED RAW MATERIAL
W = 6.73 INDUSTRIAL LABOUR FORCE
(VALUE ADDED
L=20.19 AGRICULTURAL LABOUR FORCE
R = 9.648 AGRICULTURAL RAW MATERIAL
F = 2,330 IMPORTED FOOD GRAINS
X = 61,653 TOTAL AGR OUTPUT
Q=64,319 TOTAL INDUSTRIAL OUTPUT
Y=62,107 DOMESTIC INDUSTRIAL OUTPUT AVAILABLE
IMPORTS ON CAPITAL ACCOUNT
IMPORTED CONSUMER GOODS
INDUSTRIAL SECTOR
AGRICULTURAL SECTOR
71, 207 TOTAL SUPPLY OF INDUSTRIAL GOODS
TOTAL INVESTMENT
CONSUMPTION OF INDUSTRIAL GOODS
CONSUMPTION OF AGRICULTURAL GOODS
DOMESTIC SAVINGS
P=26.92 TOTAL WORKING FORCES
HOUSEHOLD SECTOR
FOR INDUSTRIAL SECTOR
FOR AGR. AS LAGGED INPUT
FOR AGR. AS FIXED INVESTMENT
ALLOCATION OF INVESTMENT GOODS

DIAGRAM 4

2) *Industrial Sector*

i) Total industrial net output (Q),
ii) export of industrial goods (H),
iii) domestic industrial output available for domestic use (Y),
iv) consumption of industrial goods (C).

3) *Foreign Sector*

i) Imported raw material used as input by the industrial sector (Z),
ii) imported consumer goods (V),
iii) imports on capital account (U),
iv) imported foodgrains (F),
v) foreign aid (G).

4) *Household Sector*

i) Total working force (P),
ii) agricultural labour force (L),
iii) industrial labour force (W).

5) *Investment Sector*

i) Total investment (I),
ii) investment in industrial sector (D),
iii) fixed investment in the agricultural sector (B),
iv) industrial goods used as lagged-input by the agricultural sector (A).

The variables are related through five structural (or accounting) equations (*2.1*—*2.5*) which can be visualized with the aid of the flow chart (Diagram 4). The variables P, W, and L(total labour force, industrial labour and agricultural labour force) are measured in physical units (number of workers). The unit of measurement of *all* other variables is in value terms (in rupees or dollars). Furthermore, there is a time dimension for all the variables involved. For example, when we consider five planning periods, the variable X has five different values: X(1), X(2), X(3), X(4) and X(5) which are the consecutive values of X through periods 1, 2, 3, 4, and 5.

Thus, when the time dimension of all the variables are considered for the analysis of five consecutive planning periods, there will be altogether $5 \times 19 = 95$ variables which will have to be considered. From now on, we shall assume that there are five consecutive planning periods; the length of each planning period is five years. This covers a time span of twenty five years.

The problem of output consistency may be unambiguously stated in terms of certain numerical relations (the so-called "behaviouristic relations") which must be satisfied by the 95 variables identified above. Generally speaking, these numerical relations describe certain stable structural relations which are due to the stability of *consumption relations*, *production relations* or "institutional relations". The primary function of analytical economics is to select a number of relevant and important numerical relations and analyze their logical implications.

A behaviouristic relation can be either *static* or *dynamic*. A static behaviouristic relation describes a relation between variables belonging to the *same* time period while a dynamic behaviouristic relation describes a relation between variables belonging to *different* time periods. Let us describe the static behaviouristic relations first, using the data of Pakistan for concrete illustrative purpose. The numbers written in the pipes of Diagram 4 refer to the first five-year planning period (1955-1960) for Pakistan. We describe the data sources and the estimation procedure in the Statistical Appendix.

The total working force ($P = 26.92$) and its allocation ($W = 6.73$ and $L = 20.19$) are millions of workers for the initial year 1957 which is the middle point of the first five-year planning period. Thus, initially, the industrial labour force is 25 per cent of the total working force. Let S(o) denote the fraction of total working force which is initially engaged in industry. This may be written as:

2.6) $W(o) = S(o)P(o)$ (For Pakistan: $W(o) = .25 \times P(o)$)

2.7) P (o) is explicitly specified (For Pakistan: $P(o) = 26.92$))

The other numbers in Diagram 4 refer to the total flow in the five-year period (1955-1960) in millions of rupees. For consumption demand by the households, the total agricultural goods consumed is Rs. 47,193 (M = M' + F), and the total industrial goods consumed is Rs. 54,550 (C). Thus, the consumption demand, computed on a per-worker basis, is 47,193/26.92 = 1,753 (rupees) of agricultural goods and 54,550/26.92 = 2,026 (rupees) of industrial goods[7]. These *per-worker* consumption figures will be denoted by "m" and "e" respectively and will be referred to as the *consumption coefficients*. We shall assume that these consumption coefficients have a stable value through time. This may be written as.

2.8) $M(t) = mP(t)$ (For Pakistan: $M(t) = 1{,}753P(t)$)

2.9) $C(t) = eP(t)$ (For Pakistan: $C(t) = 2{,}026P(t)$)

These notations simply mean that the consumption of agricultural goods at any time period (t) can be obtained by multiplying the total working force P(t) (of the same time period) by a constant consumption coefficient "m" which prevails in the first planning period.

For the consumption of industrial goods (C = 54,550), a part, Rs. 2,600, is imported. Thus, the import component (V) is 2,600/54,550 = 5 per cent of the total consumption of the industrial goods. We shall denote this fraction by "b" and call it the *import consumption coefficient*. The import consumption coefficient will be assumed to have a stable value through time. This may be written as:

2.10) $V(t) = bC(t)$ (For Pakistan: $V(t) = .05C(t)$)

On the other hand, for the consumption of agricultural goods (M = 47,193) although a part is imported in the first planning period (F = 2,330), there seems to be no stable relation which we can postulate between "foodgrains import" and any of the other variables in our system. This is due to the fact that the import of

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7. The consumption coefficient for industrial goods (e) is seen to be higher than the consumption coefficient for agricultural goods (m). This is so because the "industrial sector" includes all non-agricultural production. In addition to large- and small-scale manufacturing industries, the "industrial sector" also includes mining, government, banking, transport and communications, wholesale and retail trade, services, rental income, as well as a part of the foodgrains which must be processed by the industrial sector. (*see*, Statistical Appendix).

foodgrains fluctuates with domestic crop fluctuations which are heavily dependent on the weather. Hence, in the formal model structure of this paper, we shall assume that there will be no import of foodgrains, *i.e.*,

2.11) $F(t) = 0$

The import of foodgrains, if any, will be viewed as a phenomenon exogenous to our model and deserving special treatment in our analysis (*see*, Appendix to Section V)[8].

For the production relations in the industrial sector, we see that for the production of total net output of Q=64,319, the industrial sector employed 6.73 million labour (W=6.73) and purchased R=9,648 million rupees of agricultural raw material as well as Z=5,901 million rupees of imported raw materials. Thus, in the first planning period, for every rupee worth of net output, the industrial sector required 9,648/64,319=.15 rupee worth of agricultural raw material and 5,901/64,319=.091 rupee worth of imported raw materials. These input coefficients will be denoted by "r" (*the agricultural raw material coefficient*) and "z" (*the imported raw material coefficient*). These coefficients are assumed to have stable values through time:

2.12) $R(t) = rQ(t)$ (For Pakistan: $R(t) = .15Q(t)$)
2.13) $Z(t) = zQ(t)$ (For Pakistan: $Z(t) = .091Q(t)$)

In the industrial sector, productivity of a worker is 64,319/6.73 = 9,557 rupees. This number will be denoted by w, the *average productivity* of labour (in the industrial sector). We shall assume that it has a stable value through time:

2.14) $Q(t) = wW(t)$ (For Pakistan: $Q(t) = 9{,}557W(t)$)

8. This special treatment for the import of foodgrains is in accordance with the method used by the Pakistan Planning Commission. For example, during the Second Five Year Plan, "the Plan requires Rs. 8,000 millions of foreign assistance . . . . . . In addition, foodgrains and other assistance under U.S. PL. 480 is expected to continue at its current annual level, yielding roughly Rs. 1,700 million during the Plan". (*Second Five Year Plan*, p. 30). A special treatment was given to the importation of foodgrains as the Plan aims at self-sufficiency in foodgrains and the importation of foodgrains "is expected to be eliminated in 1964-1965". (*Second Five Year Plan*, p. 90).

For the foreign sector, we see that the total export of industrial goods is H=2,212 which is 2,212/64,319 =4 per cent of the total net output of the industrial sector (Q).. This, the *export coefficient*, will be denoted by "h" and is assumed constant through time:

2.15) $H(t) = hQ(t)$ (For Pakistan: $H(t) = .04Q(t)$)

For the export of agricultural goods (E—7,342), we shall assume that the total domestic output (X=61,853) which is not used as domestic consumption (M) or raw material (R) will always be exported as specified by equation *2.1*[9].

The import on capital account U=6,500 is 6,500/16, 657 = 39 per cent of the total investment expenditure I=16,657 in the first planning period. We shall denote this by "j", the imported capital coefficient, and it too is assumed constant through time:

2.16) $U(t) = jI(t)$ (For Pakistan: $U(t) = .39I(t)$)

Thus, we have identified eleven static behaviouristic relations (equations *2.6—2.16*) which we shall assume to be stable through time.

We realize, of course, that the assumption of stability is unrealistic in the context of an analysis of a fast-growing economy. For example, the consumption functions (equations *2.8* and *2.9*) imply that per capita consumption will remain unchanged inspite of a possible increase (or decrease) of per capita income. The production condition (equation *2.14*) implies that the average productivity of labour will not increase inspite of the fact that the country is developing. However, economic theories of changes in these parameters involve considerations of a theory of innovations and of a dynamic consumption theory and these are still very primitive, and give us little guidance as to what constitutes reasonable hypotheses that could be formally integrated in our model structure.

For the reason mentioned in the last paragraph, a study based on the stability assumption (and this applies also to the dyna-

9. Because of assumption in equation *2.11*, equation *2.1* becomes $X = R + E + M$.

mic stability assumptions which we shall introduce below) can only be a first approximation to the problem of the projection of long-run growth path. The results, thus obtained, must be interpreted with care. For example, if the per capita consumption will be, in fact, increasing through time, our conclusion has an "optimistic bias". If the productivity of labour will be, in fact, increasing through time, our conclusion will have a "pessimistic bias". In short, in such a complicated affair as economic development, all growth paths must be "conditional".

Finally, for the first planning period, we see that the import surplus (foreign aid) is G=7,777 million rupees. As a measurement of the degree of foreign aid which Pakistan has received (or will receive in the future), we can use the ratio of total exports divided by total import, 9,554/15,001=.6. This ratio will be denoted by "q" and will be called the *import cost coefficient.* For "q" is the cost, in terms of exports, for every rupee worth of import. For an underdeveloped country receiving foreign aid, q is less than one, and preferably (from the point of view of the underdeveloped country), should be as low as possible. Thus, the definition of q is:

2.17) $E+H=q(U+V+Z)$

(For Pakistan : $E+H=.6\ (U+V+Z)$)

The import cost coefficient "q" is, we think, primarily determined by institutional (political) considerations at the present time or in the forseeble future. There is no economic theory which can help us to predict the future values of q. For this reason, we shall treat q as an "exogenous variable". This is just another way of saying that we shall not be concerned with an explanation of how large (or small) the value of q will be. What we can do is to investigate the impact on the long-run growth prospect for reasonably-postulated alternative values of q (*see*, Section VI below).

Let us now consider the dynamic behaviouristic relations which will be assumed in our model. As we have pointed out earlier, these relations involve the values of variables belonging to different time periods. The dynamic relations of our model relate to the change of population and to the uses of the various categories of investment goods.

For Pakistan, the annual rate of growth of population in recent years has been 2.15 per cent. When compounded over a five-year period, the rate of growth is $(1+.0215)^5-1=.1125$ per planning period. Denote this rate of growth by "i", we have a dynamic relation:

2.18) $P(t+1)=(1+i)P(t)$ (For Pakistan: $P(t+1)=1.1125P(t)$)

This means that we shall assume that the same rate of growth of population will be maintained in the future.

The economic significance of the investment goods D, in the industrial sector is that it leads to an increase of real capital stock, to the same amount (D), in the next planning period. This incremental capital stock enables the industrial sector to employ (and equip) more workers in the next planning period. Statistical data in Pakistan for recent years indicate that for employing each additional worker, the industrial sector needs 7,645 rupees worth of capital goods. This number, to be denoted by Φ, is the familiar *capital-labour ratio,* which we shall assume to be stable through time. This assumption leads to the following dynamic relation:

2.19) $D(t) = \Phi\ (W(t+1)-W(t))$
(For Pakistan: $D(t)=7{,}645(W(t+1)-W(t))$

The investment goods (produced by the industrial sector), which will be used by the agricultural sector, consist of two categories: B, the *fixed investment;* and A, the *lagged inputs.* The distinction between these two types of investment goods is partly based on a conceptual distinction and partly motivated by the actual practice of the Planning Commission of Pakistan. On this second point, the Pakistan Planning Commission separated total investment in the agricultural sector into two categories:

> "The means required for achieving the production target (for the agricultural sector) can be broadly divided into two categories: (*i*) irrigation and drainage schemes designed either to bring new area under the plough, or to improve areas already under cultivation; and (*ii*) measures to increase yields by use of fertilizers and organic manures, control of plant

diseases and insects, use of improved seed and adoption of better cultural practices." (*Second Five Year Plan*, p.135).

However, the Planning Commission did *not* describe, in any detail, the analytical significance of this classification. It seems to us that an analytical distinction of the two investment components can be made and that this distinction is a significant one.

The first investment component, which broadly corresponds to our fixed investment (B), are these investment expenditures which aim not so much to improve the production efficiency of the agricultural labour (L), but rather to *complement labour* so that the production efficiency of the farmers can be maintained. This type of investment is essential when there is an increase in the number of farmers due to the population pressure. This is due to the fact that additional farmers must be supplied with more land, drainage, irrigation and other social overhead facilities to maintain their production efficiency, otherwise the so-called "law of diminishing returns" will operate to decrease the production efficiency of the farmers.

From the long-run point of view, an increase of the productivity of the agricultural sector can be brought about by an *increase* of the capital-labour ratio in the agricultural sector ("capital" in this expression includes "capital and land"). However, when there is a high population pressure and a tendency to lose land (*e.g.*, through water-logging and salinity) an underdeveloped country cannot hope to increase the capital-labour ratio. All that the country can reasonably hope for is to maintain a fixed capital-labour ratio. Consequently, we shall assume that the fixed investment expenditure (B) will be made in such a way as to maintain a constant capital-labour ratio. Let the *capital-labour ratio* be denoted by "f". Using the data of the Planning Commission, the value of "f" for Pakistan is estimated to be Rs. 3,325. Thus, the analytical significance of B may be summarized as:

2.20) $B(t)=f(L(t+1)-L(t))$ (For Pakistan: $B(t)=3{,}325\,(L(t+1)-L(t))$)

Comparing equation *2.20* with equation *2.19*, we see that the analytical formulation of the significances of B(t) and D(t) are quite similar. It should also be noted that the capital-labour ratio in the industrial sector (Φ) is generally much higher than the capital-labour ratio in the agricultural sector (f).

The second category of agricultural investment, given by the Planning Commission, corresponds to what we have called the *lagged input* (A). The significance of agricultural investment of this type is, explicitly, to raise the average productivity of the farmers. This means that provided such investment expenditure is effective, the same amount of agricultural output can be produced by a smaller number of farmers. Hence, we may say that the significance of this type of agricultural investment is that it *substitutes* (rather than complements) the agricultural labour force. Consequently, a production function of the following form has been postulated for the agricultural sector:

2.21) $X(t) = aL(t) + \theta A(t-1)$

(For Pakistan: $X(t) = 2{,}730L(t) + 2.6A(t-1)$)

in which the parameter "a" is the *marginal productivity of equipped labour* and θ is the *marginal productivity of the lagged input.* The so-called "marginal rate of substitution" between labour (L(t)), and lagged inputs, (A(t-1)), is $a/\theta = 2{,}730/2.6 = 1{,}050$. This number means that for every unit of labour withdrawn from the agricultural sector, the total agricultural output will not be effected if 1,050 rupees worth of lagged input is invested to substitute the loss of equipped labour (of one unit). The production function in equation *2.21* is the simplest kind of production function which has the power of describing the "substitution" phenomenon.

From the above production function (equation *2.21*) we see that the total agricultural output (X(t)) of *this* planning period is determined by the number of farmers (L(t)) in this planning period and the amount of the lagged input (A(t-1)), provided in the previous planning period. In other words, there is a lag of one planning period (five years) between the input (of the investment goods) and the output.

The postulation of such a "lagged" production relation is due to the fact that, in our judgement, measures aiming at a significant increase of agricultural production in this way (use of fertilizers and organic manures, control of plant diseases and insects, use of improved seeds and adoption of better cultural practices) can only be effective slowly and gradually. Inputs such as these are, thus, assumed to take place in this period, but to have no effect until the next. For this reason, we have postulated a "lagged" production relation for the agricultural sector and not for the other sectors.

It is evident that, in order for a dynamic growth (*see*, Diagram 3a) to take place, a smaller percentage of total working force, working as farmers, must be able to produce enough agricultural goods (food, material and export) to support the non-agricultural sector which becomes relatively larger, in size, in the national economy. This implies that the average productivity of agricultural labour must increase through time. In our model, such an increase can be brought about by gradually "substituting" labour by the lagged input.

The problem of output consistency of the various production sectors (domestic and foreign) in the developmental planning is formulated by identifying a list of key economic phenomena (variables) and economic relations (equations). A rigorous formulation of the problem of "output consistency" implies that all these relations must be satisfied simultaneously, at all times, in the developmental process. This is just another way of stating the intuitively obvious fact that in order to enable the industrial sector to produce more goods, the agricultural sector should produce additional raw materials; in order to produce more agricultural goods, the industrial sector must expand to produce the additional investment goods, needed by the agricultural sector; in order to secure the needed imports, the domestic production sectors must produce enough export goods; in order to satisfy consumption demand due to population pressure, both production sectors must produce enough consumer goods. Furthermore, labour must be allocated to the two production sectors so as to be consistent with the output targets. All these events must simultaneously occur and must be consistent with each other.

It follows from the above discussion that a most important problem of planning for long-run development is to ensure, first of all, that the growth path is a balanced one (in the sense defined in the last paragraph) *and* that such a (balanced) growth path will lead to a rapid increase of per capita income through industrialization (in the sense defined in Section I). The major purpose of this paper is to analyze this problem based on a model structure postulated in this section.

Appendix (Section II)

Since a crucial assumption which we have made in this section is related to the production conditions in the agricultural sector, a few explanatory remarks may be added to clarify its meaning. The production efficiencies of the two categories of agricultural investment, B(t) and A(t-1), have, so to speak, a different "dimension." To be more specific:

1) The production efficiency of the lagged input (A(t-1)) can be measured by the marginal productivity, $\theta = 2.6$, obtained with one-period lag. Schematically, this can be represented by:

time: :	0	1	2	3	4	5	....
input :	1	0	0	0	0	0	....
output:	0	2.6(= θ)	0	0	0	0	....

In other words, an output of $\theta = 2.6$ is obtained, once and for all, with one-period lag.

2. The production efficiency of the fixed investment (B(t)) can be measured by a *stream of future yields*. Furthermore, the yields can be obtained only when the capital is working in conjunction with labour in a fixed ratio. Schematically, this can be represented by:

	time:	0	1	2	3	4	5	..
input	B(t):	3,325(=f)	0	0	0	0	0	..
	L(t):	0	1	1	1	1	1	..
	output:	0	2,730(=a)	2,730	2,730	2,730	2,730	..

In other words, the f-units of durable capital goods, after equipping one farmer, will produce a stream of future yields of "2,730" units of agricultural goods determined by the marginal physical productivity of equipped labour.

The investment efficiency of A(t-1) and B(t) can be compared only when we discount the "future yields" of B(t) by the rate of interest to find its present value. For example, if the rate of interest is 30 per cent, then the present value (at t=1) of the future yields is 2,730/.3—9,100. Thus, the rate of return to B(t) is 9,100/3,325=2.7, which is in a dimension comparable to the rate of return to A(t-1) *i.e.*, 0=2.6. Although, for reasonably postulated rate of interest, the magnitudes of the two rates of return (2.6 vs 2.7) seem to be comparable, from a commercial point of view, the rate of return to fixed capital B(t) is much smaller than is indicated by the number 2.7. This is due to the fact that a part of the return to the fixed investment must be compensation for the agricultural labour that works with the capital. The estimated consumption demand by an agricultural worker is 3,779 (the sum of consumption of agricultural goods 1,753 and consumption of industrial goods 2,026 (*see*, equations *2.8* and *2.9* in the text). This turns out to be *higher* than the marginal productivity of workers (a=2,730). This means that the return to fixed capital is negative if the total consumption of an agricultural worker (3,779) is substracted from its marginal productivity (2,730).

Our figures confirm the popular belief of the existence of widespread "disguised unemployment in the agricultural sector" which is ordinarily defined as an excess of "consumption over marginal productivity"—assuming farmer's savings are negligible. Furthermore, we come to the conclusion that fixed investment (B(t)) cannot attract profit-seeking commercial capital, and must remain to be a government enterprise—as is the case in Pakistan for irrigation, drainage, *etc.*, and is, in fact, a government-subsidized enterprise. The economic justification for such apparently uneconomical expenditures (B(t)) may be due to the fact that the marginal productivity of the farmers (a) may be raised in the long-run *because of* the fixed investment expenditure. For included in the fixed investment expenditure, (B(t)), are not only investment in physical resources (*e.g.*, irrigation and drainage) but also investment in human resources (*e.g.*, agricultural research, training, demonstration and other extention services). In other words, it is quite likely that "a" is an increasing function of "f".

The above consideration lends a new dimension to the production conditions in the agricultural sector not formally envisaged in the model structure described in the text. This omission is primarily due to the fact that we know very little about the quantitative relations involved in "investment in human resources". In other words, the estimated marginal productivity of labour (a= 2,730) could be higher or lower, by an unknown percentage, because of the estimated fixed investment expenditure of f=3,325 per farmer.

Later on in this paper, we shall project several alternative long-run growth paths based on the assumptions of (*i*) a fixed value of f=3,325, and (*ii*) alternative values for "a". The multiple of growth paths, thus projected, is primarily due to the uncertainty of knowledge mentioned in the last paragraph[10].

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10. We have benefitted from discussions with Dr. Richard C. Porter of the Institute of Development Economics for materials in this appendix.

SECTION III

ALLOCATION OF INVESTMENT TO AND THE BALANCED GROWTH OF THE DIFFERENT SECTORS

It follows from the above discussion that the crucial decision in the planning process is how should the investment fund, generated in each planning period, be allocated to the two production sectors to provide for a simultaneous increase of productive capacities in a consistent manner through time. In other words, the necessity of output consistency (described above) requires that the investment fund be allocated in a suitable way. If too little investment goods are allocated to the industrial sector, there will be a shortage of industrial consumer goods and/or shortage of investment goods. Conversely, if too little investment goods are allocated to the agricultural sector, there will be a shortfall in the target for agricultural production. When the investment goods are suitably allocated, we can say that the economy will move along a *balanced-growth path* through time. The calculation of the balanced-growth path amounts to an investigation of the logical implication of the system of equations *(2.1 – 2.21)*, which we have postulated in the last section. It can be shown that the following formula can be derived from equations *2.1 – 2.21*, which is the basic equation for the solution of the balanced-growth problem[11].

3.1) *a)* $D(t) = [D(o)-\beta/(1+i-K)]K^t+[\beta/(1+i-K)](1+i)^t$, where

b) $\beta = iP(o)'\,\Phi'\,\dfrac{(1+i)(a-m')-e'\theta}{\Phi'\theta+r'w'+a}$

c) $K = \dfrac{\Phi'\theta+w'\theta}{\Phi'\theta+r'w'+a}$

d) $r' = qj+(qz-h+r)(1-j)/(1-h)$

e) $P(o)' = P(o)\Phi/\Phi'$

f) $m' = m+qe[b-j(1-b)/(1-j)]$

g) $w' = w(1-h)/(1-j)$

h) $\Phi' = \Phi - f$

11. Equation *3.1a* is the solution of a first order difference equation which can be derived from equations *2.1—2.21*.

i) $e' = e(1 - b)/(1 - j) + fi$

j) $D(o) = \dfrac{\Phi u\theta + av - y}{\Phi\theta + iw' + a} p(o)'$

k) $u = w' s(o) - e'$

l) $v = (1 + i - s(o)) \Phi'$

m) $y = \Phi' (m' (1 + i) - r'w's(o))$

The readers should not be overly concerned with the mathematical aspects of this problem as they are not the major concern of this paper. Instead, we shall be mainly concerned with the economic interpretation, with the projected long-run growth path based on this formula.

A balanced-growth path, as the name implies, has a *time* and a *commodity dimension*. This is illustrated in Table 1. The time dimension is indicated by headings of the various columns. Starting from the planning period 1955-60, it covers the consecutive running of five five-year plan periods. The commodity dimension is represented by the various rows which are divided into four sub-groups:

i) Population Sector (Rows 1-4) indicates the total population, the total working force and its distribution between the agricultural sector and the industrial sector. (Figures in the table are in millions of workers which exist at the *mid-point* of a planning period.)

ii) Industrial Sector (Rows 5-14) indicates the sources of supply and the allocation of the industrial goods to different uses. The total availability of industrial goods (row 8) consists of three types of goods; domestic output (row 5), import on capital account (row 6), and import of consumer's goods (row 7).

This total supply is being allocated as exports (row 9), domestic consumption (row 10), or investment (row 11). The investment demand for industrial goods has three components: investment in industry (row 12), fixed investment in agriculture (row 13), and lagged input in the agricultural sector (row 14).

(Figures in this sector as well as in the agricultural and foreign sectors below are five-year totals in millions of rupees.)

iii) Agricultural Sector (Rows 15-18) indicates total agricultural output (row 18), and its allocation as exports (row 15), raw material for the industrial sector (row 16), or domestic consumption (row 17).

iv) Foreign Sector (Rows 19-22) indicates the imported raw material for the industrial sector (row 19), the total imports (row 20), total exports (row 21) and "foreign aid", which is the difference between imports and exports (row 22).

It should be noted that every economic magnitude in the flow chart of Diagram 4 is indicated by an appropriate row of this table by the same capital letter. Figures in this table, of course, satisfy all the structural equations *2.1—2.5* as well as all the static equations *2.6—2.17* and dynamic behaviouristic equations *2.18—2.21*, given in the last section. For example, the total working force (row 4) increases from 26.92 million to 29.95 million from the first to the second planning period. This gives a rate of increase of 11.25 per cent, which is the rate of increase specified in the dynamic equation

2.18 for the case of Pakistan. As another example, the investment goods allocated for the industrial sector in the first planning period is 6,631 million rupees (row 12). This investment enables the industrial sector to absorb 7.60-6.73=.87 million workers in the next planning period. The numbers 7.60 and 6.73 are given in the second row. The implied capital-labour ratio is 6,631/.87=7,645 rupees which is the capital-labour ratio given in the dynamic equation *2.19* for Pakistan ($\Phi=7,645$). Output consistency for all the behaviouristic equations for all the planning periods can be checked in a similar way. The computation of this table is based on the formula *3.1*, as are all the equations given in the last section.

The remaining rows (rows 23-27) of Table 1 are certain indicators computed from the rows described above. These indicators include national income (row 23), per capita income (row 24), cumulative percentage increase of per capita income (row 25), industrial workers as a percentage of total working force (row 26) and foreign aid as percentage of total investment (row 27). Take the fourth planning period (1970-1975) as an illustration, the projected national income is 183,180 million rupees, which, together with the total population figure of 118.41 million (row 1), gives a per capita income of 1,548 rupees. This shows an increase of 12.82 per cent as compared with the per capita income of 1,372 rupees of the *first* planning period (1955-60). The industrial labour force (10.64 million) now accounts for 28.71 per cent (row 26) of the total working force of 37.07 million (row 4). Since the industrial working force accounts for 25 per cent of the total working force in the first planning period (row 26), the projected growth path in Table 1 is seen to be a dynamic-growth path according to the definition given in Section I.

It can be shown that the model structure of our paper (described in the last section) implies that the indicator "per capita income" (row 24) and the indicator "industrial worker as percentage of total working force" (row 26) *always move in the same direction*. This means that per capita income will increase (decrease or remian constant) if, and only if, the degree of industrialization is rising (falling or remaining constant). This fact is verified in Table 1 where, for a dynamic growth case (the degree of industrialization is rising), the per capita income is seen to be increasing. (Hence, our model satisfies the criterion which we have stated at the end of Section 1 based on intuitive reasonings).

In the fourth planning period (1970-75), for a total domestic investment programme of Rs. 43,107 million (row 11), the amount of foreign aid projected is Rs. 17,894 million (row 22). Foreign aid, as a percentage of total investment, is 41.51 per cent given as the last indicator (row 27). This indicator is produced because it is the most widely used "foreign-aid indicator" in Pakistan. For example, for the second five-year planning period, the Pakistan Planning Commission estimated that out of a domestic total investment programme of 19,000 million, 8,000 million will be financed by foreign aid, giving a percentage of 42 per cent (*Second Five Year Plan*, p. 31).

A table, such as Table 1, is a concrete representation of the idea of the suitable allocation of the investment fund (indicated by rows 11—14) and the consequential balanced-growth path through time. We believe that the construction of a balanced-growth path by this method is the minimum requirement for rational planning as it provides the basic guideline and framework for consistent planning.

SECTION IV

THE FEASIBILITY AND SOCIAL ACCEPTABILITY OF A BALANCED-GROWTH PATH

In planning for economic development, there are two types of criteria according to which the projected long-run growth path may be evaluated. The first type is whether or not the growth path is a *balanced*-growth path. The second type is whether or not growth path is *socially acceptable.* It is the purpose of this section to discuss, in a limited sense, the conceptual distinction of these two types of problem.

We take it as self-evident that a projected growth path *should* be a balanced-growth path in the sense defined in preceding sections. For, when a growth path is not in balance, there will be production bottlenecks, and, at the same time, underutilization of the installed productive capacities in one or more sectors. This will generally imply a waste of the scarce resources. As our discussion in Section III has shown, the construction of a balanced-growth path is very often a technically-complicated exercise. Unless great care is taken to ensure that the projected growth path is in balance, it is very likely that the growth path will not be in balance or, even worse and more likely, that this imbalance is only concealed by ambiguity.

However, a projected growth path may be an imbalanced one inspite of high planning efficiency. The plan-makers must work within the constraints of economic reality. The inherent economic conditions may be so unfavourable as to render a balanced-growth path impossible. Such a possibility can be visualized very easily if, for example, the productivity in the agricultural sector is too low. For the sake of illustration, we can imagine that the productivities of labour and the lagged input are zero (*i.e.*, $a=\theta=0$ in equation *2.21*) so that the total agricultural output is zero. In that case, a balanced-growth path will obviously be impossible if there is any positive demand for domestic agricultural output at all. We shall return to the analysis of an imbalance of this type in the next section.

The fact that a projected growth path is in balance is only a necessary, but not a sufficient, condition for the growth path to be socially acceptable. This is due to the fact that the projected per capita income may not increase or may not increase as fast as is socially tolerable. Conceptually, all the four types of growth mentioned in Section I— dynamic, stagnation, slow death and sudden death — are compatible with the idea of a balanced growth. It is obvious that only a fast-growing dynamic-growth path is socially acceptable, as it is the only type which guarantees rapid increase of per capita income.

The above discussion suggests that what is socially acceptable or non-acceptable is completely determined by (*i.e.*, measured by) the rate of increase of per capita income of a growth path. This position can be defended on the ground that, although a growth path of economic development is a many-dimensioned entity, the rate of increase of per capita income is probably *the* best indicator of its social acceptability. For this reason, a definite percentage (*e.g.*, 2 per cent per year) increase of per capita income is very often taken by the planning authority to be a "minimum target" from the viewpoint of social and political tolerability of a developmental plan. This was the position of the Planning Commission of Pakistan which regarded the "2 per cent" figure as the "minimum increase in facilities and opportunities required for the country's growing population" (*Second Five Year Plan, p.* 7). Furthermore, we know[12] that this "2 per cent annual increase of per capita income" has been taken as primary analytical condition in the construction of the *Second Five Year Plan.* For these reasons, we shall take the 2-per-cent figure as the relevant criterion for the social acceptability of a long-run growth path projected in this paper.

Take the balanced-growth path of Table 1 as an example. This table was constructed for Pakistan with the values of all the parameters indicated at the bottom of that table. (The values of these parameters were first introduced in Section II above). It is seen from row 25 that in the space of twenty years (in the year 1977, which is the mid-point of the fifth planning period), the per capita

12. *See,* John C. H. Fei and G. Ranis, *A Study of Planning Methodology with Special Reference to Pakistan's Second Five Year Plan.* (Karachi: The Institute of Development Economics, 1960).

income will show an increase of 34.18 per cent in comparison with the year 1957 (the mid-point of the first planning period). This averages out at a compound rate of less than 1.5 per cent per year. This falls short of the 2 per cent annual rate of increase of per capita income [13]. Hence, the projected growth path is socially unacceptable according to the criterion of the last paragraph.

The projected foreign aid figures in Table 1 turn out to be in the neighbourhood of 53 per cent of total investment programme in the earlier planning periods (*see*, row 27). This compares more favourably with the Pakistan Planning Commission's estimate of the same figure (42 per cent as we have mentioned earlier)[14]. This means that our estimated rate of increase of per capita income would have been even lower if the Planning Commission's estimate of foreign aid were used. In view of this evidence, we may conclude that under the present production and consumption conditions, it is unlikely that an annual rate of increase of per capita income of 2 per cent can be achieved in Pakistan in the near future.

Returning to theoretical analysis, it is intuitively obvious that balanced-growth path may be unfeasible or may not generate rapid expansion of per capita income because the investment fund is inadequate. In an open economy, there are two sources of investment funds: domestic saving and foreign aid (foreign savings). If the size of total savings, coming from these two sources, is too small, per capita income will fail to increase (or will even decrease when the population increase is explosive), no matter how efficiently the investment fund is being allocated and utilized.

The arguments of this section may be summarized as follows:

1) A growth path may not be in balance due to inefficient plan-making. (This is likely to occur because the problem

13. In Table 1, for the second five-year planning period (1960-65), the annual rate of increase of per capita income is $1.31 \div 5 = 0.26$ per cent, or one tenth of the Planning Commission's tolerable political target.

14. The absolute magnitude of foreign aid for the second five-year planning period, as estimated by the Planning Commission, is Rs. 9,700 million (*Second Five Year Plan*, p. 31). This is less than the figure 10,411 million indicated in row 22 for the second five-year planning period (1960-65).

of output consistency *is* a technically-complicated one even stated in terms of a simple model of our paper).

2) A balanced-growth path may not be *feasible* in spite of high planning efficiency.

3) A *balanced-growth* path may not generate a sufficiently rapid increase of per capita income to be socially and politically acceptable.

4) The cause of (2) and (3) is inadequacy of the investment fund.

In the remaining sections of this paper, we shall analyze the impact on the growth path of a change in the supply of saving fund. In Section V, we shall study certain aspects of the problem of domestic savings. The economic significance of foreign aid will be analyzed in Section VI.

SECTION V

AGRICULTURAL PRODUCTIVITY AND LONG-RUN GROWTH PATH

The reasons ordinarily given for inadequacy of domestic savings is: "consumption is too high", or "productivity in too low", or even "rate of population increase is too high", or some combination of all these factors.

Actually, all these broad statements are correct and can be defended. However, they must be translated into analytical conditions in order to be useful for quantitative predictive purposes. For example, in order to increase domestic savings, we can decrease the value of per capita consumption coefficients ("e" and/or "m" in the behaviouristic equations *2.8* and *2.9*, and recompute the balanced-growth path to investigate the effect of an increased savings, brought about in this particular fashion. Alternatively, we can go through the same exercise by holding the consumption coefficient constant and increase the productivity coefficients in the industrial sector ("w" in equation *2.14*) or the agricultural sector ("a" and "θ" in equation *2.21*) which also lead to an increase of domestic savings. In fact, a "favourable" change of the value of *any* of the parameters in *any* of the behaviouristic equations (*2.6—2.21*) will lead to an increase of domestic savings. Hence, we must be selective in our study of the problem of domestic saving by concentrating on the most strategic sector.

In this paper, we shall concentrate on the production conditions in the agricultural sector. We have made this choice for several reasons. First of all, we do not think it is realistic to postulate a decrease in the consumption coefficients. In the production area, there seems to be much room for improving the production efficiency in this sector. This fact is well recognized by the Planning Commission of Pakistan by its repeated assertions on the necessity as well as the feasibility of an increase in the productivity in the agricultural sector in the second five-year planning period (*see*, *Second Five Year Plan*, pp. 5, 7, 127). Finally, it is intuitively obvious from our discussion in Section II that a dynamic-growth path, which implies a continuous reallocation of labour from the agricultural sector to the industrial sector, cannot take place if the agricultural productivity is not raised.

In the context of our model, the analysis of the significance of the productivity in the agricultural sector is summarized in Diagram 5. In this diagram, the marginal productivity of the lagged input θ (of equation *2.21)* is measured on the horizontal axis and the marginal productivity of equipped labour "a" (of equation *2.21)* is measured on the vertical axis. There are six auxiliary lines in this diagram: PQ_1, PQ_2, PQ_5, P^*R_1, P^*R_2, and MN[15]. With the aid of these auxiliary lines, the positive quadrant (for positive values of "θ" and "a") can be divided into six significant regions. If the actual values of the parameters "a" and "θ" happen to fall in a particular region, a particular type of long-run growth path will be generated. The six regions and their economic significance are as follows:

1) Region 1: (This region lies below the straight line PQ_1) This region covers cases for which a balanced-growth path is *impossible*. As can be seen from the relative position of this region, the impossibility of a balanced-growth path is primarily due to the fact that both "θ" and "a" are too low. As a result, the agricultural sector becomes a bottleneck, and there will be a shortage of agricultural goods even at the beginning of the developmental process (All the other regions lie above the line PQ_1). This region may be called the *agricultural shortage region.*

2) Region 2: (This region lies below PQ_2 and to the right of the straight line MN). This region covers all cases for which a growth path, although in balance, will lead to "sudden death". As we have ex-

15. The equations of these auxiliary lines are indicated in the diagram. We only want to point out the fact that positions of these auxiliary lines are determined by the values of all other parameters (*i.e.*, all parameters other than "a" and "θ") in our model. (The definitions of the parameters in Diagram 5 are given in equations *3.0a—m* in Section III).

plained in Section II, this means that the per capita income will decrease eventually as the percentage of the total working force employed in the industrial sector absolutely declines (*see*, Diagram 3d). As can be seen from the relative position of this region, a growth path of this type is produced by a low value of "a" coupled with a moderate value of "θ". The economic interpretation of this phenomenon is that the productivity of lagged inputs (*e.g.*, fertilizers) is not high enough to compensate for the low value of "a". As a result, more labour will have to be employed in the agricultural sector to meet the demand for agricultural products in the economy.

3) Region 3: (This region lies between PQ_2 and PQ_5 and to the right of P^*R_1). This region covers all cases where a growth path will be both in balance and of the "dynamic" type. This is the only case which can be socially acceptable because per capita income continuously increases as the percentage of the total labour force engaged in the industrial sector continuously rises. (Table 1 is a concrete example of a growth path of this type). As can be seen from the relative position of this region, the productivity of lagged input "θ" must be very high in comparison with value of "a". The economic interpretation is quite straight forward: when the productivity of lagged input is high enough to compensate for a possibly low value of "a", there will be an adequate supply of agricultual goods making it possible for the agricultural sector to release labour (relatively speaking) in the developmental process.

4) Region 4: (This region lies above the horizontal auxiliary line PQ_5). This region covers cases for which a *balanced*-growth path is again impossible. However, unlike region 1, the impossibility of a balanced growth is now traceable to the fact that

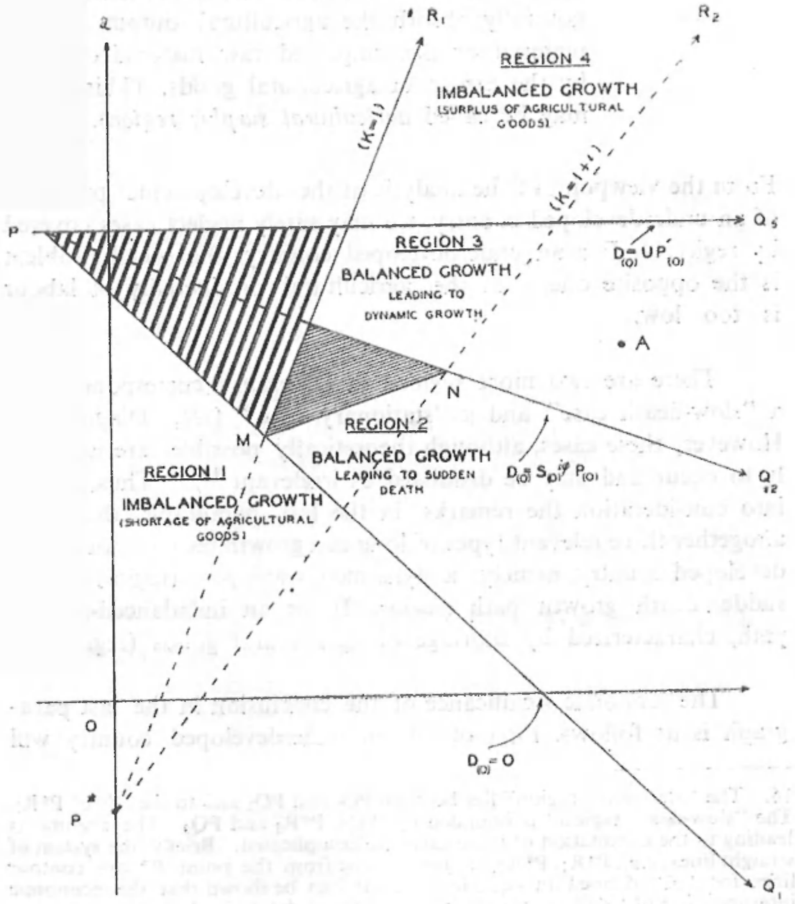
R1
R2
REGION 4
IMBALANCED GROWTH
(SURPLUS OF AGRICULTURAL GOODS)
(K=1)
(K=1+i)
P
Q5
REGION 3
BALANCED GROWTH
LEADING TO DYNAMIC GROWTH
A
N
M
REGION 2
BALANCED GROWTH
LEADING TO SUDDEN DEATH
REGION 1
IMBALANCED GROWTH
(SHORTAGE OF AGRICULTURAL GOODS)
Q2
O
P
Q1

DIAGRAM 5

marginal productivity of equipped labour "a" is too high. When this occurs, there will be a surplus of agricultural goods which cannot be disposed off domestically or through "normal" export channels. This is equivalent to the fact that the industrial sector, which now constitutes the bottleneck, cannot fully absorb the agricultural output as raw material or the imported raw material obtained by the export of agricultural goods. (This region may be called *agricultural surplus region*).

From the viewpoint of the analysis of the developmental prospects of an underdeveloped country, we may safely neglect cases covered by region 4. For an underdeveloped country, the social problem is the opposite one, *i.e.*, the agricultural productivity of labour is too low.

There are two more regions in Diagram 6 corresponding to a "slow-death case" and a "stationary case" (*see*, Diagram 4). However, these cases, although theoretically possible, are not likely to occur and may be dismissed as irrelevant [16]. Thus, taking into consideration the remarks in the last paragraph, there are altogether three relevant types of long-run growth path for an underdeveloped country, namely, a dynamic-growth path (region 3), a sudden-death growth path (region 2), or an imbalanced-growth path, characterized by shortage of agricultural goods (region 1).

The economic significance of the conclusion in the last paragraph is as follows. First of all, an underdeveloped country will

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16. The "stationary region" lies between PQ_5 and PQ_1 and to the left of P^*R_1. The "slow-death region" is bounded by MN, P^*R_1 and PQ_2. The arguments leading to the elimination of these cases are complicated. Briefly, the system of straight lines (*e.g.*, P^*R_1, P^*R_2, *etc.*) emanating from the point P^* are contour lines for "K" defined in equation *3.1c*. It can be shown that the economic interpretation of "K-1" is the real rate of interest determined by the production conditions in our model. The auxiliary line P^*R_1 corresponds to all cases for which the real rate of interest is zero. The auxiliary line P^*R_2 corresponds to all cases for which the real rate of interest equals the rate of population increases ($K - 1 = i$). Since the real rate of interest for an underdeveloped country is generally higher than the rate of population increase, that portion of the (a-θ) plane to the left of the line P^*R_2 can be ruled out as irrelevant. (For the case of Pakistan, computed in Table 1, the value of K is 1.23 which implies an annual rate of interest of 23 per cent. The point lies to the right of the P^*R_2 line.)

experience a shortage of agricultural goods in its early stage of development when the productivity of the agricultural sector is too low. This shortage is generally reflected in a rise of the urban cost of living and/or government policies (*e.g.*, price control and rationing) aiming at its suppression. However, when the agricultural productivity is *not* so low — so that the country is *not* in the agricultural shortage region — the country is faced with a tug-of-war between a dynamic growth (witnessing an *increasing percentage* of the industrial working force) and sudden death (characterized by an *absolute decline* of the industrial working force, sooner or later). In other words, there seems to be no "middle ground", such as a "stagnation case" or a "slow-death case" in which the percentage of total population engaged in the industrial sector either remains constant or continues a declining trend indefinitely (*see*, Diagrams 3b and 3c). The situation of an underdeveloped country may be compared with that of a man rowing a boat up stream: if he makes no progress he is likely to go backward.

Let us apply the above analysis to the case of Pakistan. First of all, it can be shown that the values of the parameters $a = 2,730$ and $\theta = 2.6$ can be represented by a point which lies in region 3 (*e.g.*, point A), the dynamic-growth region. Hence, as Table I has indicated, the projected long-run growth path is of the dynamic type. This means that not only can Pakistan develop along a balanced-growth path but the balanced growth will lead to gradual industrialization. In the long run, we expect the industrial sector to absorb an increasing percentage of the total labour force as the per capita income increases. Pakistan will not remain, for long, a stagnant economy which is dragged by the dead weight of an oversized agricultural sector.

In arriving at this optimistic conclusion, we must remember the drawbacks of the projected growth path in Table I. As we have pointed out in the last section:

i) per capita income, although increasing, is not increasing as fast as is socially and politically acceptable.

ii) the projected foreign aid figures are probably unrealistic so that the rate of increase of per capita income would have been even lower, had the projected foreign aid figures been more realistic (*i.e.*, lower).

Leaving the question of foreign aid aside, we may raise the question as to the feasibility of accelerating the rate of growth through an increase of the marginal productivity of labour in the agricultural sector[17].

Let us assume that the marginal productivity of labour, "a", can be raised by 5 per cent. In other words, let us assume that a=2,867 instead of 2,730 and also assume that the values of all other parameters remain the same as in Table 1. The projected long-run growth path is represented in Table 2.

As can be seen from this Table 2, the growth path is a "very" dynamic one. In the space of twenty years, the per capita income increases by 225 per cent (row 25) which amounts to a compound annual rate of growth of 4.1 per cent per year. In the same time interval, it is seen (row 26) that the industrial working force accounts for over 90 per cent of total working force instead of the 25 per cent figure which exists at the beginning (1955-60)[18].

17. Concentrating on the production conditions in the agricultural sector, an increase of productivity can be brought about by an increase of either "a" (the MPP of labour) or "θ" (the MPP of the lagged input). We have chosen to investigate the effect of an increase of "a" rather than "θ". This choice is due to the fact that, in our opinion in the developmental process, the productivity of labour is likely to increase more rapidly than the other inputs in the agricultural sector. Such increases are brought about by investment in human resources (*See*, Appendix to Section II).

18. As can be seen from row 2, the agricultural labour force begins to decline absolutely by the fourth planning period (1970-75). This implies that fixed investment in the agricultural sector (row 13) takes on negative values one planning period ahead (1965-70). When this occurs, the growth path is in balance only when a "disinvestment" in the agricultural sector is possible. However, realistically, it is unlikely that disinvestment can take place to a significant extent in the agricultural sector because of the "immobility" of such investment goods (*e.g.*, earth works, water dam, *etc.*). Hence, we are faced with an unpleasant choice, in the context of our model, of either admitting the possibility of disinvestment (and be unrealistic) or neglecting agricultural disinvestment (*i.e.*, assuming it to be zero instead of being a negative magnitude) and sacrifice the condition of balanced growth. In the Table 2, we have made the latter choice. This implies that the growth path may not be in balance for the later planning periods. This choice was made because Table 2 was constructed primarily for the purpose of illustrating the fact that "per capita income" and "% of industrial working force" (*i.e.*, rows 24 and 26) can increase very fast, due to an increase of "a". If "disinvestment in agricultural sector" is allowed to take place, these indicators would have increased even faster as the "unutilized" investment goods in the agricultural sector would have been mobilized for investment purposes in the industrial sector.

In other words, Pakistan can accomplish, in 20 years, a degree of industrialization which took the United States nearly 150 years to accomplish (*see*, Diagram 2). Such a rate of industrialization must, however, be considered fantastic and, indeed, impossible.

The above analysis seems to be indicative of the fact that the development of the agricultural sector can be of crucial importance for the development of the entire economy. Our analysis, thus, supports the strong position taken by Pakistan's Planning Commission in its emphasis on the development of the agricultural sector. However, the fact that the rate of expansion is so fantastically high poses two questions. First, is the assumed 5-per-cent increase of the marginal physical productivity of labour in the agricultural sector unreasonably high? Second, why is the rate of expansion so sensitive to a change in the magnitude of the marginal physical productivity of labour?

The first question is an *empirical one*. For the answer lies in an examination of the investment efficiency of the various schemes which are designed (*e.g.*, by the Planning Commission) for the agricultural sector. Unfortunately, the *Second Five Year Plan* does not contain any detailed information which can be used for the analysis of this problem[19].

Consequently, what constitutes a reasonable postulate with respect to an increase of the marginal physical productivity of labour (a) must be left as an open question.

Let us now turn to the second problem (why the rate of expansion is so sensitive to a change in "a"?), which is a theoretical prob-

19. The Pakistan Planning Commission projected an "overall increase of 14 per cent in agricultural output" over the five-year interval covered by the second five-year plan period. (*Second Five Year Plan*, p. 5). The Planning Commission also estimated that total population will increase by 9 per cent in the same interval. (*Second Five Year Plan*, p. 4). However, the Planning Commission has been vague with respect to the analysis of any facet of the problem of the allocation of the labour force between production sectors. (For example, the *Second Five Year Plan* does not contain any information of the projected size of labour force in any production sector and, as a matter of fact, it does not tell us the projected absolute size of the labour force). This lack of interest (which may be justified on the ground that labour is a relatively abundant factor) rules out any possibility for a realistic analysis of the problem of the productivity of labour.

lem. The cumulative rates of increase of per capita income in Tables 1 and 2 (row 25) may be reproduced as follows:

	1960-65	1965-70	1970-75	1975-80
Table 1 (lower value for "a")	1.31%	4.52%	12.82%	34.18%
Table 2 (higher value for "a")	3.23%	11.48%	72.66%	225.68%
ratio	2.47	2.54	5.67	6.58

From the "ratios" given in the last row, it is seen that the expansionary effect of an increase in agricultural productivity becomes more pronounced in the *later* planning periods. Similarly, we may compare the "percentage of industrial working force" (*i.e.*, row 26) of the two tables:

	1960-65	1965-70	1970-75	1975-80
Table 1	25.37%	26.31%	28.71%	34.85%
Table 2	25.94%	28.31%	46.36%	90.78%
ratio	1.02	1.08	1.61	2.60

Again, we see that the expansionary effect is more pronounced in the *later* periods.

It is not difficult to give an economic explanation of the above phenomenon. When there is an increase in the productivity of labour in the agricultural sector, the increase in agricultural output will *not* be used for consumption purpose (because of the fixity of the consumption coefficients) and will be used exclusively for investment purposes, directly or indirectly. Even when the increase of the productivity is small to begin with, its cumulative effect on investments and income will be large, *later*. This cumulative property, we believe, is typical of all types of productivity increase and consumption decreases (*i.e.*, all sorts of ways to increase domestic savings) in our model.

The practical significance of the above conclusion is obvious: a small but *early* improvement (*e.g.*, an increase in productivity) is possibly better than a large but *late* improvement. However, the gain in savings, due to an increase of productivity, should not be dissipated through increased consumption, if the above conclusion is to be true. This economic common sense is clearly borne out by the analysis of this paper.

To continue with our comparison of Tables 1, and 2, the foreign-aid figures (in million rupees) of the two tables (row 22) are:

	1955-60	1960-65	1965-70	1970-75	1975-80
Table 1	8,959	10,411	12,848	17,894	30,153
Table 2	8,950	11,106	15,656	44,328	123,542

It is seen that the foreign-aid figure becomes higher (and more so in the later planning period) when the agricultural productivity increases. This is due to the fact that, since foreign aid is assumed to be a fixed percentage of import (2.17), the value of foreign aid will expand automatically when the foreign trade expands (the later due to an increase of domestic productivity). Thus, we can say that the fantastically fast rate of expansion of per capita income in Table 2 is partly due to the automatically augmented foreign aid. Since, as we have pointed out earlier, the foreign aid projected in Table 1 is already too high to be realistic, Table 2 is even more unrealistic in this respect.

It follows that we should investigate the possibility for the projection of alternative long-run growth path which satisfies the following conditions:

i) requiring less foreign aid than Tables 1 and 2,

ii) produce a rate of expansion of per capita income somewhere between Table 1 and Table 2 (lower than the fantastically high rate of Tablo 2 and higher than the socially unacceptable low rate of Table 1).

Appendix (Section V)

Before we leave this section on analysis of the agricultural sector, a few words may be added on the treatment of foreign aid in the form of the import of *agricultural goods*. As we have pointed out earlier[20], the Planning Commission of Pakistan gave a special treatment to agricultural import by emphasizing that: i) the import of foodgrains is to be temporary and is expected to be eliminated in the earlier planning periods; *ii*) the temporary import is to be "financed" by foreign aid only; *iii*) the accounting treatment of such imports as foreign aid is to be separated from the other "regular" foreign aids. Under these conditions, the problem of import of agricultural goods can be easily treated in our model as is illustrated in the following numerical example.

Let us assume, for the sake of simplicity, that foreign aid in foodgrains is computed on the per-agricultural-worker basis, *e.g.*, 136 rupees per worker per five-year period. Let us assume that the marginal productivity of equipped labour is, in fact, $a = 2{,}730$ (*i.e.*, the figure used in Table 1). The per-worker-foreign-aid figure (136) can be treated as if it is an increase of the marginal physical productivity (2,730) to bring us an imaginary marginal physical productivity figure of $2{,}730 + 136 = 2{,}866$. Based on this figure (2,866) (treating this figure as if it is the true marginal physical productivity) a long-run growth path can be projected, namely, Table 2. The only modifications, which need to be made of this table, are:

20. *See*, footnote in Section II after equation *2.11*.

i) the "total domestic output" X, listed in row 18, should now be correctly named as "total output available" which includes domestic output and imports of food (under foreign aid);

ii) the amounts of imported food for each planning period can be computed by multiplying the agricultural labour force (row 3) by 136, *i.e.*,

1955-60:	$20.19 \times 136 = 2{,}720$	million rupees
1960-65:	$22.18 \times 136 = 3{,}016$	million rupees
1965-70:	$23.89 \times 136 = 3{,}249$	million rupees

These figures also stand for *additional foreign aid* (agricultural aid) which is given a special accounting treatment from the regular foreign aid of row 22.

If the import of foodgrains is completely eliminated by the end of the second five-year planning period (the end of 1965) through an increase of the domestic marginal physical productivity to the level of 2,866, then from the next planning period, the two modifications, just introduced, need not be made.

SECTION VI

THE EFFECT OF THE AVAILABILITY OF FOREIGN AID ON THE LONG-RUN GROWTH PATH

When the domestic savings are inadequate to generate a dynamic-growth path, which shows a rapid increase of per capita income, an underdeveloped country can, and usually does, try to augment domestic savings by seeking foreign aid from the outside world. It can either borrow from foreign countries or receive grants-in-aid from friendly countries. We shall use the term "foreign aid" to cover both grants-in-aid and net foreign borrowing from private and public sources. (The term "net" borrowing is used to refer to the fact that interest payments and capital repatriations in any period are subtracted from the total borrowings in the same period. Defined in this way, a positive foreign aid is always shown as an import surplus to the same amount. Hence, we can use the ratio of the value of total export to the value of total import as a measurement of the degree of foreign aid. As we have pointed out in Section II, this ratio, denoted by q, is the cost of unit imports measured in terms of exports. Equivalently, the number $1-q$ is the ratio of "import surplus" to "total import", and measures the extent of "balance-of-payments support" which a country receives. As such, an increase of foreign aid can be represented by a lowering of the value of q(in other words, an increase of foreign aid and a lowering of import cost are equivalent expressions in our model).

If an underdeveloped country is to receive positive foreign aid, the value of q must be less than one. Otherwise, the country would be giving foreign aid; and when the value of q is zero, imported commodities become free goods. This is equivalent to the fact that a country can receive an unlimited amount of foreign aid. Thus, practically $0<q<1$ for an underdeveloped country.

For Pakistan, the Planning Commission has given the following consolidated table on the requirements of foreign aid during the second five-year planning period (1960-65):

FOREIGN EXCHANGE GAP DURING THE PLAN

(million of rupees)

Foreign exchange earnings	10,600
Non-development foreign exchange expenditures	12,100
Imports of foodgrains under P. L. 480	1.000
Extraordinary imports of other agricultural commodities under P. L. 480 ..	700
Development imports	6,500
Foreign exchange gap	9,700

(*Source:* **Second Five Year Plan, p. 98**)

It is seen that the total value of exports is 10,600 million rupees while the total value of import is 20,300 million rupees. Thus, the value of "q" for the second five-year planning period is $q = 10{,}600/20{,}300 =$ 52 per cent. We have no way to judge whether this projected degree of foreign aid will actually be realized in the second planning period; and, of course, we know even less of the long-run trend of the degree of foreign aid. However, the Pakistan Planning Commission gave the following information on the availability of foreign aid in the *first* five-year planning period (1955-60):

(million of rupees)

	Projected	Actual
Total foreign exchange expenditure	16,620	14,455
Total foreign exchange earnings	10,500	9,554
Deficit	6,120	4,901

(*Source:* **Second Five Year Plan, p. 85, Table 4**)

Based on these figures, the projected value of q is .63 and the actual value of q is .66 during the first five-year planning period. Thus, it seems that:

i) For understandable reasons, the Planning Commission tends to project foreign aid figures which are "slightly higher" than what is likely to be available.

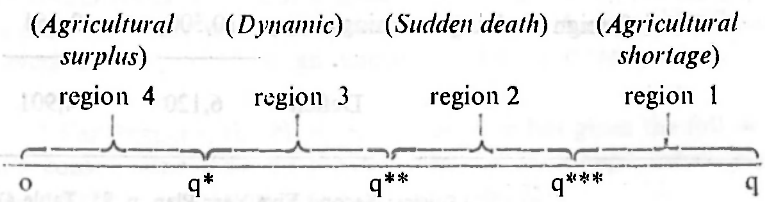
ii) The Planning Commission became more optimistic in respect to the availability of foreign aid in the second five-year planning period than in the first five-year planning period.

iii) If the optimism of the Planning Commission is justified, the value of the import cost coefficient is in the neighbourhood of .5.

In the long-run growth paths, projected in this paper (Tables 1 – 7), we have chosen $q = .5$ to be likely value of the import cost coefficient with the understanding that a higher value of q ($q = .6$) would imply a pessimistic view and a lower value of q ($q = .4$) would imply an optimistic view of the long-run availability of foreign aid.

It is intuitively obvious that an increase of foreign aid (a lowering of the value of q) will lead to a more favourable pattern of growth path. This means that as foreign aid increases, the growth path can change from the case of "impossibility of balanced growth due to the shortage of agricultural goods" (region 1, Diagram 5) to the case of "balanced-growth path leading to sudden death" (region 2, Diagram 5) and even to a case of "balanced dynamic growth" (region 3, Diagram 5). That this is precisely the case can be deduced as a logical consequence of the theoretical structure of our model.

The beneficial effects of foreign aid just described can be summarised in the following diagram:



6.1) *a)* $$q^{*} = \frac{a(v\text{-}u)\text{-}\Phi\ (1+i)\ m\text{-}w(r-h)\ (u+so\Phi')}{(u+so\Phi')\ (w'\ j+wz)\ +\Phi'\ (1+i)\ (eb\text{-}e'j\ +jfi)}$$

b) $$q^{**} = \frac{\theta\ (w\text{-}i\Phi r(o)/(1+i)\ +a\ (l\text{-}s(o))\text{-}m\text{-}ws(o)\ (r\text{-}b)}{ju\ +\ eb\ +\ f\,i\ +\ wzs(o)}$$

c) $$q^{***} = \frac{0+a\ (1+i\text{-}s(o)\ \text{-}\ (1+i)\ m\text{-}ws\ (o)\ (r\text{-}h)}{(1\text{-}i)\ e\ (b\text{-}j\ (1\text{-}b)/1\text{-}j)\ +\ w's\ (o)\ j+ws\ (o)\ z}$$

The horizontal axis measures the value of q. A number of critical values of q, q*, q** and q*** may be computed (from the formulae indicated) and marked on the horizontal axis. As can be seen from these formulae, the critical values q,* q** and q*** depend on all the other parameters in our model. It can be shown that under certain realistic assumption, these critical values satisfy the following inequalities:

$$q^{***} > q^{**} > q^{*}$$

and hence four intervals can be marked off on the horizontal axis. These four intervals correspond to the four regions described in the last section. If the *actual* value of q happens to fall in a particular interval, a particular type of growth path will be determined. It is seen that as the actual value of q decreases, a growth path changes to a more favourable category.

The critical values q*, q** and q*** depend upon all the domestic production and consumption conditions as well as the foreign trade conditions. The variation of these conditions amounts to a change of the values of one or more parameters involved in the definition of q*, q** and q*** (equation *6.1*). If *one* parameter is assumed to change, the values of q*, q** and q*** may be represented by three curves, (the intervals between these curves define the various regions of growth. As a concrete application of this technique, let us analyze the impact on q*, q** and q*** due to a change of the marginal productivity of labour in the agricultural sector, "a". (This special case serves to integrate the analysis of the last section with this section.)

In Diagram 6, the value of "q" is measured on the horizontal axis and the value of "a" is measured on the vertical axis. The three curves, marked q*, q** and q***, represent the relation between "a" and the critical values of q*, q**, q***. these curves are computed from equations *6.1a—c* from which it is seen that they are straight lines and, under realistic assumptions, have positive slopes. For a fixed value of "a" represented by a horizontal line, the intervals of the horizontal line, determined by the points of intersection with the three straight lines, correspond to the four regions of growth. Thus.

i) the *dynamic region* lies between curves q* and q**.

ii) the *sudden-death region* lies between the q** curve and q*** curve.

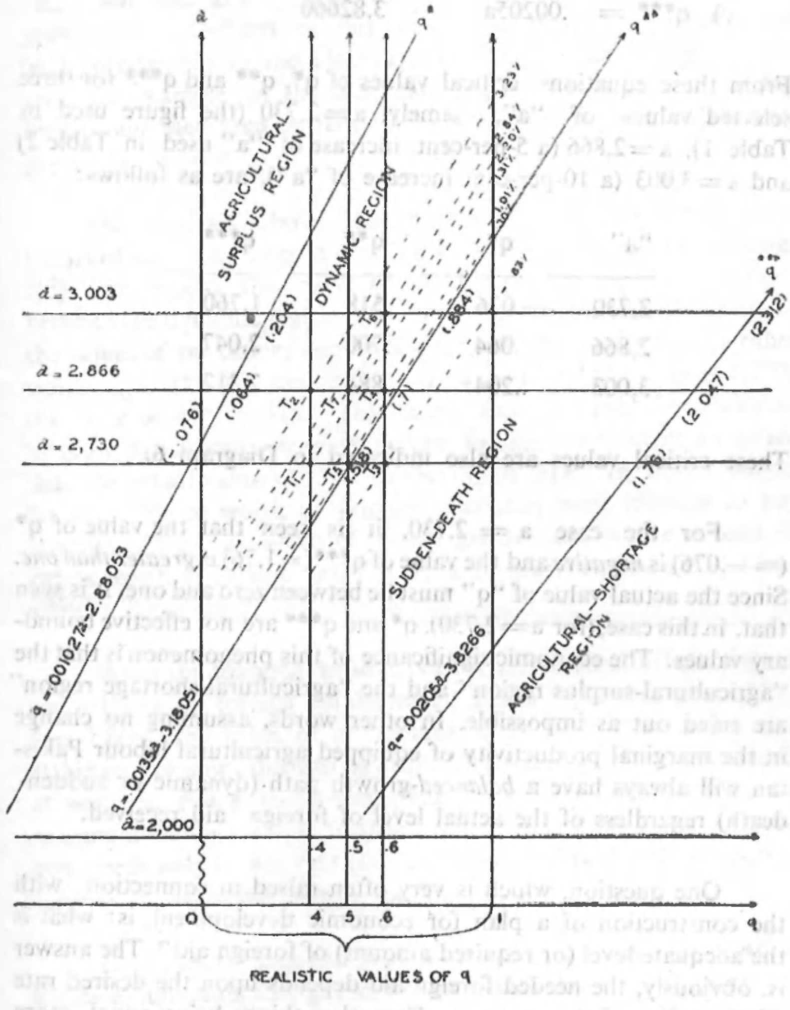
iii) the *agricultural-surplus region* lies to the left of the q* curve.

iv) the *agricultural-shortage region* lies to the right of q*** curve.

If a combination of the actual values of (a, q) happens to fall in any particular region, the type of the growth path is then determined.

With the aid of Diagram 6, we can easily visualize the economic significance of a change of the values of "a" and/or "q". For example holding the value of "q" fixed, a movement of a point along a vertical line upward (representing an *increase of labour productivity*) is seen to move gradually into a more *favourable growth region*. (This is due to the fact that the three straight lines have positive slopes). This corresponds to the intuitively obvious fact that, with the same degree of foreign aid, the growth prospect is better as domestic productivity increases.

Applying the above technique to the case of Pakistan, the equations for the straight lines of q*, q** and q*** are computed from equation *6.1* with the values of the parameters (except "q") indicated in the bottom of Table 1.



a
q*
q**
q***
a = 3.003
a = 2.866
a = 2,730
a = 2,000
AGRICULTURAL SURPLUS REGION
DYNAMIC REGION
SUDDEN-DEATH REGION
AGRICULTURAL-SHORTAGE REGION
REALISTIC VALUES OF q
0
.4
.5
.6
1
q

DIAGRAM 6

q^{**}). From the projected growth paths of these tables, we see that they are, indeed, dynamic-growth paths.

As a counter example of a dynamic-growth path, suppose, at the current level of marginal productivity of labour ($a = 2,730$) with an implied maximum import cost $q^{**} = .518$, the actual value is $q = .6$. In other words, the case is represented by the point T_3 in the sudden-death region. Pakistan, thus, fails to acquire the minimum foreign aid. The projected long-run growth path is given in Table 3. From this table, we see:

i) the fraction of total working force engaged in the industrial sector continually declines (row 26),

ii) the per capita income continually declines (row 25),

iii) the investment expenditure in the industrial sector continually declines and takes on negative values after a finite number of 3 planning periods (row 12). From the fourth planning period on, the industrial labour force will have to decline *absolutely*. (For this reason, the projected growth path is only shown for three planning periods).

These are the common characteristics of all growth paths of the sudden-death type. They clearly show why such a growth path cannot be socially acceptable. In other words, if all these characteristics appear in spite of the effort of the aid-giving countries, the level of foreign aid must be regarded as falling short of a "needed minimum".

We are fully armed with theoretical tools to analyze the practical matters of economic planning in Pakistan which we left at the end of the last section. The question is to project an alternative long-run growth path which *i*) requires less foreign aid than Table 1 (and Table 2); *ii*) involves a rate of expansion of per capita income somewhere between Table 1 and Table 2 (*see*, end of last section.) Referring to the positions of the points T_1 and T_2 (these notations are chosen so that point T_1 represents Table 1 and point T_2 represents Table

2, *etc.*) in Diagram 6, it is obvious that, if the marginal productivity of the labour has been raised to the higher level (a=2,886 as in T_2) the alternative growth paths which we are seeking must be represented by a point (*e.g.*, T_7, T_4) which lies to the right of T_2. For such points (*e.g*, T_7, T_4) involve less foreign aid than T_2 and, for this reason, will involve rates of expansion of per capita income less spectacular than T_2. We, of course, do not know whether these points (T_7, T_4) are "better than" T_1 (*i.e.*, whether the rates of expansion of per capita income are faster than T_1). Hence, we must do some experiments.

The long-run projected growth path corresponding to the point T_4 (a=2,866, q = .6, other parameters remain unchanged) is given in Table 4[21]. Comparing Table 4 with Table 2, we see:

i) the foreign-aid figure (both in absolute value (row 22) and as percentage of total investment expenditures (row 26)) in Table 4 are smaller, and

ii) the rate of expansion (measured by increase of per capita income (row 25) or by percentage of industrial working force (row 26)) in Table 4 is much slower.

These are results which we expected. On the other hand, when we compare Table 4 with Table 1, we see:

21. Notice that the first figure in row 4 is one. This means that we have assumed that the total working population in the *first* planning period has size of "one unit". We have presented such a table to illustrate the so-called "linear property" of our model. If the actual size of the total working force in the first planning period is P(o) (*e.g.*, P(o)=26.92 million) for the case of Pakistan) then the projectd growth path can be obtained from Table 4 by multiplying *every* entry of the table (rows 1 to 23 inclusive) by (P(o)).

For example, if the initial working population of Pakistan is (P(o) =26.92 million, then the foreign-aid figures (row 22) becomes.

1955-60	1960-65	1965-70	1970-75	1975-80
221.85×26.92	255.04×26.92	307.39×26.92	401.85×26.92	602.65×26.92
=5,972.20	=6,865.68	=8,274.94	=10,817.80	=16,223.34

The values of the indicators in row 24 to row 27 (inclusive), however, remain unchanged (*i.e.*, remain what they are in Table 4). This "linear property" of our model makes it easier for use to compute alternative projections when the size of the total working force alone changes.

i) foreign aid (rows 22 and 27) is higher in T_1 than in T_4.

ii) rate of expansion (rows 25 and 26) is higher in T_1 than in T_4.

Thus, our experiment has failed! The projected growth path in Table 4 does *not* involve a higher rate of expansion than Table 1. This means that we have to do another experiment. This time, let us take point T_7 which, we expect, involves a rate of expansion higher than T_4 (and lower than T_2) and *maybe* higher than T_1. The long-run growth path corresponding to the point T_7 ($a=2,866$, $q=.5$) is given in Table 7. Comparing Table 7 with Table 1 and Table 2, we see:

	Percentage cumulate increase of per capita income (row 25)		Percentage of industrial working force (row 26)		Million of rupees of foreign aid (row 22)	
	1960-65	1965-70	1960-65	1965-70	1960-65	1965-70
Table 2	3.23	11.48	25.94	28.31	11,106	15,655
Table 7	2.20	7.62	25.64	27.22	8,956	11,731
Table 1	1.31	4.52	25.37	26.31	10,411	12,848

The foreign-aid figures of Table 7 are smaller than those of either Table 1 or Table 2. The projected rate of expansion (measured in the first four columns) of Table 7 lies between Table 1 and Table 2. Thus, we are successful, this time! We believe that, provided that the marginal productivity of equipped agricultural labour can be increased by 5 per cent, Table 7 seems to be a "better" long-run growth path than the other growth paths projected in this paper. For, in the first place, the projected foreign-aid figure for the second five-year planning period (8,956) seems to be realistic in the sense that it is smaller than the figure (9,700) projected by the Planning Commission by a "reasonable amount". In the second place, the projected rate of increase of per capita income (2.20 per cent) for the second five-year planning period (1960-65) is, we think, just about what Pakistan can reasonably hope to achieve in the next five years. This rate of increase is, to be sure, much lower (about 1/5) than the Planning Commission thought to be the "politically acceptable" figure of 2 per cent *per year* (about 10 per cent for a five-year period). However, judging from the experience of the *First Five Year Plan*, the "2-per-cent-per-year" figure of the Planning Commission is unrealistic[22].

Although the "2.2 per cent for five years" figure of Table 7 seems to be too low from the "Planning Commission Standard," such a state of affairs is not a cause of alarm and dismay. On the contrary, this rate of increase, if accomplished, may be regarded as quite satisfactory. This optimism is due to fact that a *modest but positive* beginning can lead, through a cumulative effect, to a very satisfactory rate of growth of per capita income in the long run. This is clearly illustrated in the long-run growth path projected in Table 1, for which the *annual compound rates of growth* upto 1965, 1970, 1975 and 1980 are:

	1965	1970	1975	1980
annual compound rate of increase of per capita income	0.26%	0.45%	0.65%	1.50%

Since Table 7 provides a higher rate of increase of per capita income than Table 1, it is seen that, the *long-run annual rate of growth* in,

22. The projected rate of increase of per capita income over the first five-year planning period (1955-60) is 7 per cent. (*First Five Year Plan*, p. 13). The realized increase of per capita income during the first four years (1955-59) is only 0.7 per cent (*Second Five Year Plan*, p. 45). For the second five-year planning period, the per capita income increase of "2-per-cent-per-year" projected by the Planning Commission is almost certain to be higher than what was actually accomplished in the *entire five-year period* during the first five-year planning period. In the projection of the "2-per-cent-per-year" figure, the Planning Commission assumed that the rate of population increase (1960-65) will be 1.8 per cent per year. (*Second Five Year Plan*. p. 5). The 1961 Census, which was taken after the publication of the *Second Five Year Plan*, shows an annual rate of population increase of 2.2 per cent which is much higher (about 22 per cent higher) than the 1.8 per cent figure used by the Planning Commission.

say, twenty years, will probably be higher than the 2-per-cent-per-year figure in spite of the modest beginning. A lesson that we should learn from the model structure of this paper is: provided Pakistan can make a small and positive progress in the near future (or, to use a popular expression, provided Pakistan can "take-off in a sustained growth" in the next five years), the short-run increase of per capita income should *not* be a major concern to the plan-makers[23]. Provided the economy is a "dynamic" one, the long-run rate of increase of per capita income will be satisfactory sooner or later. Furthermore, our calculation has shown that this *is* the case for Pakistan.

Appendix (Section VI)

Referring to Diagram 6, we have, thus far, constructed five long-run growth paths corresponding to T_1, T_2, T_3, T_4, and T_7, and have developed the idea that, from the viewpoint of "social desirability" these points can be ranked in the following order:

T_2, T_7, T_1, T_4, T_3,

Specifically, this ranking can be determined by the cumulative rate of increase of per capita income (row 25 of these tables) up to a given planning period. Using the planning period 1960-65 as a "target year", the cumulative percentage rates of increase of per capita income are:

T_2	3.23
T_7	2.20
T_1	1.31
T_4	1.01
T_3	—0.83

which are seen to correspond to the above "social ordering." Treating this "cumulate rate of increase of per capita income"

23. As we have pointed out in Section IV, the "2-per-cent-per-year increase of per capita income" was taken as a primary analytical condition for the construction of the entire *Second Five Year Plan,* by the Planning Commission. It follows from our analysis here that such assumption is unrealistic and can lead to very misleading results.

as an *index*, all the points in Diagram 6 can be ordered. This ordering can be represented by a system of ***equal-index contour lines*** (the dotted lines in Diagram 6), where

i) points on the same contour line receive the same value of the index (these points are equally desirable).

ii) points on a higher contour line receive a higher value of the index (points on a higher line are more desirable).

These contour lines have a positive slope indicating the intuitively obvious fact that "domestic increase of agricultural productivity" can substitute for "foreign aid" in order to maintain the same rate of expansion of per capita income. (In Diagram 6, the common index of a given contour line is marked on the line. For example, the contour line through T_1 is marked with 1.31 per cent.

An "indifference map" of this sort is useful for at least two purposes. From the theoretical standpoint, the theory of needed minimum foreign aid which we have just presented can be generalized. For, now we can define the "minimum" foreign aid as that level of foreign aid which is sufficient to generate a pre-assigned value of rate of expansion of per capita income. (In other words, the needed minimum foreign aid may not be (and ordinarily is not) that level of foreign aid which merely ensures a dynamic growth path but must also ensure that the dynamic growth path is growing *fast enough*). Provided the desired rate of expansion of per capita income is given, the needed foreign aid, relative to all levels of "a", can be read from the contour line which receives the same "index".

The second use of the indifference map (which is really a by-product of the above theoretical reasonings) is that it can be used to facilitate the experimental process of locating suitable alternative long-run growth paths. For, with the aid of the indifference map, we can now "predict" the value of the "index" (*i.e.*, the rate of expansion of per capita income) for alternative combinations of "a" and "θ" before the long-run growth path is actually projected. This saves us the time which would have been required to compute a long-run growth path that turns out to be so obviously irrelevant. (Our own experience was that much time has been wasted in this way.)

The indifference map of this sort can be determined, ideally, by deductive reasonings (*i.e.*, by mathematical manipulation). However, in view of the complexities of the problem involved, a better way of determining a "rough" indifference map is to project a number of long-run growth paths and, after computing the "indices" from these growth paths, determine the positions of the various selected indifference curves. Furthermore, an indifference map, obtained in this way, is an automatic by-product of the experimental procedure. (In other words, even a projected long-run growth path that is obviously irrelevant, the effort involved is not wasted. For the "index" of such a growth path (together with the values of "a" and "0") can help us to determine, more accurately, the relative positions of the indifference curves.)

The indifference map of Diagram 6 is determined in this way. In addition to the points T_2, T_7, T_1, T_4, T_3, we have also projected two long-run growth paths that correspond to points T_5 and T_6 (*see*, Tables 5 and 6). These seven points, which are ranked in the following order,

T_2, T_6, T_7, T_4, T_5, T_3.

determine the seven contour lines in Diagram 6. These contour lines give us a fairly good idea of the rate of expansion of per capita income of some neighbouring points for which the long-run growth path has not been projected. Our "inductive" evidence has shown that the indifference curves seem to be straight lines roughly parallel to the q** curve. However, this fact has not been proved by deductive reasoning.

SECTION VII

CONCLUSION

The theory of minimum foreign aid in the last section can be immediately generalized. For example, we can compute the needed minimum foreign aid when the value of any or all parameters involved in the definition of q^{**} (equation *6.1b*) are changed. Provided we know the revised values of these parameters, we can compute q^{**} (from equation *6.1b*). If, in addition, we know the actual value of foreign aid ("q"), we can then determine whether the actual level of foreign aid meets the minimum requirement of dynamic growth (the condition being $q < q^{**}$). We can also project alternative growth paths, based on the revised values of the parameters, to compare any or all dimensions of the growth paths involved. Such methods are usually called "comparative dynamic economic analysis" and provide a good framework for an economic development plan.

In particular, we may mention the important problem of population growth. Following the procedure outlined in the last paragraph, we could have easily made a comparative dynamic analysis of the population problem in the context of this model. (Notice that the population growth rate "i" is involved as a parameter in the definition of q^{**} in equation *6.1b*. We did not do this because there are a large number of such "important" problems which we could have studied. We would rather emphasize the methods of analysis which are nearly the same in all cases.

In view of the uncertainty inherent in the real world, one essential condition for efficient planning is the ability to make alternative plans (*i.e.*, to modify an existing plan) in an orderly fashion and with reasonable speed. The method of comparative dynamic analysis is precisely such a method. For the central requirement of such a method is that the ground rules for plan construction are carefully laid out beforehand; this method *cannot* be used unless it is used orderly and systematically. To construet an "outline plan" (a "Table") in this paper, our experience is that, when the computers are properly trained, it takes two men two working days to construct a "Table".

In the current state of our knowledge, planning for economic development, especially long-run economic development, *cannot* be a precise science. The "correct" planning methodology seems to be an artistic effort which involves a reasonable combination of common sense, intuition and value judgements on the one hand; and, in the economics of planning, a fair amount of rigorous analytical groundwork on the other hand. This is illustrated in the repeated experiments, involving trial and error, success and failure, which we did in the last section. There is, decidedly, a "non-scientific" element as well as "scientific" element in this process. However, whether scientific or non-scientific, the most important requirement for efficient planning is that it must be "orderly"; otherwise, there is little hope for progress. It is hoped that our paper has made a modest contribution to planning methodology in this sense.

STATISTICAL APPENDIX

TABLES

STATISTICAL APPENDIX

In this appendix, we want to indicate the sources of our data as well as the procedure we have adopted for the computation of the parameters given in Section II of the text. Most of the figures are taken from the following sources.

(*1*) The *First Five Year Plan* (*1955-60*), Planning Commission, Government of Pakistan.

(*2*) The *Second Five Year Plan* (*1960-65*), Planning Commission, Government of Pakistan.

(*3*) *Report of the Food and Agriculture Commission*, Government of Pakistan.

(*4*) *Census of Manufacturing Industries 1955*, Central Statistical Office, Government of Pakistan.

(*5*) *Crops, Vegetables and Fruits in Pakistan*, *1957*, Ministry of Food and Agriculture, Government of Pakistan.

(*6*) *Markets and Prices*, December 1955, Co-operation and Marketing Department, Government of Pakistan.

(*7*) *Foreign Trade Statistics of Pakistan*, *1955*, Central Statistical Office, Government of Pakistan.

We shall refer to these sources by the number indicated above.

The estimation of the parameters of this paper is not based on any high-powered statistical technique. This is due to the scarcity of statistical data. In most cases, we have statistical data for only a single observation. In other cases, we do not even have statistical data for a single observation and the estimation can be carried out only indirectly by making certain restrictive assumptions.

The general procedure, which we have used, consists of three steps:

Step one: an accounting table is first constructed indicating the accounting relations of a system of magnitudes which has been described in the flow chart (Diagram 4) in the text.

Step two: we estimate, independently, a "minimum number" of variables in the above table.

Step three: then we deduced the value of the other variables in the accounting tabel with the aid of the set of values obtained in *step two* and the accounting relations implied in the accounting table.

Such an accounting table is first presented for each sector, the agricultural sector (Section 1), the non-agricultural sector (Section 2), and the household sector (Section 3). Following the presentation of such a table, the independent estimations of *step two* are then described in each case.

In these accounting tables, we have listed the values of *total flow in the five-year period* (1955-60). When a "five-year flow figure" cannot be obtained directly from published sources, we have tried to estimate a flow figure for a *single year* and then adjust the figure to the five-year basis.

The readers should be familiar with the system of accounting relations implied by the flow chart (Diagram 4). The capital letters which we have used to describe an economic magnitude in Section II in the text will be used consistently in this appendix.

SECTION 1: AGRICULTURAL SECTOR

The production and the allocation of agricultural goods for 1955-60, indicated in Diagram 4, may be summarised as follows:

Total domestic output (X)...........	Rs. 61,853	million
Less export (E)	Rs. 7,342	million
Less raw materials (R)	Rs. 9,648	million
Domestic output for consumption (M')	Rs. 44,863	million*
Plus imported foodgrains (F)	Rs. 2,330	million
Total consumption (M)	Rs. 47,193	million*

We want to indicate how these figures are derived. The figures that are marked with (*) are computed by the accounting relations implied in this table. The other figures are estimated independently.

1.1) TOTAL DOMESTIC OUTPUT (X)

The following figures on the contribution to Gross National Product, at factor cost, by the agricultural sector are given on page 45 of source (2):

1955-56	11,877	million rupees
1956-57	12,778	million rupees
1957-58	12,449	million rupees
1958-59	12,102	million rupees
1959-60	12,647	million rupees

This gives a total of 61,853 million rupees. In our model, we have assumed that the intermediary factors of production purchased by the agricultural sector are negligible. Thus, the figure 61,853 has been taken to be the value of total domestic net output for the agricultural sector (X).

1.2) EXPORT (E)

The following figures on exports during 1955-60 are given on page 564 of source (3):

Total export	9,554	million	rupees
Less export of non-agricultural goods..	2,212	million	rupees
Export of agricultural goods (E)	7,342	million	rupees

1.3) IMPORTS (F)

The following figures on the total imported foodgrains are given on page 29 of source (3):

Import on aid	1.618	million	rupees
Import on Pakistan's own reserves	712	million	rupees
Total import of foodgrains (F). ..	2,330	million	rupees

1.4) RAW MATERIAL (R)

We have no data for the actual value of "R" (agricultural output purchased by the industrial sector as raw material for 1955-60). Hence, this number (R=9,648) was indirectly estimated in the following way. For the single year 1955, we have the following figures on domestically-produced agricultural raw material:

Domestically-produced agricultural raw material[1]	2,391	million	rupees
Plus domestically-produced rice and wheat milled	317	million	rupees
Less net export of agricultural raw materials[2]	1,207	million	rupees
Domestic agricultural raw material purchased by industrial sector in 1955	1,501	million	rupees

For the same year (1955) the net output of the non-agricultural sector is computed as follows:

1. This includes oil-seeds, fibres, sugar-cane, tobacco, tea leaves, forestry, hides and skins, wools, *etc.* This figure (2,391) is obtained from sources (5) and (6) and the next figure (317) from sources (1) and (4).

2. The export figure is 1,243 and the import figure is 36 *See*, source (7).

Total net output of large-scale manufacturing industries (source (4), p. 3)	2,569	million rupees
Total net output of small-scale manufacturing industries[3] (source (2), p. 45)..............	1,907	million rupees
Total net output of service sector[4] (source (2), p. 45)	5,477	million rupees
Total industrial net output	9,953	million rupees

Thus, we can estimate the agricultural raw material coefficient "r" (of equation *2.12*) as the ratio of "agricultural raw material" (1,501) and "total industrial net output" (9,953), *i.e.*, r = 1,501/9,953 = .15. This is the value for "r" for the single year 1955. We shall assume that the same value for "r" holds in every year from 1955-60. Based on this assumption, we can compute the value for R (the agricultural raw material for the five-year period 1955-60) as the product $R=Q \times .15$, where Q is total domestic net output of the non-agricultural sector in the five-year period (1955-60). It will be shown in Sub-Section 2.4 below that Q=64,320. Hence, the value of R is $.15 \times 64{,}320 = 9{,}648$.

SECTION 2: THE NON-AGRICULTURAL PRODUCTION SECTOR

The production and allocation of non-agricultural goods for 1955-60, indicated in Diagram 4, may be summarized as follows:

Agricultural raw material used (R)	9,648*	million rupees
Plus imported raw material (Z)	5,901	million rupees
Plus value added (V_i)	48,770	million rupees
Total domestic net output (Q)	64,319	million rupees
Less export (H)	2,212	million rupees

3. Computed on the basis of ratio of value added to net output in large-scale manufacturing industries.

4. Government, banking, transport and communications, services, rental income, wholesale and retail trade.

Output available for domestic use (Y) ..	62,107*	million rupees
Plus import of consumer goods (V)	2,600	million rupees
Plus imports on capital account (U)	6,500	million rupees
Total supply of industrial goods	71,207*	million rupees
Consumption (C)	54,550	million rupees
Plus Investment (I)	16,657*	million rupees
Total domestic demand of industrial goods......	71,207*	million rupees

We want to show the derivation of the figures not marked with (*). The figures that are marked with (*) are computed from the accounting relation implied by the above table.

2.1) AGRICULTURAL RAW MATERIAL (R)

Estimated in Sub-Section 1.4 above.

2.2) VALUE ADDED OF THE NON-AGRICULTURAL SECTOR (V_i)

For the five-year period, 1955-60, the value added of the non-agricultural sector was computed from source (2) page 45, as the difference between the GNP (values added at factor cost) and the value added of the agricultural sector.

Year	GNP (at factor cost)	Value added in agricultural sector	Value added in non-agricultural sector
1955-56	20,840	11,877	8,963
1956-57	22,186	12,778	9,408
1957-58	22,200	12,449	9,751
1958-59	22,277	12,102	10,175
1959-60	23,120	12,647	10,473

Total value added in non-agricultural sector 48,770 million rupees.

2.3) IMPORTED RAW MATERIAL (Z)

In order to compute the imported raw material (Z = 5,901) for the *five*-year period (1955-60), we have the following relevant data for the single year of 1959-60.

i) The value added of the non-agricultural sector for 1959-60 was 10,433 as computed in Sub-Section 2.2 above.

ii) The total raw material imported in 1959-60 was estimated at 1,270 million rupees. This figure was computed from source (2) page 88 which gives the following data for the year 1959-60:

Total imports on current account (except food) ..	1.940	million	rupees
Less consumer's goods	200	million	rupees
Less government non-development imports..	320	million	rupees
Less imported food (purchased from Pakistan's own resources)	150	million	rupees
Import of raw materials and service	1.270	million	rupees

With the two figures (value added of the non-agricultural sector = 10,473 and imported raw material = 1,270), we may compute a ratio 1,270/10,473 = .121 which is imported raw material as a fraction of value added of the non-agricultural sector for the single year 1959-60.

iii) Finally, we may assume that the same ratio (.121) which prevailed in 1959-60, prevailed in the five-year period (1955-60). Since the value added of the non-agricultural sector for the five-year period (1955-60) is 48,770 (*see* Sub-Section 2.2 above), the imported raw material for the five-year period (1955-60) is estimated as $48,770 \times .121 = 5,901$.

2.4) TOTAL DOMESTIC NET OUTPUT OF THE NON-AGRICULTURAL SECTOR (Q)

The value of Q was estimated on the assumptions of the following equations:

i) $X + V_i + Z = Q + M + E$

ii) $R = X - M - E$

iii) $R = .15 \times Q$

The equations (*ii*) and (*iii*) have been explained in Section 1 of the Statistical Appendix (*see*, Sub-Section 1.4). The validity of the first equation (*i*) can be easily seen from the flow diagram (Diagram 4) *e.g.*, $X + V_i + Z$ is the inflow to the two production sectors and $Q+M+E$ is outflow from the same (two) production sectors.

When equation (*ii*) and (*iii*) are substituted in equation (*i*), we have:

$$Q = \frac{V_i+Z}{1-.15} = \frac{V_i+Z}{.85}$$

Since V_i (=48,770) and Z (=5,901) have been independently estimated in Sub-Sections 2.2 and 2.3, the value of Q is

$$Q = (48,770 + 5,091)/.85 = 64,319.$$

(The value of $R = .15 \times 64,319 = 9,648$ is seen to be the same as in Sub-Section 1.4).

2.5) EXPORT OF DOMESTIC NON-AGRICULTURAL GOODS (H)

On page 83 of source (2), the export of non-agricultural goods for 1955-60 includes:

Jute manufacturers	685 million rupees
Cotton manufacturers	429 million rupees
Invisible receipts	1,098 million rupees
Total exports (H)................	2,212 million rupees

2.6) IMPORT OF CONSUMER'S GOODS (V)

The total import of consumer's goods for the single year 1959-60 is 520 million rupees (*see*, source (2), p. 88). We assume that the same level of imports has been maintained in 1955-60. Thus, the import of consumer's goods is $V = 520 \times 5 = 2{,}600$ million rupees for the period 1955-60.

2.7) IMPORT ON CAPITAL ACCOUNT (U)

The value of U is 6,500 million rupees for the period 1955-60 as given on page 565 of source (3). (The estimation of consumption of industrial goods (C) will be described in the following section).

SECTION 3: SAVINGS, INVESTMENT AND CONSUMPTION

The following table is a summary of the compositions of GNP and NI, for the five-year period 1955-60 (in millions of rupees) as indicated in Diagram 4.

61,853	Value added in agricultural sector	61,853
48,770	Value added in industrial sector	48,770
	Foreign aid (import surplus)	7,777
110,623	National income GNP	118,400
	Less:	
47,193	Consumption of agricultural goods	47,193
54,550	Consumption of non-agricultural goods	54,055
8,880	Savings	
	(+)	
7,777	Foreign aid	
16,657	Investment	16,657

The foreign aid figure (7,777) is computed as the difference between total imports and total exports:

Import of raw material (Z)	5,901	million rupees
Import of consumer's goods (V)	2,600	million rupees
Import on capital account (U)	6,500	million rupees
Import of foodgrains (F)	2,330	million rupees
Total imports	17,331	million rupees
Export of agricultural goods (E)	7,342	million rupees
Export of industrial goods (H)	2,212	million rupees
Total exports (*Less*)	9,554	million rupees
Foreign aid (import surplus)	7,777	million rupees

Based on this figure of foreign aid, we can compute NI (110,623) and GNP (118,400). Since we have already estimated consumption for agricultural goods (47,193), we only need to estimate savings in order to compute "consumption of non-agricultural goods" *i.e.*, (NI−savings−consumption of agricutural goods) and investment (foreign aid *plus* savings). In order to estimate savings, the following gross savings ratios (*i.e.*, gross domestic savings as proportion of GNP) are given on page 28 of source (2);

1958-59	6.1
1959-60	6.5
1960-61	7.0
1961-62	7.3
1964-65	8.6

We have taken a ratio of 7.5 as the pertinent savings ratio. The "savings" is then GNP $\times$ .075 = 118,400 $\times$ .075 = 8,880.

SECTION 4: POPULATION AND LABOUR FORCE

We have taken the population of 1957 (*i.e.*, the mid-point of the five-year interval 1955-60) as representing the population of the first five-year plan period (1955-60). According to 1961 Census, the size of population for 1957 is 86 millions.

In order to compute total working force for 1957, the 1951 Census report indicates that the ratio of working force to total population is 31.3 per cent, we assume that this ratio is maintained in the later years. Based on this assumption the total working force in 1957 is 86 $\times$ .313 = 26.92 million. For the distribution of total working force between the agricultural and non-agricultural sector, the 1951 Census gives the figures of 75 per cent and 25 per cent respectively. Assuming the same ratios are maintained, the agricultural labour force is estimated to be 20.19 million (26.92 $\times$ .75) and the non-agricultural labour force is 6.73 million (26.92 $\times$ .25) in 1957.

SECTION 5: ESTIMATION OF PARAMETERS

The parameters S(o) in behaviouristic equation *2.6*, P(o) in equation *2.7*, m in equation *2.8*, e in equation *2.9*, b in equation *2.10*, r in equation *2.12*, z in equation *2.13*, w in equation *2.14*, h in equation *2.15*, and j in equation *2.16* are computed directly from the data presented above by the method described in the text. The value of the parameter q in equation *2.17* was estimated in Section VI in the text. Hence, we only need to describe the estimation of the parameter "i" (in equation *2.18*), "Φ" (in equation *2.19*), "f" (in equation *2.20*) "a" and "θ" (in equation *2.21*). For the annual rate of increase of population "i", the 1961 Census indicated that the average annual rate of increase of population from 1951 to 1961 is 2.15 per cent. Compounding this figure over a five-year interval, the five-year rate of increase of population is $i = (1 + 0215)^5 - 1 = .1125$. For the capital-labour ratio (Φ) in the non-agricultural sector, we have assumed that the capital-output ratio, on a single year basis, is "4". Thus, the capital-output ratio, on a five-year basis, is $n = 4/5 = .8$. Since $\Phi = n \times w$($w = 9{,}557$ is the output-labour ratio estimated above), the capital-labour ratio is 7,645 ($\Phi = .8 \times 9{,}557$).

For the estimation of the parameters in the agricultural sector (a, θ and f), we have first computed the following table which described the magnitude and the "output-increasing" effects of the two types of investment expenditures (*i.e.*, fixed investment and lagged input) in the agricultural sector for the second five-year planning period; (figures in millions of rupees):

	Magnitude of total expenditure (five-year total 1960—65)	Annual incremental output (at the end of 1965)
Fixed investment (B)	3,990	655
Lagged input (A)	688	1,794
Total	4,678	2,449

This table was computed from the figures contained in *Second Five Year Plan.* Since the total investment expenditure in the agricultural sector was given in source (2) in two separate chapters—*i.e.*, the chapter on agricultural development and the chapter on water and power development—we must combine the relevant figures in these two chapters.

From the chapter on "water and power development," the following figures (page 203) are taken by us to be those expenditures which are relevant to the agricultural sectors:

Irrigation	437	million rupees
Drainage, reclaimation and tubewell	229	million rupees
Flood regulation	310	million rupees
Open canals	110	million rupees
Multipurpose Development*	401	million rupees
Investigation and Survey*	72	million rupees
Miscellaneous*	39	million rupees
Total	1,598	million rupees

We shall assume that the entire amount (1,598) is a part of the fixed investment. These expenditures (1,598) are public investment expenditures. In addition, the Second Plan also listed the following expenditures which we shall also assume to be a part of the fixed investment expenditures:

Private investment on irrigation (page 12)	60	million rupees
Village Aid (page 12)	480	million rupees
Total	540	million rupees

For total investment expenditures listed under the heading of "agricultural sector", we found that the total investment expenditure consists of two sources, namely, private and public.

*Computed in the ratio of expenditures on power and expenditure exclusively taken for agricultural sector.

The total investment expenditures from these two sources are:

Total public investment expenditure (page 12)	1,660	million rupees
Total private investment expenditure (page 12)	880	million rupees
Total investment expenditure listed under "agricultural sector"	2.540	million rupees

This total investment expenditure was divided by us into two parts corresponding to the division of "fixed investment (B)" and "lagged input (A)". The following expenditures are taken by us to be the lagged inputs (source (2), p. 194).

Manures and fertilizers	318	million rupees
Plant protection	256	million rupees
Seed multiplication and distribution	114	million rupees
Total	688	million rupees

This is the total lagged input (A). The remaining expenditures are taken to be the fixed investment expenditures[5]. Thus the fixed investment expenditure, listed under "agricultural sector", is 1,852 (=2,540—688). Hence, the total fixed investments in the agricultural sector from all sources is 3,990 (=1,598+540+1,852). These investment expenditures in the agricultural sector (A=688, B=3,990) are total investment expenditure in the five-year period (1960-65).

For an evaluation of the "output-increasing" effects of A and B, the Planning Commission made an estimation of the contribution, in terms of the amounts by which annual agricultural output can

5. They include expenditures on mechanization, soils, agricultural economics and statistics, agricultural marketing, foodgrains storage, agricultural extension, agricultural research, agricultural education, colonization, animal husbandry, range management, forestry, soil conservation, fisheries, underdeveloped areas, land reforms, Central Jute Committee, Central Cotton Committee, Food and Agricultural Council.

be raised by the end of the second five-year plan period, *i.e.*, by the end of 1965 (page 142). These estimations are[6]:

Contribution by lagged input (A)	1,794	million rupees
Contribution by fixed investment (B)	655	million rupees
Total output-increase effect	2,449	million rupees

These figures are listed in the second column of table presented above. They are in units of annual output flows.

For the computation of "θ", the marginal productivity of the lagged input in the agricultural sector, the formula we have used, is:

$$\theta = \frac{\text{annual incremental output due to lagged input}}{\text{magnitude of lagged inputs (A)}}$$

$= \frac{1,794}{688}$ (*see*, the second row of the first table in this section)

$= 2.6$

The assumption underlying this formula is that the expenditures (A) will be incurred at the beginning of the second five-year planning period and the incremental output will be obtained towards the end of the second five-year period (*i.e.*, there is a lag of five years between the input and output).

For the computation of "a" (the marginal productivity of labour) and "f" (the capital-labour ratio) in the agricultural sector, we need to know the size of the increase of the agricultural labour force during the five-year period (1960-65). This incremental labour force in the agricultural sector is computed, indirectly, in four steps:

6. The figures given by the Planning Commission are in physical units (tons, bales, pounds). We have converted them into value units. In this conversion, we have used the prices of agricultural goods in source (6) for the year 1955 as base year. For the 10 years interval (1955-65), we have assumed that there is an increase in prices of 20 per cent from the base year.

Step one: We know that the total investment expenditure in the second five-year planning period is 19,000 million rupees, (source (2), p. 12) and the total investment expenditure in the agricultural sector is 4,678 million rupees (*see*, first table). Thus, the total investment expenditure in the non-agricultural sector is 14,322 (= 19,000—4,678) million rupees in the second five-year planning period, *i.e.*, D = 14,322.

Step two: We have computed the capital-labour ratio $\Phi = 7{,}645$ in the non-agricultural sector (*see*, above in this section). With this value of Φ, the total labour force which will be absorbed by the non-agricultural sector during the second planning period, is

$$D/\Phi = 14{,}322/7{,}645 = 1.87 \text{ million of workers}$$

Step three: At the rate of increase of population of 2.15 per cent per year, the total increase in labour force is 3.028 million workers. (This is based on the assumption that the size of the labour force at the beginning of the Second Plan is 26.92 million—*see*, Section 5 of this appendix).

Step four: It follows from steps two and three, that the labour force will increase by 1.2 million (=3.028—1.87) in the agricultural sector, L = 1.2

Based on this value L = 1.2 and the value of B(the fixed investment of 3,990), the capital-labour ratio "f" in the agricultural sector is computed as:

$$f = B/L = 3{,}990/1.2 = 3{,}225 \text{ (rupees per farmer)}$$

Since, for such an increase of labour (L = 1.2) equipped with B units of fixed capital, the annual incremental output of agricultural goods is 655 million rupees (*see*, first table), it follows that the marginal productivity of labour is:

$$a = 655/1.2 = 546 \text{ rupees } \textit{per year}$$

For a five-year period, the marginal productivity of labour in the agricultural sector is $5 \times 546 = 2{,}730$.

TABLE I

LONG-RUN PLANNING FOR PAKISTAN

(1955—80)

(value in million rupees)

Sector	S.No.	1955-60	1960-65	1965-70	1970-75	1975-80
POPULATION SECTOR (in million men)						
Total population (P ÷ 0.313)	1	86.00	95.68	106.44	118.41	131.35
Industrial worker (W)	2	6.73	7.60	8.77	10.64	14.37
Agricultural labour (L)	3	20.19	22.35	24.55	26.43	26.87
Total working force (P)=(W + L)	4	26.92	29.95	33.32	37.07	41.24
INDUSTRIAL SECTOR:						
Domestic output (Q)	5	64.319	72,607	83,770	101,704	137,338
Import on capital a/c (U)	6	6,351	7,711	10,415	16,812	33,551
Import of consumer goods (V)	7	2,727	3,034	3,375	3,755	4,177
Total Availability (Q+U+V)=(H+C+I)	8	73,397	83,352	97,560	122,271	175,066
Export (H)	9	2,573	2,904	3,351	4,068	5,494
Consumption (C)	10	54,540	60,675	67,504	75,096	83,544
Investment (I) = (D+B+A)	11	16,284	19,773	26,705	43,107	86,028
a) In industry (D)	12	6,631	8,930	14,349	28,509	67,376
b) In agriculture (B)	13	7,186	7,323	6,220	1,468*	—
c) Lagged input in agriculture (A)	14	2,467	3,510	6,136	13,130	13,652
AGRICULTURAL SECTOR:						
Export (E)	15	3,399	4,037	5,214	7,860	14,597
Raw material (R)	16	9,648	10,891	12,565	15,256	20,601
Consumption (M)	17	47,191	52,500	58,408	64,977	72,287
Total domestic output (X)=(15+16+17)	18	60,238	67,428	76,187	88,093	107,484
FOREIGN SECTOR:						
Import of raw materials (Z)	19	5,853	6,607	7,623	9,255	12,498
Total import (6+7+19)	20	14,931	17,352	21,413	29,822	50,226
Total export (9+15)	21	5,972	6,941	8,565	11,928	20,091
Foreign aid (20 - 21)	22	8,959	10,411	12,848	17,894	30,135
INDICATORS:						
National income (10+11+17)	23	118,014	132,948	152,617	183,180	241,859
Per capita income (23 ÷ 1) (in rupees)	24	1,372	1,390	1,434	1,548	1,841
Cumulative percentage increase of per capita income	25	—	1.31%	4.52%	12.82%	34.18%
Industrial workers as percentage of total working force	26	25.00%	25.37%	26.31%	28.71%	34.85%
Foreign aid as percentage of investment	27	55.02%	52.65%	48.11%	41.51%	35.03%

w=9,557	r=0.15	z=0.091	j= 0.39	ϕ=7,646
a=2,730	θ= 2.6	f=3,325	m= 1,753	e=2,026
b=0.05	h=0.04	q=0.4	i=0.1125	S(o)= 0.25

*The value of B for the succeeding planning period is a small negative number.

TABLE 2

LONG-RUN PLANNING FOR PAKISTAN

1955—80

(value in million rupees)

Sector	S. No.	1955-60	1960-65	1965-70	1970-75	1975-80
POPULATION SECTOR (in million men)						
Total population (P÷0.313)	1	86.00	95.68	106.45	118.42	131.74
Industrial worker (W)	2	6.73	7.77	9.43	17.18	37.43
Agricultural labour (L)	3	20.19	22.18	23.89	19.68	3.80
Total working force (P)=(W+L)	4	26.92	29.95	33.32	37.06	41.23
INDUSTRIAL SECTOR :						
Domestic output (Q)	5	64,319	74,249	90,149	164,218	357,766
Import on capital a/c (U)	6	6,351	8,719	14,529	55,181	168,837
Import of consumer goods (V)	7	2,727	3,034	3,359	3,755	4,177
Total Availability (Q+U+V)=(H+C+I)	8	73,396	86,002	108,037	223,154	530,779
Export (H)	9	2,573	2,970	3,606	6,569	14,321
Consumption (C)	10	54,540	60,676	67,177	75,096	83,544
Investment (I)=(D+B+A)	11	16,284	22,357	37,254	141,489	432,914
a) In industry (D)	12	7,945	12,711	25,147	59,261	154,854
b) In agriculture (B)	13	6,615	5,675*	—	—	—
c) Lagged input in agriculture (A)	14	1,724	3,970	12,107	82,228	278,060
AGRICULTURAL SECTOR :						
Export (E)	15	3,394	4,434	6,831	22,983	67,907
Raw material (R)	16	25,727	29,700	36,060	65,687	143,106
Consumption (M)	17	47,191	52,500	58,408	64,977	72,287
Total domestic output (X)=(15+16+17)	18	76,312	86,633	101,298	153,647	283,300
FOREIGN SECTOR :						
Import of raw materials (Z)	19	5,853	6,757	8,203	14,944	32,557
Total import (6+7+19)	20	14,917	18,510	26,091	73,879	205,571
Total export (9+15)	21	5,967	7,404	10,437	29,552	82,228
Foreign aid (20-21)	22	8,950	11,106	15,655	44,328	123,542
INDICATORS :						
National income (10+11+17)	23	118,014	135,532	162,839	281,562	588,746
Per capita income (23 ÷ 1) (in rupees)	24	1,372	1,416	1,530	2,378	4,469
Cumulative percentage increase of per capita income	25	—	3.23%	11.48%	72.66%	225.68%
Industrial workers as percentage of total working force	26	25.00%	25.94%	28.31%	46.36%	90.78%
Foreign aid as percentage of investment	27	54.96%	49.68%	42.02%	31.33%	28.54%

$w=9{,}557$	$r=0.15$	$z=0.091$	$j=0.39$	$\Phi=7{,}646$
$a=2{,}867$	$\theta=2.6$	$f=3{,}325$	$m=1{,}753$	$c=2{,}026$
$b=0.05$	$h=0.04$	$q=0.4$	$i=0.1125$	$S(o)=0.25$

*The value of B for the succeeding planning periods are large negative numbers.

TABLE 3

LONG-RUN PLANNING FOR PAKISTAN

(1955—80)

(value in million rupees)

Sector	S. No.	1955-60	1960-65	1965-70	1970-75	1975-80
POPULATION SECTOR (in million men)						
Total population (P÷0.313)	1	86.00	95.68	106.44	118.41	
Industrial worker (W)	2	6.73	7.42	8.06	8.46	
Agricultural labour (L)	3	20.19	22.53	25.26	28.60	
Total working force (P)=(W+L)	4	26.92	29.95	33.32	37.06	
INDUSTRIAL SECTOR:						
Domestic output (Q)	5	64,319	70,866	77,025	80,900	
Import on capital a/c (U)	6	6,351	6,643	6,277	4,043	
Import of consumers goods (V)	7	2,727	3,034	3,375	3,755	
Total availability (Q+U+V)=(H+C+I)	8	73,396	80,543	86,678	88,698	
Export (H)	9	2,573	2,835	3,081	3,236	
Consumption (C)	10	54,540	60,676	67,501	75,095	
Investment (I)=(D+B+A)	11	16,284	17,032	16,095	10,366	
a) In industry (D)	12	5,240	4,928	3,101*		
b) In agriculture (B)	13	7,792	9,059	11,115		
c) Lagged input in agriculture (A)	14	3,252	3,045	1,879		
AGRICULTURAL SECTOR:						
Export (E)	15	6,386	6,841	6,916		
Raw material (R)	16	9,648	10,630	11,554		
Consumption (M)	17	47,191	52,500	58,406		
Total domestic output (X)=(15+16+17)	18	63,224	69,970	76,875		
FOREIGN SECTOR:						
Import of raw material (Z)	19	5,853	6,449	7,009		
Total import (6+7+19)	20	14,931	16,125	16,662		
Total export (9+15)	21	8,958	9,675	9,997		
Foreign aid (20-21)	22	5,972	6,450	6,665		
INDICATORS:						
National income (10+11+17)	23	118.014	130.208	142.002		
Per capita income (23 ÷ 1) (in rupees)	24	1.372	1,361	1,334		
Cumulative percentage increase of per capita income	25	—	-.83%	-2.78%		
Industrial workers as percentage of total working force	26	25.00%	24.76%	24.19%		
Foreign aid as percentage of investment	27	36.68%	37.87%	41.41%		

$w=9{,}557$ $r=0.15$ $z=0.091$ $j=0.39$ $\Phi=7.646$

$a=2{,}730$ $\theta=2.6$ $f=3{,}325$ $m=1{,}753$ $c=2.026$

$b=0.05$ $h=0.04$ $q=0.6$ $i=0.1125$ $S(0)=0.25$

*The values of D for the succeeding planning periods are large negative numbers.

TABLE 4

LONG-RUN PLANNING FOR PAKISTAN

(1955—80)

(value in rupees)

Sector	S. No.	1955-60	1960-65	1965-70	1970-75	1975-50
POPULATION SECTOR:						
Total population (P ÷ 0.313)	1	3.19	3.55	3.95	4.40	4.90
Industrial workers (W)	2	0.25	0.28	0.32	0.38	0.48
Agricultural labour (L)	3	0.75	0.83	0.92	1.00	1.05
Total working force (P) = (W+L)	4	1.00	1.11	1.24	1.38	1.53
INDUSTRIAL SECTOR:						
Domestic output (Q)	5	2,389	2,689	3,074	3,632	4,592
Import on capital a/c (U)	6	236	282	363	535	934
Import of consumer goods (V)	7	101	113	125	139	155
Total availability (Q+U+V)=(H+C+I)	8	2,726	3,034	3,562	4,306	5,681
Export (H)	9	96	108	123	145	184
Consumption (C)	10	2,026	2,254	2,508	2,790	3,103
Investment (I) = (D+B+A)	11	605	722	932	1,371	2,394
a) In industry (D)	12	240	307	447	769	1,561
b) In agriculture (B)	13	270	283	269	181*	
(*c*) Lagged input in agriculture (A)	14	95	132	217	421	
AGRICULTURAL SECTOR:						
Export (E)	15	237	276	338	458	
Raw material (R)	16	358	403	462	545	
Consumption (M)	17	1,753	1,950	2,170	2,414	
Total domestic output (X) = (15+16+17)	18	2,289	2,629	2,969	3,415	
FOREIGN SECTOR:						
Import of raw materials (Z)	19	217	245	280	330	
Total import (6+7+19)	20	555	639	768	1,005	
Total export (9+15)	21	333	383	461	603	
Foreign aid (20-21)	22	222	256	307	402	
INDICATORS:						
National income (10+11+17)	23	4,384	4,926	5,609	6,574	
Per worker income (23÷4)	24	4,384	4,428	4,532	4,775	
Cumulative percentage increase of per capita income	25	-	1.01%	3.37%	8.01%	
Industrial workers as percentage of total working force	26	25.00%	25.29%	25.98%	27.60%	
Foreign aid as percentage of investment	27	36.68%	35.31%	32.99%	29.31%	

w=9,557	r=0.15	z=0.091	j= 0.39	Φ=7,646
a=2,867	θ= 2.6	f=3,325	m= 1,753	e=2,026
b=0.05	h=0.04	q=0.6	i= 0.1125	S(o)=0.25

*The value of B for the succeeding planning period is a large negative number.

TABLE 5
LONG-RUN PLANNING FOR PAKISTAN
(1955—80)

(value in million rupees)

Sector		S. No.	1955-60	1960-65	1965-70	1970-75	1975-80
POPULATION SECTOR (in million men)							
Total population		1	86.00	95.67	106.44	118.41	131.35
Industrial worker (W)	...	2	6.73	7.51	8.43	9.59	11.22
Agricultural labour (L)	...	3	20.19	22.43	24.88	27.48	30.01
Total working force (P) = (W+L)		4	26.92	29.95	33.32	37.07	41.24
INDUSTRIAL SECTOR:							
Domestic output (Q)	...	5	64,319	71,813	80,601	91,611	107,238
Import on capital a/c (U)	...	6	6,351	7,224	8,472	10,617	15,077
Import of consumers goods (V)	...	7	2,727	3,034	3,375	3,755	4,177
Total availability (Q+U+V) = (H+C+I)	...	8	73,396	82,071	92,448	105,982	126,492
Export (H)	...	9	2,573	2,873	3,224	3,664	4,290
Consumption (C)	...	10	54,540	60,676	67,502	75,096	83,544
Investment (I) = (D+B+A)		11	16,284	18,523	21,722	27,222	38,658
a) In industry (D)	...	12	5,996	7,031	8,808	12,502	21,316
b) In agricultural (B)	...	13	7,462	8,145	8,633	8,428	6,155
c) Lagged input in agriculture (A)	...	14	2,825	3,347	4,281	6,291	11,187
AGRICULTURAL SECTOR:							
Export (E)		15	4,893	5,524	6,367	7,690	10,217
Raw material (R)		16	9,648	10,772	12,090	13,742	16,086
Consumption (M)		17	47,191	52,500	58,406	64,977	72,287
Total domestic output (X) = (15+16+17)		18	61,731	68,795	76,863	86,408	98,589
FOREIGN SECTOR:							
Import of raw materials (Z)		19	5,853	6,535	7,335	8,337	9,759
Total import (6+7+19)		20	14,931	16,793	19,181	22,708	29,013
Total export (9+15)		21	7,465	8,396	9,591	11,354	14,506
Foreign aid (20-21)		22	7,465	8,396	9,591	11,354	14,506
INDICATORS:							
National income (10+11+17)		23	118,014	131,698	147,630	167,294	194,488
Per capita income (23 ÷ 1) (in rupees)		24	1,372	1,376	1,387	1,413	1,476
Cumulative percentage increase of per capita income		25	-	0.30%	1.07%	2.94%	7.58%
Industrial workers as percentage of total working force		26	25.00%	25.09%	25.31%	25.86%	27.21%
Foreign aid as percentage of investment		27	45.84%	45.33%	44.15%	41.71%	37.52%

w=9,557 r=0.15 z=0.091 j= 0.39 ф= 7,646

a=2,730 θ= 2.6 f=3,325 m=1,753 e= 2,026

b= 0.05 h=0.04 q= 0.5 i=0.1125 S(o)= 0.25

TABLE 5

LONG-RUN PLANNING FOR PAKISTAN

(1955—80)

(value in million rupees)

Sector	S. No.	1955-60	1960-65	1965-70	1970-75	1975-80
POPULATION SECTOR (in million men)						
Total population (P ÷ 0.313)	1	86.00	95.68	106.44	118.41	131.35
Industrial worker (W)	2	6.73	7.73	9.21	11.79	17.09
Agricultural labour (L)	3	20.19	22.22	24.11	25.28	24.41
Total working force (P)=(W+L)	4	26.92	29.95	33.32	37.07	41.23
INDUSTRIAL SECTOR:						
Domestic output (Q)	5	64,319	73,907	88,019	112,671	163,364
Import on capital a/c (U)	6	6,357	8,509	13,020	23,542	49,525
Import of consumers goods (V)	7	2,727	3,034	3,375	3,755	4,177
Total availability (Q+U+V) = (H+C+I)	8	73,403	85,450	104,404	139,968	217,066
Export (H)	9	2,573	2,956	3,521	4,507	6,535
Consumption (C)	10	54,529	60,676	67,491	75,096	83,544
Investment (I) = (D+B+A)	11	16,301	21,818	33,392	60,365	126,987
a) In industry (D)	12	7,673	11,297	19,724	40,566	93,549
b) In agriculture (B)	13	6,734	6,297	3,883*		
c) Lagged input in agriculture (A)	14	1,894	4,230	9,785		
AGRICULTURAL SECTOR:						
Export (E)	15	6,390	8,005	11,124		
Raw material (R)	16	9,648	11,086	13,203		
Consumption (M)	17	47,191	52,500	58,408		
Total domestic output (X) = (15+16+17)	18	63,229	71,591	82,735		
FOREIGN SECTOR:						
Import of raw material (Z)	19	5,853	6,726	8,010		
Total import (6+7+19)	20	14,937	18,269	24,408		
Total export (9+15)	21	8,962	10,961	14,645		
Foreign aid (20-21)	22	5,975	7,308	9,763		
INDICATORS:						
National income (10+11+17)	23	118,021	134,994	159,291		
Per capita income (23 ÷ 1) (in rupees)	24	1,372	1,411	1,497		
Cumulative percentage increase of per capita income	25	—	2.84%	9.11%		
Industrial workers as percentage of total working force	26	25.00%	25.82%	27.64%		
Foreign aid as percentage of investment	27	36.65%	33.50%	29.24%		

w=9,557	r=0.15	z=0.091	j= 0.39	Φ=7,646
a=3,003	θ= 2.6	f=3,325	m=1,753	e=2,026
b= 0.05	h=0.04	q= 0.6	i=0.1125	S(o)= 0.25

*The value of B for the succeedding planning periods are large negative numbers.

TABLE 7
LONG-RUN PLANNING FOR PAKISTAN
(1955—80)

(*value in million rupees*)

Sector	S. No.	1955-60	1960-65	1965-70	1970-75	1975-80
POPULATION SECTOR (in million men)						
Total population (P÷0.313)	1	86.00	95.68	106.44	118.41	131.35
Industrial worker (W)	2	6.7	7.68	9.07	11.52	16.70
Agricultural labour (L)	3	20.2	22.27	24.25	25.55	24.53
Total working force (P) = (W+L)	4	26.92	29.95	33.32	37.07	41.24
INDUSTRIAL SECTOR:						
Domestic output (Q)	5	64,319	73,400	86,676	110,088	159,613
Import on capital a/c (U)	6	6,350	8,198	12,199	21,957	47,223
Import of consumers goods (V)	7	2,727	3,034	3,375	3,755	4,177
Total availability (Q+U+V) = (H+C+I)	8					
Export (H)	9	2,573	2,936	3,467	4,404	6,385
Consumption (C)	10	54,540	60,676	67,504	75,096	83,544
Investment (I)	11	16,283	21,021	31,278	56,300	121,084
a) In industry (D)	12	7,265	10,622	18,726	39,627	95,195
b) In agriculture (B)	13	6,910	6,552	4,314*		
c) Lagged input in agriculture (A)	14	2,108	3,847	8,238		
AGRICULTURAL SECTOR:						
Export (E)	15	4,892	6,020	8,264		
Raw material (R)	16	9,648	11,010	13,001		
Consumption (M)	17	47,191	52,500	58,406		
Total domestic output (X) = (15+16+17)	18	61,731	69,530	79,671		
FOREIGN SECTOR:						
Import of raw materials (Z)	19	5,853	6,679	7,888		
Total import (6+7+19)	20	14,930	17,911	23,461		
Total export (9+15)	21	7,465	8,956	11,731		
Foreign aid (20-21)	22	7,465	8,956	11,731		
INDICATORS:						
National income (10+11+17)	23	118,014	134,196	157,188		
Per capita income (23 ÷ 1)	24	1,372	1,403	1,477		
Cumulative percentage increase of per capita income	25	—	2.20%	7.62%		
Industrial workers as percentage of total working force	26	25.00%	25.64%	27.22%		
Foreign aid as percentage of investment	27	45.85%	42.60%	37.50%		

$w=9{,}557$	$r=0.15$	$z=0.091$	$j=0.39$	$\phi=7{,}646$
$a=2{,}867$	$\theta=2.6$	$f=3{,}325$	$m=1{,}753$	$e=2{,}026$
$b=0.05$	$h=0.04$	$q=0.5$	$i=0.1125$	$S(o)=0.25$

*The value of B in the succeeding planning periods are large negative numbers.

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