Studies on the Strategy and Technique of
Development Planning

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Readings in Development Economics

No. 1

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Introduction to the Series

The Pakistan Institute of Development Economics has compiled a series of *Readings* on various aspects of the development problems of Pakistan. These *Readings* consist of important studies relevant to the subject-matter to which the different volumes in this series pertain. It is hoped that the studies presented in these volumes will go a long way to fill in the lacunae in the field of economic literature for Pakistan.

All of the studies included in this volume were originally published in the Institute's quarterly journal, *The Pakistan Development Review*. The Institute has now been in existence for over a decade and *The Pakistan Development Review* is in the ninth year of its publication. During this period, the Institute has made very significant contribution in various fields of applied economic research. The studies carried out at the Institute have been of immense value to the planners, researchers and academics. Most of these studies were published in one form or the other in *The Pakistan Development Review* which is widely recognized, both in Pakistan and abroad, as one of the outstanding journals in the field of Development Economics.

In recent times we have been receiving suggestions from outside and have been increasingly becoming aware ourselves of the desirability of compiling in a number of volumes the significant contributions of the Institute in particular areas of research in development economics. We have come to recognize that this would be of significant use not only to those planners and researchers who would like to have important pieces of analyses in any particular area to be collected in a single volume, but also to the teachers and students at the advanced levels at the universities who have been handicapped in the teaching of courses in economics of Pakistan because of the lack of analytical and empirically oriented studies. It is in the hope of fulfilling these needs that we have embarked on the project of compiling books of readings selected from the studies published by the Institute.

It may be noted that we have confined ourselves to the studies actually undertaken by the members of the research staff at the Institute. *The Pakistan Development Review* regularly attracts contributions from eminent economists outside the Institute, both national and international. Many of these contributions are highly competent and relevant. But we have found it useful to confine ourselves to the studies carried out *at the Institute* because one of our purposes is to highlight the contribution of the Institute in specific areas of applied economic research.

Nurul Islam
Director
Pakistan Institute of Development Economics

STUDIES on the STRATEGY & TECHNIQUE of DEVELOPMENT PLANNING

Introduction

Azizur Rahman Khan

I

The present volume is a selection of the studies on the strategy and technique of planning. It is easily recognized that these subjects cover a vast area. The definition of these subjects is rather flexible and can be stretched to include a large number of things. The *Review* has published a very large number of articles, notes and comments which fall under these categories according to the one or the other definition. Naturally we have been highly selective. On strategy, we have confined ourselves to those studies which have been concerned with the overall strategy of Pakistan's planning and have left out those which are exclusively concerned with particular aspects of it, hoping that the latter would be included in similar readings on specific aspects of the development problem. In the area of techniques, we have only taken into account those studies which set out models for the planning of the whole economy and not for specific sectors or policies.

II

The two articles on strategy are respectively by John Power and Keith Griffin who were research advisers at the Institute. Each of these articles raises basic questions about the pattern of industrialization and the strategy of development adopted in Pakistan during the period preceding its publication. Each

of them succeeded in stimulating a debate on the crucial aspects of policy and encouraging other studies in the related questions. Finally each of them succeeded in some sense in influencing and/or foreseeing changes in public policy.

John Power's article was written early in 1963. The First Five-Year Plan had shown no increase in income per head and performance during the first two years of the Second Plan had been uncertain. The general euphoria that started characterizing the writings on Pakistan's development from about the mid sixties is, therefore, completely absent from Power's analysis which begins with a pessimistic note. He identifies the stagnant saving rate and the slow growing exports as the main factors preventing the take-off and for the first time systematically puts forward the hypothesis that the particular pattern of industrialization adopted by Pakistan's planners is directly responsible (along with other factors of course) for the failure of these things to grow. Later events happily did not justify Power's extreme pessimism but his indictment against the industrialization strategy stimulated a large number of studies on the efficiency of industrialization in Pakistan from various angles. To this date Power's arguments remain controversial, but their importance is almost universally recognized. In fact his arguments have found endorsement even in the official plan documents. For example, the *Third Five-Year Plan* states: "the past experience, particularly during the First Plan period, shows that it is fairly difficult to obtain a high rate of saving from the economy by concentrating on the production of consumer goods and by hoping to export the products of these industries to finance capital goods imports" (page 34, June 1965 edition).

Keith Griffin's article was written in the summer of 1965 as the Second Plan reached its successful completion and the Third Plan was launched in an atmosphere of great optimism. Achievements in terms of overall growth and the growth of exports had been very significant and yet Griffin pointed out several weaknesses of the strategy which in his opinion constituted too high a social cost. Pakistan's development strategy deliberately sacrificed distributive justice for the sake of economic growth. In the hope of generating high savings, the concentration of income at the hands of the capitalists was encouraged by the creation of a mechanism of transfer of resources from the poorer agricultural sector to the richer capitalist sector and by the adoption of policies which allowed the wages to be depressed. Griffin pointed out that the sacrifice of distributive justice did not in fact produce the desired result, that the resources thus diverted to the capitalists were being used for consumption rather than productive investment purposes. The economy was dangerously dependent on foreign assistance whose contribution to growth was far from unambiguous. After the publication of Griffin's paper, a number of studies were undertaken at the Institute and outside on the empirical estimation of the changes in the distribution of income and the levels of living of the urban and rural workers over time, on the desirability of balancing the objectives of distributive justice and economic growth and on the dangers of continuing a high degree of dependence on foreign assistance. The issues are still being debated, but already social justice and increasing self-reliance are being mentioned by the official planners as highly desirable objectives requiring appropriate incorporation into the Fourth Plan.

III

On the planning techniques, the present volume includes three multisectoral models—an *interregional* programming model, a *national* programming model and a *regional* consistency model. It is widely recognized these days that aggregative models are extremely unsatisfactory and inadequate guides for the actual planners. To be operationally useful, it is important not only to identify the major activities into which the economy can be divided but also to take explicit account of the intersectoral deliveries of various kinds. In Pakistan no use of multisectoral models was made before the formulation of the Third Five-Year Plan (1965/66 — 1969/70). The Third Plan for the first time made some use of a multisectoral model which itself was rather highly aggregated, identifying only seven producing sectors and treating the national economy as a homogeneous unit [2]. Moreover, the use of the model was not made explicit.

The Institute appreciated quite early the need for the formulation of multisectoral models for planning. Early in the sixties it sponsored analytical and empirical studies about the intersectoral relationships. In recent years, it has made great effort in systematically building up the data for the formulation of multisectoral models. Simultaneously work has been going on in the area of formulating models which would be able to analyse important planning problems. Each of the three models reported in the present volume combines these efforts in trying to find answers to specific planning problems during particular planning periods.

The three models are similar in so far as they all use the input-output technology of the Leontief type. The other points of similarity are that they all make the demand for capital endogenous and that they all make projections for only

the terminal year of the plan period while neglecting the details of the intermediate periods. Thus, while these models are more useful than the static input-output model, they are not intertemporally detailed as the fully dynamic models.

Apart from these similarities, the frameworks of the three models are different with respect to some important features. The first and the second model are of the *optimizing type* while the last one is a simple *consistency* model. The first model is *interregional;* it distinguishes between the two major geographic units of Pakistan and explicitly accounts for all interregional flows. The second model is *national* in so far as it treats the entire Pakistan as a single economic unit. The last model is regional: it is formulated for one of the regions of the country. The three models also differ in the level of aggregation: the two programming models are rather highly aggregated, the first one having seven sectors and the second one specifying twelve sectors, while the consistency model is far more detailed with the specification of 29 sectors. Khan's programming and consistency models are applied respectively to the cases of the Third and Fourth Five-Year Plans while Naseem's programming model covers the ten-year period from 1963/64 to 1972/73.

The three models also differ in their objectives and purposes. Khan's multisector programming model for regional planning goes into the problem of determining the sectoral and regional allocation of resources consistent with the maximization of the national product subject to certain constraints regarding its distribution between the two major regions. One of the related questions it analyses is the possible conflict between two of our objectives of national planning — the maximization of national product and the reduction of the disparity in the levels of per capita incomes between the two regions — and derives the somewhat surprising result that the two are not inconsistent. Incidentally, this result has been confirmed by more recent studies [1].

Naseem's model sets out to estimate the limits to import substitution over the decade 1963/64 to 1972/73 taking into account the constraints in the form of minimum consumption growth, export possibilities and realistic limits to domestic savings mobilization. By varying these exogenous constraints and certain parameters, he is able to generate interesting information about the behaviour of the model and about the extent of substitutability and trade-off between strategic aggregates.

Khan's consistency model is an attempt to determine for the economy of East Pakistan the resource requirements for alternative rates of growth and for alternative sets of assumptions with respect to export possibilities and import substitution during the fourth-plan period. Through the variation of certain assumptions with respect to growth of consumption, exports and limits to import substitution, even this simple consistency model is able to generate highly useful information on the rate of substitution between strategic resources and on the costs of different objectives.

The Institute believes that the development of planning techniques is a continuous process in which the present contributions are only first steps. In order to end up with a satisfactory and operationally adequate framework, effort must continue in the direction of both improving the basis of the technical data that go into the application of such models and developing the framework of the model to approximate increasingly the reality of the situation.

Finally, we must add that the present contributions are by no means the only significant ones made by the Institute in these areas. As discussed in the beginning, the present selection has been reached only after limiting the scope of the subject rather arbitrarily to exclude many topics that would otherwise fall under the general heading. To get a comprehensive view of the Institute's achievements in the field, one has no alternative but to go through the long list of its publications, particularly the *Pakistan Development Review*, the research report series and the monograph series. We, however, hope that the present volume will fulfil its objective which is to focus attention on the essential and more important aspects of the Institute's contribution and to make these available in a convenient volume to researchers, planners, teachers and students.

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Part I

Industrialization in Pakistan: A Case of Frustrated Take-off?

John H. Power

This chapter originally appeared as an article in the Summer-1963 issue of *The Pakistan Development Review* and is the result of research carried out by the author during his association in advisory capacity with the Pakistan Institute of Development Economics during 1962-1963.

The author is thankful to Dr. Christoph Beringer, A. R. Khan and A. H. M. Nuruddin Chowdhury with whom he had the benefit of discussing many questions raised in this paper. The views expressed herein are entirely of the author, however.

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Industrialization in Pakistan: A Case of Frustrated Take-off?

John H. Power

Development planning in Pakistan aims at reaching the stage of self-generating growth "within a measurable period of time" [7, p. 4]. The perspective of long-term growth outlined in the *Second Five-Year Plan* envisages a quadrupling of national income and the achievement of a 6-per-cent per annum growth rate by the end of the sixth-plan period [7]. This is generally taken to define the period of planned take-off into self-sustained growth. The choice of a 30-year period is, in any case, consistent with take-off periods identified by Rostow for a number of countries, all of which fall within a range of 20 to 30 years [10, p. 38].

Whatever merit the device of identifying stages of growth has for economic history, the stipulation of a limited period during which it is expected that the transition from economic stagnation to steady progress will have been largely completed has two advantages for development planning. First, in view of the sacrifices required, a landmark of achievement, visible within the time horizon of the "take-off generation", is almost essential if there is to be any measure of popular support for economic development. Second, it provides a time schedule of planned progress to discipline policy decisions and to serve as a yardstick against which to measure economic performance.

The first of these functions of an identified take-off period has been largely absent in Pakistan. There has been remarkably little in the way of an attempt to popularize economic development, and correspondingly there has been little in the way of sacrifices asked or made.

As for the second function, the second-plan targets have been set within the framework of a 30-year perspective and the Planning Commission assesses the economy's progress against the standard of these targets. So, while the 30-year take-off period has not found a place in the popular imagination, it does serve as an operational concept for the planners. How effectively it disciplines policy decisions is another matter, however.

The take-off is a period of acceleration after which steady sustained growth presumably carries the economy to maturity. Therefore, growth in the initial years of the period must be expected to be modest compared to that at the end. Just how modest a growth is consistent with the eventual successful completion of take-off cannot easily be delimited, since there is an infinite variety of time schedules theoretically compatible with ultimate success. Nevertheless, after eight years of "planned development" in Pakistan, it is perhaps appropriate to assess the extent of progress thus far to ascertain whether there are as yet any signs of an incipient launching of take-off. First, however, at the risk of treading all too familiar ground, I will venture a few remarks on the nature of take-off, since in what follows certain aspects of the process will be emphasized at the expense of others.

THE CONCEPT OF TAKE-OFF

Rostow's preconditions for take-off — an improvement in agricultural productivity to create a surplus for saving, the provision of a minimum of social overhead capital to make investment profitable, and a broad revolution in social attitudes, class structure, and institutions to favour rational calculation and wealth accumulation—are so well known as scarcely to require repeating [10, pp. 17-28]. What must be emphasized, however, is that in the West these preconditions were achieved over centuries of gradual change, while in the newly developing countries today, they must to some extent be created simultaneously with the attempt to launch the take-off itself. This is true even for a country as relatively well favoured in this respect as is Pakistan.

This might suggest at the outset that a much longer period of take-off should be contemplated by planners in these countries. There are two important offsetting factors to consider, however. First is the demonstration effect of Western ideas and the material manifestations of Western technology. These aid enormously in hastening the change in attitudes and institutions. Second is the presence of economic aid. This serves to provide the required additional margin of saving plus investment in social overhead capital, thus enabling economic growth to begin earlier and at a higher rate than would otherwise be possible. Under these conditions, the attainment of self-sustaining growth is a process of replacing foreign with domestic saving, as well as one of raising the ratio of investment to income.

Still the presence of foreign aid only raises the possibility of initiating take-off before the preconditions have been fully established. It does not ensure that the effort will be successful. Foreign aid can serve to forestall as well as encourage the social and institutional changes that are required. It can serve as an excuse for postponing the reorganization of ownership and production in agriculture that is often a prerequisite to raising agricultural productivity. And, if misdirected, it can fail to provide the infrastructure needed to sustain the growth of directly productive investment. The preconditions cannot be imported, but in their absence what can be imported is rendered less effective.

What this suggests is that one way of assessing progress toward take-off in the Pakistan economy would be to take a careful look at the gains along each of these fronts. One suspects that he would find much remaining to be accomplished before the basis for compound-interest growth is laid. And if growth in the first eight years of the 30-year take-off period has been at a pedestrian rate, this may be the most important reason.

But an analysis of the extent to which the preconditions have been established is not the purpose of this paper. I take an agnostic view on the question whether Pakistan can launch a take-off under present conditions. I will address myself rather to less fundamental and more immediate questions about policies affecting saving and investment, especially those which relate to the character of the industrialization process.

So, in turning to Rostow's requirements for the take-off itself, as opposed to the preconditions, I will pass over "the existence or quick emergence of a political, social and institutional framework which exploits the impulses to expansion....and gives to growth an on-going character" [10, p. 39]. My concern will be instead with his other two requirements: a rise in the rate of investment from 5 to 10 per cent of national income, and the development of manufacturing, *i.e.*, industrialization.

In order to provide a theoretical base for what follows, I would like to present a view of the take-off process somewhat different from Rostow's. A part of the difference, though not all of it, stems from the emphasis here on the situation facing the newly developing countries today. I suggest that we focus on three different, but interrelated, structural disequilibria that give the take-off period (for these countries, at least) a specific character.

First is the agriculture industry sectoral disequilibrium. Given the ratio of land to population almost everywhere in the world, labour productivity in agriculture (with best techniques for given factor proportions) can begin to approach labour productivity in industry only after there has taken place a drastic reallocation of labour (in terms of proportions, if not in absolute terms) away from agriculture and toward industry. This, reinforced by the

relative income elasticities of demand for agricultural and industrial products, dictates the basic structural change that is required to raise per capita income and generate a surplus for saving and reinvestment.

Second is the structural disequilibrium at the factor level between the growth of labour supply and saving. Given the rapid rate of population growth in most underdeveloped countries today, it takes a very high rate of saving to equip the additions to the labour force in productive nonagricultural employment. In Pakistan, for example, it has been estimated that in the first two years of the Second Plan only half of the growth of the labour force was able to find nonagricultural employment [6, p. 5]. This means simply that a failure to correct the second structural disequilibrium has intensified the first. So a successful take-off requires a sharp rise in the rate of saving[1].

Third is the disequilibrium between imports and exports. Take-off requires growth rates of the order of 5 or 6 per cent per annum (given population growth rates of 2 to 3 per cent). The import requirements of such a growth process would undoubtedly rise even more rapidly in the absence of import substitution. Demand for the traditional primary commodity exports of underdeveloped countries, however, is likely to grow at a much slower rate, while relatively low price-elasticities of demand for these commodities make it undesirable to attempt to increase overall supply at a more rapid rate. This implies a rapidly rising potential balance-of-trade deficit that must be met eventually by import substitution and promotion of new—presumably manufactured — exports[2], even if in the short run foreign aid can fill a part of the gap. This need reinforces the urgency of industrialization stemming from the first disequilibrium. On the other hand, a failure on the front of import substitution and export promotion implies also a failure on the saving front, again emphasizing the interrelatedness of these three elements of structural disequilibria[3].

A substantial rate of progress in the direction of correcting these basic disequilibria is then a part of the general requirements for take-off into self-sustaining growth. To the extent that a country has a relative abundance of

[1]A sharp fall in the rate of population growth would be a better solution, but this possibility is ignored in the present analysis.

[2][4, pp. 34-45]. As Nurkse points out, the petroleum-exporting countries have proved exceptions to this generalization in recent decades.

[3]The term "structural disequilibria" is used here to suggest something deeper than ordinary "market disequilibria". That is, the solution is not simply one of permitting market forces to exert their natural corrective influences *via* changes in relative prices. For example, devaluation would not work to correct the third disequilibrium in the absence of some means of reducing the excess of investment over saving. But investment cannot be reduced without giving up the growth goal, and saving is low not because interest rates are low but primarily because the country is poor. Likewise, there is conceptually some set of relative factor prices that could correct the first disequilibrium *via* inducing a high average labour intensity of production over the economy. But it may be impossible for the market wage rate to fall to the required level, especially if labour in agriculture receives through communal sharing its average product rather than its marginal product.

high-quality land, adequate water supply, and other natural resources, industrialization is of course less urgent, both because of the opportunities for high productivity employment in primary activities and because of the export potential that this implies. Again, if foreign aid could be expected to continue at a rising rate indefinitely, the saving and balance-of-trade problems would be less immediate. For most countries, however — and Pakistan surely falls in the general case — evidence of initiating take-off will include measurable gains along all three fronts.

So, in reviewing the progress of Pakistan's economic development in the light of the requirements for take-off, the focus will be on industrialization, saving and the balance of trade. Since a regional breakdown of the data is not yet available, the record relates to the experience of the economy as a whole. Because it is such a critical factor in Pakistan's development, however, I have added a brief comment on the apparent disparity in growth rates between East and West Pakistan.

INDUSTRIALIZATION AND GROWTH IN PAKISTAN

Table I shows the growth since 1949/50 of national income in aggregate and per capita terms, the change in the shares contributed by agriculture and manufacturing and the trend of imports and exports. Four facts clearly emerge from these data. First, the past thirteen years have witnessed a significant pace of industrialization. While national income rose by 37 per cent, the percentage share contributed by manufacturing doubled, and agriculture's share correspondingly declined.

Second, population grew at about the same pace as national income, so that per capita income was virtually unchanged over the period. What slight gain occurred was achieved in the very early years. Annual average per capita income was virtually the same in the three years just prior to the First Plan, during the five years of the First Plan, and in the first three years of the Second Plan.

Third, though the trends of imports and exports are somewhat obscured by the Korean War and erratic fluctuations in the stringency of foreign-exchange licensing, it appears nevertheless that imports have risen substantially while exports have not. On a per-capita basis, exports have actually declined. The aggregate data, of course, hide considerable change in the composition of both exports and imports. Within the latter, there was a great rise in machinery, metals, transport equipment and chemicals; while cotton-textile imports declined drastically. On the side of exports, the shift was from raw cotton and jute to their manufactures. Still the rise in manufactured exports was not sufficient to raise total exports significantly, nor was import substitution adequate to raise the share of domestic saving in development

TABLE I

SELECTED GROWTH INDICATORS, 1948-1963

Year	National income (1949/50—1952/53 prices)		Population (millions)	Income per capita		Gross saving as per cent of gross national product	Value added in agriculture as per cent of national income	Value added in manufacturing as per cent of national income	Value of imports (1949/50 =100)	Value of exports (1949/50 =100)
	in crore rupees	index (1949/50=100)		Rs.	index (1949/50 =100)					
1949/50	1,753	100	78.9	222	100		61	7	100	100
1950/51	1,839	105	80.4	229	103		60	7	125	214
1951/52	1,852	105	81.8	226	102		59	8	172	168
1952/53	1,906	109	83.3	229	103		59	8	107	126
1953/54	2,025	116	84.8	239	108		59	9	86	108
1954/55	2,034	116	86.3	236	106		58	10	85	102
1955/56	2,022	115	88.2	229	103	7.9	56	11	72	105
1956/57	2,149	123	90.1	239	108	4.5	57	11	127	94
1957/58	2,154	123	92.1	234	105	5.3	56	12	111	83
1958/59	2,155	123	94.1	229	103	6.1	55	12	85	78
1959/60	2,267	130	96.2	236	106	5.6	56	12	133	108
1960/61	2,348	134	98.7	238	107	5.7	56	12	172	105
1961/62	2,420	138	101.3	239	108	7.4	55	13	168	108
1962/63	2,400	137	103.9	231	104		53	14	198	113

Note: 1) For national income, Central Statistical Office (CSO) estimates are used through 1961/62, except that the terms-of-trade adjustment is not included. The 1962/63 figure was calculated on the basis of estimated changes in value added in agriculture and manufacturing, assuming income from the rest of the economy to have grown in proportion to the growth of population. Weights are 55 per cent for agriculture, 13 per cent for manufacturing and 32 per cent for the remainder.

2) Value added in agriculture was estimated to have declined 5 per cent in 1962/63 on the basis of official crop reports.

3) Value added in manufacturing was calculated on the basis of an estimated 10.8-per-cent increase in the index of industrial production. The latter was derived by assuming that the average of the indexes for the last two quarters would equal the index for the second quarter (a relationship which has roughly held in recent years, owing to an invariable seasonal decline in the fourth quarter).

4) The population figures are the author's own estimates based on a benchmark for 1960/61 and the assumption of growth rates of 1.8 per cent for the pre-Plan period, 2.2 per cent for the First Plan and 2.6 per cent for the Second Plan. I have had the benefit of discussions with Dr. Karol J. Krotki, formerly a Research Adviser at the Pakistan Institute of Development Economics, about these estimates, but the responsibility for them is entirely my own.

5) The import and export figures are from the CSO, adjusted for the devaluation of 1955, but not corrected for price changes. The figure for 1962/63 is an estimate based on the first seven months.

6) Saving rates are from Planning Commission data in the *Second Five-Year Plan* [7, p. 28] and the *Mid-Plan Review* [6, p. 49]. The calculation differs from that in the *Mid-Plan Review*, however, as explained in the author's "Two Years of Pakistan's Second Plan" [8, pp. 129-130].

expenditure. The result was a rising trend in the dependence on foreign financing.

The fourth fact of importance from Table I is, then, the failure of the saving rate to rise. While its behaviour appears erratic, there is no evidence of a rise above the range of 5 to 6 per cent. The rate of 7.9 per cent for 1955/56 was undoubtedly due to the temporary effect of devaluation on the trade balance; and the rate of 7.4 per cent for 1961/62 seems to be equally abnormal for reasons I have discussed elsewhere [8, pp. 131-132]. In any case with the fall in agricultural production and national income in 1962/63, a drop in the saving rate is likely. The unhappy conclusion is that the saving rate is still at a pre-take-off level.

To sum up, we find over the thirteen years a significant pace of industrialization, some import substitution, but stagnant exports, saving, and per-capita income. I turn now to some of the implications of the above findings.

Has industrialization, first of all, contributed to the correction of the first disequilibrium described above—the gap between average labour productivity in agriculture and nonagriculture? Note that our index of industrialization is nonagriculture's share of output, not its share of the labour force. Is the former a good indicator of the latter?

To answer this (and some subsequent questions), consider the identity

$$\frac{Y_n}{Y} \equiv \frac{L_n}{L} \cdot \frac{Y_n/L_n}{Y/L}$$

where Y and L are, respectively, national income and total labour force; and Y_n and L_n are nonagricultural income and nonagricultural labour force. That is, the share of nonagricultural income is the product of the proportion of the labour force in nonagriculture and the ratio of average labour productivity there to average labour productivity in the whole economy.

Assume initially that labour productivity is constant in both agriculture and nonagriculture, but that it is higher in nonagriculture. Then a rising Y/L is possible only in association with a rising L_n/L. In this case L_n/L must rise faster than Y_n/Y because of the rise in Y/L. If, however, we abandon the assumption of constancy and permit productivity in nonagriculture to rise relatively to overall productivity, the rise in Y_n/Y can equal or even exceed the rise in L_n/L. Thus, in the general case nothing can be inferred about the magnitude of the shift in allocation of labour from the change in the sectoral distribution of income.

In the Pakistan case, however, because of the stagnation of per capita income we must add the assumption that Y/L is roughy constant (since the

labour force as a percentage of the population did not change significantly over the period studied). We can in this case draw a direct inference about productivity in agriculture as well as the shift in the sectoral allocation of the labour force. For if Y/L is constant, then a rise in Y_n/Y implies a rise in the product of L_n/L and Y_n/L_n. Ruling out a fall in productivity in non-agriculture as extremely unlikely[4], the remaining possibilities all imply a fall in the average productivity of agricultural labour. For otherwise a rise in either or both of these ratios (L_n/L and Y_n/L_n) would raise Y/L. A decline in L_n/L coupled with a more than proportionate rise in Y_n/L_n (however improbable) would also imply a reduction in productivity in agriculture because of the adverse shift in labour allocation[5].

Moreover, a rise in L_n/L is much less likely than a rise in Y_n/L_n to be associated with a fall in agricultural labour productivity because the labour shift in this case is favourable. The most reasonable inference in the case of constancy of Y/L is, then, that the rise in Y_n/Y has been due more to a rise in Y_n/L_n than to a rise in L_n/L. This means that the shift in labour allocation has not only failed to match the shift in income proportions, but has failed also to prevent an actual decline in productivity in agriculture. (CSO data indicate a decline of more than 11 per cent over the period 1949/50 to 1961/62.) And only a rise in nonagricultural labour productivity has prevented an economy-wide decline of output per worker. Thus, we can conclude that in Pakistan the rise in the relative share of nonagricultural value added has depended too much on rising productivity in nonagriculture and too little on shifting labour from lower to higher productivity employment to provide any relief from the first disequilibrium.

It could be argued that a given unit of capital invested to raise productivity in this way creates a greater fund for saving and reinvestment, and thus contributes more in the long run to the correction of all three disequilibria. This remains to be proved, however. And in the absence of a clearcut demonstration of the "economic" superiority of such a strategy, planners would do well to avoid the political and social (dare I say regional?) problems to which it would give rise. In any case, in Pakistan the saving ratio has not risen

[4]Since this would have to be accompanied by a rise in L_n/L greater than the rise in Y_n/Y (which doubled in the period studied), it implies a massive transfer of labour out of agriculture into low-productivity employment or unemployment elsewhere. While it is very doubtful that this has happened, it would not affect the main argument of this paper, since it means simply a transfer from agricultural to nonagricultural underemployment.

[5] $\frac{Y_a}{Y} \equiv \frac{L_a}{L} \cdot \frac{Y_a/L_a}{Y/L}$ where the subscript 'a' designates the agricultural sector.

Since Y_a/Y has fallen over the period and L_a/L must have risen in this case, Y_a/L_a *a fortiori* must have fallen.

noticeably with the rise in nonagriculture's share of income, so it is very difficult to justify the sacrifices such a strategy implies[6].

Turning to the failure of the saving rate to rise, one might be tempted to explain this as a result of the failure of per capita income to rise, but in the analysis of growth dynamics we would be more inclined to explain the latter as a result of the former. In any case even without a rise in per capita income, we might have expected a high marginal saving and reinvestment mechanism to emerge from the rapid increase in the share of income originating in manufacturing. This shift in the distribution of income plays a leading role in many theories of the take-off [3, pp. 233-238]. Why has it failed thus far in Pakistan?

I would like to venture the hypothesis that the character of the industrialization itself, with its emphasis on import substitution—especially the replacement of imported *consumption* goods—has something to do with it. In so doing I do not mean to downgrade the importance of other explanations any one of a number of which may deserve equal consideration. My reason for focussing on this one is not that I firmly believe it to be more important than any other, but rather that it has been relatively neglected.

I think that it is fair to say that import substitution was not the result of a carefully planned balance-of-payments strategy. Whatever were the reasons for adopting import licensing as the primary control over the foreign-exchange position, I doubt that they included a considered judgement as to the relative merits of various export- and import-competing industries based on comparative advantage, economies of scale, external economies, marginal saving rates, *etc.*

Nevertheless, the licensing system undoubtedly did influence the direction of industrialization. Since it gave greater protection to finished consumption goods than to intermediate goods or capital equipment, it encouraged investment in the former rather than in the latter. Moreover, since the least essential imports were the most stringently licensed, the system gave a special encouragement to investment in nonessential consumption-goods production.

How strong this influence was, whether industrialization would have taken this direction anyway, are questions I will not attempt to answer. What matters for what follows is not so much *why* as the *fact* that industrialization in Pakistan has been very heavily oriented toward production for domestic consumption some part of which could hardly be called essential for economic development.

[6]Substantial improvements in agricultural output can undoubtedly be achieved in Pakistan through better techniques and organization plus relatively inexpensive inputs. This would generally ameliorate the conditions of the growing redundant farm population and should be given an important place in the development effort. The long-run solution to the problem of poverty in agriculture will, nevertheless, still be dictated by the scarcity of land.

Why should industrialization, oriented toward the production of consumption goods, be less effective in contributing to self-sustaining economic growth than one which emphasizes capital-goods production or production for export? On the surface, the former would seem to have definite advantages. There is an existing market which can easily be reserved for domestic industry by import restrictions. The products are familiar and the marketing system is already established. And there may be fundamental comparative-advantage reasons for developing consumption-goods industries first.

Moreover, the contribution to saving is potentially just as great for replacement of consumption-goods imports as for replacement of capital-goods imports or promotion of new exports. This can be seen with the aid of another identity

$$C_d + I_d + X_d \equiv C_m + C_d + S$$

where C_d, I_d, and X_d are value added in domestic production, respectively, for consumption, investment, and exports. S is domestic saving and C_m is the imported component of consumption. The left-hand side is the national product and the right-hand side is the disposal of national income.

An increase in the national product in the form of a rise in either I_d or X_d will mean an equal rise in S if consumption (C_m+C_d) is not permitted to rise. But a rise in domestic production of consumption goods for domestic absorption will also raise saving to the extent that C_m is correspondingly reduced. Thus in a case of pure import substitution (the rise in C_d being matched exactly by a fall in C_m) S will rise by the increase in national product just as in the case postulated above of a rise in I_d or X_d.

The analysis could be extended to the more general case where consumption is permitted to rise with the rise in national product, but the conclusion is the same. The change in saving associated with a rise in output depends on the change in consumption regardless of the kind of goods the output increase embodies. This also emphasizes, however, that if the consumption function is affected by the investment choice, this must be taken into account along with all of the other factors in determining investment strategy.

With this I will turn now to what appear to me to be some of the dangers inherent in a strategy of primary emphasis on replacement of imported consumption goods. First, such a strategy must meet Nurkse's balanced-growth requirement [5, pp. 11-17]. There can be no specialisation for the home market. This means encouraging investment in the production of a little bit of a lot of things, with all of the disadvantages that this implies. It means in some cases an uneconomically small scale of production. In others it means too few firms for the kind of competition that enforces efficiency and progress. It means scattering thinly scarce capital, foreign exchange, and technical and organizational talent. It means, in short, doing many things poorly instead of fewer things well.

As a consequence, the rise in the value added in manufacturing includes a lot of just plain inefficiency in production. Turning the terms of trade against agriculture (by substituting high-priced domestic manufactured goods for cheaper foreign ones) can be justified when a reasonable degree of efficiency turns the high prices into profits for reinvestment. If the high prices are matched by high costs of production, however, the hope of generating self-sustaining growth *via* such a strategy tends to be frustrated and the rationale for a transfer of saving from agriculture to industry is less evident.

The second danger inherent in this kind of import-substitution strategy is the possibility that the early momentum of industrial development will not be maintained because of a failure to develop a self-generating mechanism of industrial growth. This is clearly related to the first danger since a profits-saving-reinvestment sequence is a necessary part of any such mechanism. But even if this condition is met, what about the market inducements to invest after the painless takeover of the existing market from foreign competition has been accomplished?

The pace of investment and industrial growth will be gradually slowed as these market limits are reached[7] unless some combination of three things happens. The first is a rapid growth of productivity across the whole economy (and especially in agriculture) which moves real income per capita ahead fast enough to warrant continuing high investment in industrial growth. The second is the operation of a "backward linkage" [1, pp. 100-116] effect inducing investment in the production of the equipment and intermediate goods used in the consumption-goods industries. That is, import substitution must be extended to the prior stages of production. Third is the opening-up of export markets for the surpluses that would develop inevitably if the pace of industrialization is maintained.

Now none of these will happen automatically. There is no natural, spontaneous evolution from the kind of "hot-house" industrial growth induced by shutting out imports to this kind of permanent, self-sustaining growth. A rapid rise in productivity is itself inhibited by the implications of the balanced-growth strategy, as discussed above. The same can be said for the development of export markets, with one additional comment. A few markets will even initially be large enough in a country the size of Pakistan to support a number of firms of economical size. These will be for the consumption

[7] There is some evidence that this has occurred in Pakistan. Between 1950 and 1955 industrial production grew at an annual average rate of 26 per cent. In the first-plan period the rate was 11 per cent, while in the first three years of the Second Plan it has been between 9 and 10 per cent.

goods which have a heavy weight in budgets of low-income families, *e.g.*, cotton cloth. While these have great natural advantages for import substitution they have definite disadvantages for export promotion. The usual low income-elasticity of demand for such goods means that demand in the advanced countries is not growing rapidly. And as the less-developed countries nearly unanimously select such industries for early import substitution, the export market is further limited.

This leaves the backward linkage effect on investment to replace imported capital equipment and intermediate goods. What is required is that profits from consumption-goods industries be diverted away from reinvestment there to investment in equipment and material-supplying industries. This should be a natural development, but there are some influences working against it. First, the capital market is not sufficiently developed to make this kind of reallocation of profits easy. The most likely place for reinvestment of profits is in the industry where they are earned. Nor has the government's taxing and relending activities developed sufficiently to fill this gap. Eventually giant, diversified monopolies of the Japanese *Zaibatsu* type might substitute a for capital market, but this development is still at an early stage in Pakistan.

Second, since final goods are given greater protection in the import-control system than intermediate and capital goods, investment in the production of the latter always seems less profitable anyway. Ultimately, the growing supply of consumption goods would reduce the profitability of investment there, but this might occur only after the aggregate consumption function has been permitted to rise steadily, defeating all attempts to raise the saving rate.

This brings me to the third danger of such an industrialization strategy—the danger of consumption liberalization[8]. We have seen above that replacement by domestic production of imported consumption goods contributes effectively to growth only to the extent that consumption is simultaneously constrained. Unfortunately, however, this strategy carries within it an automatic decontrol of consumption. Let us see how this is so.

We must start with a recognition that some sort of control over consumption was essential right from the beginning of the development effort in Pakistan, even to achieve a 5-per-cent saving rate. The principal instruments of control have been the controls on imports—duties and the licensing system. When most manufactured consumption goods had to be imported, this worked not only to curb imports, but to constrain consumption as well.

[8]For a fuller discussion of this plus empirical evidence for Pakistan, *see* [2].

With substitution of domestic production for imports, however, the proportion of consumption-goods demand so constrained has steadily dwindled with the consequence that consumption has been automatically liberalized.

The objection might be raised that import controls did not really curb consumption effectively, but instead simply diverted it away from imported goods. To a considerable extent this is undoubtedly true, but it is the import substitution itself that made this easy. More important, no doubt, was the shift in income distribution that occurred. As import substitution took place, income was transferred from the government (customs duties) and from the profits of favoured importers to income recipients in the new industries. We can guess that because of the relative inefficiency of these industries, a substantial part of the value added there became nonprofit income, a much higher proportion of which is consumed. This guess is at least consistent with the empirical evidence cited above.

Finally, we must note the natural tendency for the emergence of pressures to minimize the constraints on consumption when the business community is overwhelmingly committed to the output of consumption goods. As domestic production rose, the constraints on consumption steadily took more the form of restrictions on the licensing of materials, parts and equipment for the consumption-goods industries, and less the direct limitation of imports of finished goods. And so the phenomenon of excess capacity due to scarcity of imported supplies emerged. While this was clearly the result of a misallocation of investment—too much capacity installed to produce finished consumption goods and too little to produce materials and equipment—and while to justify the full use of the existing capacity would have required such a rise in consumption as to emasculate the saving plan, all of the pressures were on the side of liberalizing the licensing of supplies. For the excess capacity was there, and the cheapest way to get an increase in production (never mind what kind of production!) was to import supplies. What the economy really needed, of course, was a stiff increase in taxes on consumption to offset the steady erosion of control over consumption, but how can one call for higher consumption taxes when there is excess capacity in the consumption-goods industries? This is the kind of trap into which the industrialization strategy followed by Pakistan (albeit inadvertently) naturally leads.

No doubt there are other important reasons why industrialization in Pakistan has failed to raise the saving rate or even to begin to correct the agriculture/industry disequilibrium. I believe, however, that the foregoing explains a good part of it. Any explanation would be incomplete, however, without at least a brief comment on the question of disparity between East and West Pakistan and how this relates to what has been said. This is undertaken in the next section which is then followed by a brief conclusion.

EAST-WEST DISPARITY

Unfortunately we do not yet have national income data broken down for the two provinces. Consequently, we cannot simply read off the various growth indicators and compare them. So what I propose to do instead is to fit the East-West relationship into an ordinary simple growth model in order to see what might be implied by the few bits and pieces of information we do have.

Consider the case of an overwhelmingly agricultural economy in which population is growing rapidly, land is very scarce, average labour productivity in agriculture is lower than in nonagriculture and marginal labour productivity in agriculture is considerably below average (perhaps even zero), so that a rapid shift in labour allocation away from agriculture is essential to prevent a decline in per capita income there. This is, I think, one way of describing East Pakistan. While industrialization, if successful, will eventually alter the dependence on agriculture, the success of industrialization itself depends in the first instance on the existence of a surplus in agriculture and the appropriation of a part of that surplus for investment in industry.

The appropriation may take place in a variety of ways, but for the present analysis I would like to focus on just two. Assume that a significant part of agricultural output is exported. Assume further that the nation's currency is overvalued and that industrialization is being encouraged behind the protection of import duties or import licensing or both. It might be said that under these circumstances agriculture is being exploited to the benefit of industry. For, the foreign exchange it earns in exports cannot be used to buy inexpensive manufactured goods in world markets, but instead must be converted into home currency to buy the expensive products of protected domestic industry.

This would be quite misleading, however, for the alternative to developing (even inefficient) domestic industries is to permit the growing labour force to pile up in agriculture, steadily reducing average living conditions there. The appropriation should be thought of rather as a means by which the agricultural population equips (perhaps involuntarily) its surplus for employment elsewhere in its own interest. Note, however, in line with the analysis set out earlier, that the industrial development could be so inefficient that it fails to generate an industrial take-off *via* a rising saving rate.

The other means of transfer of saving from agriculture is simply a balance-of-trade surplus with nonagriculture and the rest of the world combined. That is, to the extent that agriculture does not use its foreign-exchange earnings to buy from nonagriculture (assuming that it is prohibited from buying in world markets), there is a capital outflow which can be appropriated by nonagriculture to run a deficit with the rest of the world. Again, however, this

could (though it need not) be the means of improving agriculture *via* industrialization.

Suppose, however, that the transfer occurs without the accompanying movement of labour into nonagricultural employment. In this case the saving transfer does not have the rationale suggested above, and it is difficult to find any justification for it. Yet it is something like this that has happened in East Pakistan.

Over 14 years, from 1948 to 1961, East Pakistan's total balance-of-trade surplus was about 1,500 million rupees, a capital outflow which, together with foreign capital of about 3,900 million rupees, financed West Pakistan's cumulative deficit of 5,400 million rupees[9]. In addition, East Pakistan had a deficit of about 3,500 million rupees with West. If we assume that on the average Pakistan products are priced 40 per cent above their equivalents in world markets, there is implied an additional transfer from East to West of about 1,000 million rupees. This gives a total transfer of about 2,500 million rupees for 14 years, or about 180 million rupees per year. This is more than 2 per cent of East Pakistan's average annual income for the period as best we can estimate it. In addition, if we assume that East Pakistan's share of the foreign capital inflow into West was in proportion to its population, the transfer would be almost doubled.

What would we expect the result to be of a transfer of this magnitude, unmatched by any significant labour migration? Unless East Pakistan had an enormous saving capacity, we would expect lagging industrial development, rapidly rising unemployment, and possibly a decline in per capita income. And while it is difficult to document this result, unofficial estimates seem to confirm it.

Again, it is possible to justify the temporary worsening of the position of a particular region (as well as of a particular sector) if this results in such substantial gains elsewhere that a reverse transfer can occur at an early date. It would be nothing less than a tragedy, however, if the result is no better than stagnation for the whole economy.

CONCLUSIONS

My conclusions can be summarized very briefly:

i) The doubling of the percentage share contributed by manufacturing to national income since 1948/49 represents an impressive rate of industrialization, taking the form principally of replacement of imported consumption

[9]Sources for the data in this paragraph are the CSO and [9]. I am indebted to A.R. Khan for compiling the data.

goods. It has not resulted so far, however, in any appreciable progress in the direction of correcting the three disequilibria defined above. There is as yet no sign of an incipient take-off in Pakistan.

ii) To achieve a pace of industrialization that will propel the whole economy toward self-sustaining growth requires, first of all, a rise in the saving rate. This has not yet occurred. Moreover, it requires the extension of import substitution to intermediate- and capital-goods production, or the rapid expansion of exports, or both. These will not occur automatically and, in fact, are inhibited by present tax and exchange-rate policies.

iii) Per capita income has not risen significantly and agricultural per capita income has probably fallen. Moreover, it has undoubtedly fallen most in East Pakistan. A strategy of industrialization which, in the short run, leads to a deterioration in living conditions in the agricultural sector and in the East Pakistan region could be justified only if the acceleration of industrial progress were so great that the industrial sector would in the near future begin to absorb the whole of the increase in the labour force plus a portion of the rural underemployed. This seems out of sight, however, in the light of recent experience.

iv) This means, I think, that far more attention should be given to measures that will provide for an early improvement in agricultural productivity. Substantial increases of per-acre yields of agricultural output are possible with relatively inexpensive additional inputs. These would ameliorate the situation in agriculture even if they would do nothing to correct unemployment. In addition, however, a much larger rural public works programme must be rapidly implemented—especially in East Pakistan. Without substantial increases in agricultural production, any attempt to accelerate industrialization is likely to be frustrated by shortages of food and raw materials. In any case, however, living conditions in East Pakistan agriculture cannot improve significantly (in the absence of large-scale emigration) until a far greater proportion of industrial investment is allocated to that province.

v) At the same time steps must be taken to encourage rapid expansion of exports and production of intermediate and capital goods. The system of overvaluation of the currency plus licensing plus exports bonus scheme discriminates against both. Foreign exchange is valued more highly in substituting for imports of final consumption goods than in producing equipment and supplies or goods for export. Until this is corrected, little progress can be expected on this front.

vi) Finally, talk of reducing dependence on foreign aid would appear to be premature. Until economic growth has attained real momentum, Pakistan must continue to rely heavily on external financing of its development effort. There is no great virtue in self-financed stagnation. What is required to make aid effective, however, is a much more strenuous effort to mobilize domestic resources for development. A rapidly rising rate of domestic saving would eventually bring dependence on foreign aid to a natural end.

This, in turn, implies sacrificing consumption gains for a considerable time to come. The above analysis suggests that, in any case, what gains in income have occurred have been limited to a small urban minority. It is the propensity to consume of this small minority that must, first of all, be curbed *via* tax or other measures. This is strong medicine, but the alternative might be continuing stagnation with rising external indebtedness.

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Financing Development Plans in Pakistan

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Financing Development Plans in Pakistan

Keith B. Griffin

Pakistan is beginning her Third Five-Year Plan[1] in a mood of great optimism. After the disappointment of the First Plan, the country was able to make undoubted progress during the Second. All the major objectives of the Second Five-Year Plan were exceeded and there were few important shortfalls of the specific subsector targets. Perhaps the most important of these were *a*) the failure to use all the resources allocated to family planning, and *b*) the relatively slow rate of growth of exports of cotton manufactures; of second-order importance was *c*) the growing shortage of cement[2].

TABLE I

PLANNING OBJECTIVES AND ACHIEVEMENTS, 1955-1965

Per cent increase over plan period	FIRST 5-YEAR PLAN		SECOND 5-YEAR PLAN	
	Target	Achievement	Target	Achievement
G.N.P.	15	11	24	29
Agricultural output	15[a]	7	14	19
Industrial output	68[b]	32	47	51
Exports	33	13	15	40
Per capita income	7	3	10	13

[a]Foodgrain and fibre output only.
[b]Gross value added in large-scale industry only.

Sources: [29; 30; 31; 32].

[1] The third-plan period officially began on July 1, 1965.

[2] Only half the budget allocated to family planning was spent; exports of cotton manufactures were 250 million rupees less than planned; output of cement in 1964/65 was 2.4 million tons less than the 4.0-million-ton target.

Industrial output continued to grow rapidly. Although consumer goods still account for over 50 per cent of gross value added in industry, investment and intermediate goods have shown rapid rates of growth during the last ten years [17, p. 108]. One must be careful, however, not to extrapolate these growth rates too far into the future as the base upon which these calculations were made is extremely small. "Large-scale manufacturing" in Pakistan still means, in essence, textiles and a handful of food-processing industries.

Exports grew at the extraordinary rate of 7 per cent per annum during the Second Plan, as compared with the 3-per-cent rate anticipated. Almost all of the above-target achievements can be attributed to three items—raw cotton, miscellaneous exports and invisibles, with the last named being nearly as important as the other two combined.

Details of the country's export performance over the last ten years can be found in Appendix Table A-1. A summary of that information is included in Table II below.

TABLE II

GROWTH RATE OF MAJOR EXPORTS, 1954/55-1964/65

	1954/55	1964/65	Annual compound percentage rate of growth
	(.....*million rupees*.....)		
All exports	1918	3050	4.7
Raw jute	857	820	—0.46
Manufactured jute	16	350	36.1
Raw cotton	496	400	—2.0
Cotton manufactures	32	170	18.0
Hides and skins	45	70	4.5
Wool	80	90	1.2
Miscellaneous	258	480	6.4
Invisibles	166	530	12.2

Source: Appendix Table A-1.

The behaviour of raw-cotton exports appears quite different when viewed over the two plan periods as a whole. In spite of the dramatic increase in exports beginning in 1962/63, by the end of the second-plan period the value of exports was still slightly lower than that prevailing ten years before. The explanation of this is that throughout most of the period there were two conflicting trends at work: until 1960/61 cotton production in West Pakistan was stagnant; at the same time domestic consumption of cotton by the new textile industry grew

rapidly. As a result, the volume of cotton available for export diminished. More recently, cotton output has increased and the rate of growth of domestic consumption has been reduced. This has led to a sharp rise in exports of raw cotton [19].

In some respects the most surprising accomplishment during the Second Plan was the rapid growth of agricultural output. The sector had been badly neglected during the previous ten years and it was largely responsible for the failure of the First Plan. During the last five years, however, the production of both food and fibre crops — and, as we have seen, particularly of cotton — is reported to have greatly increased. Jute production was the only serious disappointment. The average increase in output over the four years, ending in 1963/64, was 8.4 per cent for wheat, 27.5 per cent for rice, 20 per cent for cotton, 26.5 per cent for sugarcane and —1.7 per cent for jute.

Cotton, wheat and sugarcane are produced principally in West Pakistan. We know there has been a substantial increase in private investment in tubewells and the use of fertilizers in this province [18]. Thus, the increase in output can easily be understood. Jute and rice are grown in East Pakistan; jute output declined; rice output increased enormously. Yet we know that neither the area cultivated nor the use of unconventional inputs rose very much, so — at least on the surface — it is very difficult to explain the reported increase in rice yields[3].

Still, after all the qualifications are made it is clear that physical output and GNP per capita increased rather than decreased during the last ten years, and it is quite likely — at least in the latter half of the period — that they did so at a fairly substantial rate.

THE ADOPTED STRATEGY

The strategy for development in Pakistan has been to channel resources to those groups in the community whose average and marginal savings rates are thought to be relatively high. In practice, this has meant that income should be redistributed away from the massive agricultural population and in favour of the small class of wealthy, urban, industrial entrepreneurs[4]. The surplus thus accumulated and available for investment would be guided into high-priority projects through the use of indirect (monetary and fiscal) controls. After the unhappy experience of the early 1950's there has been a general tendency to avoid direct controls, state ownership of industries, and government intervention.

[3]Rice yields are reported to have risen 36 per cent between 1957 and 1964. *Cf. Pakistan Economic Survey, 1964/65* [27]. Yet as the National Income Commission stated, "... estimates of yield per acre in both parts of Pakistan are subjective estimates." [26, p. 18]. The decline in prices in 1964 is used as evidence of increased yield, but the large harvest in that year probably was due to favourable weather conditions.

[4]The "trickle-down" effects in the urban areas are very slight. There is evidence that people in the bottom 50 per cent of the income scale in Karachi have a lower standard of living than those in the bottom half of the rural income scale. In fact, they are even poorer than the equivalent East Pakistani peasant! [31, p. 29].

These domestic resources would then be supplemented with large imports of foreign capital, *i.e.*, grants, loans and private foreign investment. Capital imports would be concentrated in the early periods of the development effort so that by the end of the Perspective Plan in 1985 we would witness the "elimination of dependence on foreign assistance" [31, p. 17].

Such, in outline, has been the strategy for development. Let us consider its consequences and implications.

a) Decontrol and Free Enterprise

Large-scale textile manufacturing and some food-processing industries began to appear a few years after Pakistan achieved her independence. The major impetus to industrialize, however, came during the Korean War boom of 1950/51. Export prices rose over 26 per cent in two years, and foreign exchange was readily available to finance imports of machinery. When the boom ended export prices collapsed: cotton prices fell nearly 50 per cent and jute prices by 68 per cent. Imports of consumer goods were sharply curtailed, "thereby giving the newly established industries a monopoly of the domestic market" [38, p. 54]. Profits were high and their reinvestment contributed to further growth.

The government provided additional assistance to private capitalists in 1952 when it established the Pakistan Industrial Development Corporation (PIDC). This is a semi-autonomous agency controlled and financed by the state which is responsible both for participating in private ventures and in starting projects of its own. PIDC has been instrumental in promoting such industries as sugar refineries, jute textiles, fertilizers and cement plants. More recently, it has begun to concentrate less on consumer-goods industries and more on basic industries, such as machine tools, heavy electrical equipment and petro-chemicals.

It has been the policy of the PIDC to divest itself of its projects once they have become well established. Of the 43 large industry projects completed by the West Pakistan Industrial Development Corporation (WPIDC)[5], 24 have been converted into public limited companies and 19 of them are now under private management [27, p. 34]. Thus, considerable effort has been made to encourage private enterprise: private industrialists have been shielded from foreign competition; they have been given credit if they were short of capital, tax concessions to ensure that profits were high, and export bonuses to encourage them to sell abroad; and when these were not sufficient the government has established the industry and turned it over to private enterprise once it was underway.

The alternative policy of maintaining state ownership could have been advantageous for at least two reasons: first, since private capitalists consume

[5]The former PIDC was divided into two organisations, one for each wing, in July 1962.

some of their profits, state ownership and the assumed 100 per cent reinvestment of profits from the nationalized industries in principle could have led to a higher savings rate and rate of growth[6]. Second, state ownership would have eliminated the justification for the growing concentration of incomes and wealth which are such prominent features of the country today. The authorities, however, chose to move in the opposite direction.

The tone of the First Five-Year Plan has been described as "moralistic and libertarian" [38, p. 63]. By the time the Second Plan was published in June 1960 the general strategy of development was seldom questioned. The document contained only a few assertions and short statements of policy. A sample might include the following: "The creative energies of the people can be best harnessed to the needs of development if policies of economic liberalism are pursued". "Private investment in industry is to be given maximum encouragement." "... the Plan places greater reliance on the market mechanism and fiscal and monetary policies ... " [30, pp. xiv, 5, 8]. The apparent success of the Second Plan has further reduced the need to justify the policies pursued. As far as the planners are concerned "it is clear that the distribution of national product in the Third Plan should be such as to favour the saving sectors" [31, p. 33].

b) The Distribution of Income

In order to enjoy a higher level of consumption in the future, present consumption must be restrained and the surplus thus mobilized must be used for productive investment. Evidently, a growing proportion of the national income must be saved and invested if growth is to be accelerated, and it is this refraining from consuming which constitutes the real sacrifice or cost of economic development. What is of crucial importance is *whose* consumption is restrained, *i.e.*, the way in which these sacrifices are distributed among the population, because the control of the surplus and the way in which it is mobilized determine not only the distribution of income throughout the development period but also the form and composition of development itself.

To the extent that domestic resources have been mobilized in Pakistan it has been achieved by restraining the growth of the living standards of the poorest members of society—the rural masses. The Third Plan states: "There was a considerable transfer of savings from the agricultural to the industrial sector .. as

[6]It is frequently asserted that "the experience gained in these countries (that is, 'in countries that are following a socialistic pattern') indicates that public enterprise has not been as efficient as private enterprise. . ." [21, pp. 5-6]. Such a statement cannot be supported with empirical evidence, and there are many reasons to believe that it is utterly false. There are numerous examples of efficient public enterprises not only in socialist economies but in capitalist and mixed economies as well. The cases of Volkswagen in Germany (now private), the electricity company in France, the Suez Canal in Egypt, or the National Petroleum Co. in Chile come readily to mind

terms of trade were deliberately turned against agriculture through such policies as licensing of scarce foreign exchange earned primarily by agriculture to the industrial sector, compulsory government procurement of foodgrains at low prices to subsidize the cost of living of the urban, industrial workers, generous tax concessions to industry and lack of similar incentives for commercial, agricultural investment" [31, p. 7]. These measures were particularly strong in the 1950's; they have been modified since then but have not been abandoned completely.

The evidence is quite strong that agricultural prices were squeezed in the early years of the 1950's through such policies as compulsory delivery of foodgrains and export taxes on cotton and jute. At the same time tariff protection, import licensing and other exchange controls allowed industrial prices to soar. But as a result of a modification of policy, by the end of the decade, agriculture's terms of trade appear to have greatly improved, although in recent years they may have declined again slightly.

The government's measures had the effect of reducing per capita income and consumption in rural areas relative to the rate of growth of GNP per capita and, perhaps, also in absolute terms. It was mostly in the agricultural sector that consumption was restrained and a surplus generated.

Table III presents the existing data on real GNP per capita, rural income per capita, and the per capita availability of foodgrains. It shows clearly that throughout most of the past 15 years average agricultural incomes were declining. During the last five years they rose fairly rapidly, but at the end of the period they were still no higher than at the beginning. GNP per capita, on the other hand, rose by about 50 rupees.

Column (3) indicates that in spite of the massive imports of PL 480 commodities the per capita availability of foodgrains is no higher today than at the time of Partition. Moreover, these official estimates quite likely are overestimated. Total availability of foodgrains is obtained by subtracting a 10-per-cent allowance for seed, animal feed and wastage from domestic production; adding all imports and subtracting exports. This figure is then divided by the official estimate of population size. Most competent observers, however, believe that *a*) the population size is underestimated and *b*) its rate of growth is accelerating. (*See*, for example, [9; 14; 39].) If these demographers are correct then the per capita availability of foodgrains, particularly in the later periods, is overestimated. The level of food consumption *in rural areas* must be even lower as income has been sharply redistributed to the urban sector. The conclusion of all this is that the vast majority of the Pakistani population probably has a lower standard of living today than when the country achieved its independence in 1947.

TABLE III

PER CAPITA INCOME AND CONSUMPTION

	GNP per capita	Rural income per capita	Foodgrains per capita*
	(1)	(2)	(3)
	(*rupees*)	(*rupees*)	(*ounces per day*)
1948/49			16
1949/50	311	207	15 (15)
1950/51	312	205	14 (14)
1951/52	313	204	13 (13.3)
1952/53	314	202	13 (13.6)
1953/54	315	202	15 (13.6)
1954/55	316	201	13 (13.3)
1955/56	316	199	12 (13.3)
1956/57	316	198	15 (13.6)
1957/58	317	195	14 (14)
1958/59	317	195	13 (13.6)
1959/60	318	194	14 (14)
1960/61	326	197	15 (14.3)
1961/62	334	199	14 (14)
1962/63	342	202	13 (14)
1963/64	351	205	15
1964/65	360	207	

*Numbers in parentheses are three-year moving averages.

Sources: Cols. (1) and (2): Appendix Table A-2, Col. (3): [27, Table 13].

Looking at the evidence in Table IV, which refers to the two plan periods, it would appear that average urban incomes are six times higher than rural (1,278 *vs.* 207 rupees) and that they grew four times faster (12.8 per cent over ten years *vs.* 3 per cent). Even though the number of urban residents increased 60 per cent over the 10 years (it is not unusual to have high percentage rates of growth when the base is small), the absolute number of rural people increased by 18 million. Hence, it is clear that income distribution is becoming more unequal. The fruits of development are being reaped by the minority of urban

rich while the majority of the nation remains the rural poor. Moreover, the growing inequality in income distribution is also reflected in the economic relations between the two wings. In terms of its contribution to the Gross Regional Product agriculture is 11 times larger than "large-scale" manufacturing[7] in East Pakistan, whereas in West Pakistan it is only 4.7 times larger.

TABLE IV

RURAL-URBAN INCOME DISTRIBUTION

	1954/55	1964/65	Increase	
			Absolute	Percentage
Population (*million*)	88	112	27	27.3
Urban	10	16	6	60.0
Agricultural	78	96	18	23.1
Income per capita (*rupees*)	316	360	44	13.9
Urban	1133	1278	145	12.8
Agricultural	201	207	6	3.0

Source: Calculated from data in Appendix Table A-2.

It is, of course, a gross simplification to assume that all who live in rural areas are poor and all urban dwellers are rich.

The distribution of land in West Pakistan is very unequal and a commission was appointed in 1958 to recommend reforms. The commission proposed *i*) that the government expropriate all holdings of irrigated land above 500 acres and those of other lands (with exceptions) in excess of 1,000 acres. Compensation would be paid at something less than the market value and the land would be sold to small cultivators. The commission also recommended *ii*) that the methods of collecting rents be modified and that tenants be given greater security, and *iii*) that the fragmentation of holdings be stopped and that already fragmented holdings be consolidated.

The commission's report was accepted and the programme was begun in January 1959. By the end of the Second Plan 2.2 million acres, or about 2 per cent of the land in the province, had been expropriated and resold. Compensation was assessed at 76 million rupees and bonds were issued for the entire amount. By July 1965 half the bonds had been redeemed for cash payment. The expropriated land was largely marginal and uncultivated while many

[7]Large-scale manufacturing is defined by the National Income Commission to include any establishment which employs at least 20 persons and uses mechanical power.

large holdings have been left untouched; tenant relations were largely unchanged and "about 6.7 million acres (50 per cent of the target) were consolidated" [32, p. 41].

There is very little information about the distribution of income in urban areas. M. Shoaib, the Finance Minister, has, however, recognized that: "There is a growing discontent in the country about increasing concentration of income and wealth and economic power in the hands of a relatively few" [37, para 40]. It is common knowledge that "the rich have certainly become very rich indeed, and persons and families which were worth millions a decade ago are now worth hundreds of millions . . . The same family groups own industrial undertakings, banks, insurance companies, consultancy offices, construction firms, distribution trade, *etc.*, *etc.*, so that not only is there a horizontal but also a vertical concentration of wealth, and a tremendous concentration of economic power" [11, p. 9]. Only one-tenth of 1 per cent of the population pays income tax, yet the plan informs us that the top 5 per cent in Karachi have incomes 27 times higher than the bottom 5 per cent (who are even poorer than the equivalent rural group) [16, p. 29]. The exemption limit for personal income tax is 6,000 rupees or nearly 17 times the per capita income. There is little to warrant this policy as it has even been shown that the nominal level of noncorporate private savings has not risen substantially since 1949 [16]. Furthermore, a sample survey in Dacca also reveals that as much as 42.5 per cent of personal "savings" in the urban sector is in the form of gold and ornaments, consumer durables and housing [7, p. 26].

c) Private Savings

We have shown so far *i*) that the development strategy has placed considerable reliance on private enterprise and that it has been government policy to protect and strengthen private capitalists; *ii*) that the rural areas have been squeezed to such an extent that the level of rural consumption per capita possibly is lower and certainly no higher than it was fifteen years ago; and *iii*) that the strategy adopted has led to the creation of a privileged class and an unequal distribution of income. We must now consider more closely to what extent the strategy has been successful in achieving a high rate of domestic savings.

TABLE V

GROSS DOMESTIC SAVINGS AND INVESTMENT AS PERCENTAGE OF GNP

	1949/50	1954/55	1959/60	1964/65
Domestic savings as a percentage of GNP	4.6	6.8	5.9	9.5
Investment as a percentage of GNP	4.6	7.9	10.9	15.8

Source: [31].

The Planning Commission has repeatedly called attention to what it considers the "remarkable acceleration in gross investment" and the "considerable increase in domestic savings" [31, pp. 4 and 6]. The data it presents would appear to substantiate this claim. Yet if one accepts the estimate that "depreciation accounts for 4 per cent of GNP" [18, p. 5], then the net domestic savings ratio on the most optimistic assumption is only slightly higher than 5 per cent. This can hardly be considered a respectable savings effort. If the government is serious about outrunning the population increase (which is currently estimated at 3 per cent per annum and still accelerating) and eliminating its dependence on foreign aid by 1985, it will have to raise the net savings ratio to roughly 12-15 per cent. The perspective plan is somewhat more ambitious: it envisages a 25-per-cent marginal rate of savings leading to a 21.8-per-cent gross savings ratio by the end of the period [31, p. 19].

Since a great deal depends upon the behaviour of private savings it is worthwhile to examine what occurred during the Second Plan more closely. It is estimated that about 11,474 million rupees were invested in the private sector over the last five years. Of this amount, 451 million rupees were financed by private foreign investment and 1,600 million rupees by foreign loans and grants. A further 221 million rupees represent investment by the two PIDC's. Roughly 2,525 million rupees were spent on private housing, apparently mostly for the wealthy. The Planning Commission candidly states that: "In the private sector, the construction activity has been impressive, especially in the upper income groups" [32, p. 76].

These four items account for 4,797 million rupees of investment in the private sector. This means that private initiative and savings were responsible for only 6,677 million rupees of investment in directly productive activities[8]. This effort of private savers represents only slightly more than 3 per cent of the Gross National Product.

This, however, is only part of the story. We have shown earlier that the strategy of development was to restrain the growth of agricultural incomes and facilitate investment in industry by private entrepreneurs. Up to now we have implied that all private saving was in fact done by this class and invested in manufacturing. Yet we know that during the Second Plan there was a substantial amount of private investment in rural areas; just how much is still uncertain. The best estimate we have was prepared by W. Falcon and C. Gotsch. They reached the conclusion that in 1962/63 private investment in agriculture was of the order of 781 million rupees [4, p. 6].

[8]All that is meant by "directly productive activities" in this context is investment in anything other than housing. This definition, of course, begs the important question of whether private investment in such things as cigarettes, perfumes and cosmetics is in any sense "directly productive".

TABLE VI

PRIVATE DOMESTIC SAVINGS IN DIRECTLY PRODUCTIVE ACTIVITIES DURING THE SECOND PLAN

1.	Total investment in private sector		Rs. 11,474 million
2.	Foreign private investment	451	
3.	Foreign loans and grants	1600	
4.	Investment in PIDC's	221	
5.	Investment in housing	2525	
6.	Sub-total: rows 2 through 5		4,797
7.	Private savings in directly productive activities (row 1 — row 6)		6,677
8.	Private savings in directly productive activities as percentage of GNP		3.3

Source: [32, pp. 26,28,54,116].

Now if we take the annual average of item 7 in Table VI, we get 1,335 million rupees as an estimate of private investment in directly productive activities. As we have seen, 781 million rupees were invested in agriculture, so the approximate amount of private savings invested in directly productive activities *outside of agriculture* was only 554 million rupees. This was only slightly more than 1 per cent of the GNP or 3 per cent of total urban income in 1962/63. The Falcon-Gotsch estimate of private investment in agriculture, however, was made independently of the estimates included in Table VI. Thus there is no assurance that this estimate is included in the figure we are using for private savings in directly productive activities; we can only be confident that nonagricultural productive investment is somewhere between 3.3 per cent and 1 per cent of GNP.

As long ago as 1959 the Credit Enquiry Commission revealed thal nearly 60 per cent of the bank credit was secured by 222 families. From the viewpoint of equity it is highly doubtful that the "sizeable transfer of savings ... taking place through the rural branches of the commercial banks to the urban centres" can be considered a "great help" [31, p. 33]. Further provision of credit is only likely to perpetuate this socio-economic system.

The desirability of well-meaning proposals to raise savings through a "reduction of the corporation tax rate to either a nominal payment or to zero" is highly doubtful [15, p. 268]. Corporate tax rates already are quite moderate and income from this source accounts for only about 5 per cent of all tax

revenues. Preliminary findings of a study underway at the Pakistan Institute of Development Economics by Abdur Rab indicate that the effective corporate tax rate (on net taxable income, *i.e.*, net of exemptions) is only about 25 per cent. In fact, the total tax burden is unusually low [20]: only 7—9 per cent of GNP is currently paid in taxes and the government hopes to raise this to 10 per cent during the Third Plan. The government has become increasingly unable to finance its expenditures with tax receipts. In 1960/61 government receipts (taxes plus other revenues) covered over 68 per cent of total expenditures (both non-development and development expenditures); by 1964/65 they covered barely 66 per cent. This was a continuation of a long trend. As Chowdhury states "though there has been some growth of tax revenues, this has been slower than the growth of total budgeted expenditure. There has been, however, much greater availability of foreign aid" [3, p. 108].

d) The Savings Transfer from Agriculture

Assuming additional unemployed resources cannot be readily mobilized, if the domestic savings rate is to increase, consumption must be restrained, *i.e.*, resources must be transferred from consumption-use to investment-use. Consumption, in turn, may be restrained more severely in some sectors than in others—just as investment may increase more in some sectors than in others. If we find, for example, that the relative reduction in consumption in sector A during some period exceeds the increase in investment in that sector, we say there has been a transfer of resources to the other sector N. If we should also find that the transfer of resources from A to N is greater than investment in sector N, then we say there has been a transfer of savings from sector A to consumption in sector N.

We have tried to obtain a rough measure of the transfer of savings from the agricultural to the nonagricultural sector by constructing the "balance of payments" of agriculture for the fiscal year July 1964-June 1965. Relevant data are scarce and of poor quality and our estimate has been pieced together from a variety of sources. Hence, the estimate in Table VII must be viewed only as an indication of the order of magnitude.

It appears that agriculture annually transfers about 3,600 million rupees of resources to the urban sector. This represents over 15 per cent of the value of its gross output. Total development expenditure during the five years of the Second Plan was 26,330 million rupees, of which 10,100 million rupees were financed by capital imports. Domestic resources accounted for only 16,230 million rupees of plan expenditure, or an annual average of 3,246 million rupees. On pages 34-35 we argued that private nonagricultural investment probably was somewhere between 554 to 1,335 million rupees on the average. If this estimate is

correct it implies that at least 63 to 85 per cent of the savings transferred from agriculture are dissipated in higher consumption in urban areas.

TABLE VII

SALES AND PURCHASES OF THE AGRICULTURAL SECTOR, 1964/65

(in million rupees)

1.	Sales by agriculture to urban sector and foreign countries	14,425
2.	Purchases of intermediate goods	1,518
3.	Purchases of capital goods from foreign countries	69
4.	Purchases of capital goods from urban sector	262
5.	Purchases of consumer goods	8,914
6.	Total purchases	10,763
7.	Sales minus purchases (=resource transfer)	3,662

Sources: Rows (1) and (2): [10].
Row (3): [15].
Row (4): [7]. The 1959/60 estimates of the output of agricultural machinery and appliances, cement, strainers, engines and turbines, pumps and compressors were brought up to 1964/65 by assuming a 13-per-cent annual compound rate of growth — which was the rate experienced by large-scale manufacturing as a whole.
Row (5): [11]. The estimates were brought up to 1964/65 by using income elasticities of demand suggested by the survey data and assuming per capita rural income increased by 5 per cent as suggested by the data in Appendix Table A-2. The estimate is known to be overstated by a considerable amount because village-produced textiles and footwear are treated as purchases from the urban sector.

We cannot conclude from this, however, that the agriculturalists are rapidly becoming industrial capitalists. Without a flow-of-funds statement it is impossible to trace the financial flows and determine the form in which assets are accumulated. Some of the savings, of course, are transferred through taxation, but at the same time fertilizers, pesticides and water are heavily subsidized. Some of the savings are deposited in rural branches of national banks and then transferred to the urban sector. Probably, a larger proportion is deposited directly in urban banks by large landowners who reside in, say, Lahore or Karachi. Some of the funds may be invested directly in manufacturing activities, but the volume may prove to be small. Further research on this topic is obviously necessary, but it does seem clear that if the agricultural surplus were mobilized and combined with high urban savings the need for foreign aid would soon disappear.

FOREIGN AID AND INVESTMENT

Private savings and the government's surplus on current expenditure account were totally inadequate to finance the development effort during the first two plans. The relative success of the plans and the consequent performance of the economy depended to a great extent on the availability of foreign assistance and its efficient utilization.

During 1955-60 Pakistan's capital imports were over 5 billion rupees. 56 per cent of this was in the form of grants; the remainder composed of loans and a small flow of private foreign investment (*see*, Table VIII). These external resources financed half the plan expenditure and a third of the total imports; they supplemented Pakistan's earnings from exports by over 50 per cent. In the next plan period, the volume of aid doubled and the proportion of loans rose to 80 per cent. Aid now supplemented export earnings by over 76 per cent and financed nearly 40 per cent of all imports, although the proportion of development expenditure financed by aid declined to 38 per cent.

Thus, between the two plans, there was an abrupt change in the composition of capital imports. Grants declined by 762 million rupees while the volume of loans increased by almost 444 per cent. It is perhaps unfair as well as indelicate to suggest that grants decreased once Pakistan's alignment with the West, its acceptance of US military aid, and its membership in SEATO and the Baghdad Pact (later CENTO) were assured—but the suspicion remains nevertheless. This de-emphasis of grants was associated with a dramatic increase in "tied" loans. The immediate consequences are reflected in the fact that from 1960/61 to 1963/64 the share of dollar-area imports rose from 26 to 46 per cent.

TABLE VIII

CAPITAL IMPORTS AND FOREIGN DEBTS

	1955-60	1960-65	1965-70
1) Total capital imports (*in million rupees*)	5,070	10,100[b]	16,500[b]
a) grants	2,837	2,075	n.a.
b) loans	1,808	8,025	n.a.
c) private foreign investment	425	450	700
2) Capital imports as per cent of			
a) export earnings	55.3	76.2	82.0
b) total imports	35.0	39.3	46.5
c) development expenditure	52.0	38.4	31.7
3) Servicing of foreign debt	161.1[a]	951	2810
[a]debt servicing as per cent of capital imports	3.2	9.4	17.0
[b]debt servicing as per cent of export earnings	1.8	7.2	14.0

Sources: [27; 30; 31; 34, various years].

a) Repayment of principal only.

b) The Second and Third Plans exclude the 945.9-million-dollar Indus Basin Project. All but 29 million dollars of this will be financed from external resources, according to the terms of the 1960 treaty signed with India.

The long-run consequences of tied aid can be quite serious. It is a common belief that products purchased under tied-loan agreements usually cost 15-25 per cent more than world prices. It is quite likely that this is an underestimate since *a*) foreign suppliers frequently raise their prices when loans are tied and world competition is eliminated and *b*) there is evidence that German industrialists charge 40 per cent more than world prices under their tied-loan agreement[9]. In comparison with untied aid, these practices squeeze the developing countries in three ways: first, by definition, by raising the cost of imports, tied loans augment the deficit on current account of the balance of payments and lead to a deterioration of the terms of trade. The deterioration of the terms of trade will be a once-for-all change except insofar as the proportion of tied aid increases. This terms-of-trade effect can be partially offset by diversifying the sources of aid. In other words, by raising the cost of development expenditure, tied loans lead to a higher capital-output ratio and lower rate of growth. Secondly, this effect may be permanent as the industrial apparatus of the borrowing country may become permanently dependent upon a high-cost supplier for spare parts, replacements and ancillary equipment. Thirdly, tied loans lead to higher debt repayment obligations and a greater foreign debt burden. Assume, for example, that Pakistan obtains a tied loan of 1,000 dollars at 5 per cent repayable over 10 years from the Eximbank to buy a piece of machinery which costs only 800 dollars on the world market. Total debt servicing on this loan will be 1,275, *i.e.*, 1,000 dollars for repayment of principal and 275 dollars for interest charges. In comparison, if Pakistan had been able to obtain an (hypothetical) untied loan for 800 dollars on the same terms, total debt servicing would have been only 1,020, or 255 dollars less.

Aid in the form of surplus agricultural commodities under the PL 480 programme increased from 1,618 million to 1,970 million rupees over the two plan periods. 723 million rupees were spent in support of the public works programme which is attempting to provide employment and increase productivity by undertaking labour-intensive investment projects in rural areas. It could be argued that this is the most effective use to which PL 480 aid has been put, and certainly in principle such programmes deserve to be supported. Critics of the programme, however, frequently allege that in practice the public works programme has contributed much less than one would hope because *a*) corruption is widespread, *b*) the type and location of projects is determined by political rather than economic factors, and *c*) the work (including maintenance) has been poorly done due to lack of skills and technical knowledge. Evidently, more research is needed on this topic.

It has been suggested that in other respects PL 480 assistance has been harmful. Beringer and Ahmad believe "that there is a danger that the relatively

[9] *See* the statement by Mr. A. Jawad, President of the Karachi Chamber of Commerce, as reported in *Dawn* (Karachi), July 10, 1965, p. 5.

stable food-price situation which has been maintained with the help of PL 480 imports is beginning to blur the government's vision of the seriousness of the agricultural supply situation in Pakistan" [2, p. 59]. It is uncertain whether the government's vision is blurred, *i.e.*, whether agriculture has been neglected in general, but it is a fact *a*) that the index of wheat output was 100 in 1960 and only 106 by 1963/64 and *b*) that the average acreage devoted to wheat increased from 10.4 million in 1950-55 to 11.7 million in 1955-60 to over 12 million in the early 1960's [25, p. 1]. Thus, there is a clear association between PL 480 imports and stagnating wheat production.

It could be argued that Pakistan should concentrate her efforts on increasing the output of jute and cotton — which earn foreign exchange — and continue to rely on PL 480 imports to meet her food requirements. This, however, would seem to be an unwise policy as it would give a foreign government extraordinary power to influence this country's internal and external affairs. Alternatively, one could argue that Pakistan should export jute and cotton in return for foodgrains purchased from commercial sources. The advisability of this policy would depend upon where the country's comparative advantage lies and what are the likely future changes in costs and prices in the cash crop and foodgrain industries. It certainly isn't obvious that Pakistan can best feed her growing population by selling cotton rather than by growing wheat.

a) Foreign Aid in the Third Plan

The Planning Commission has tried to give the impression that the country's dependence on foreign assistance is diminishing. It is true that capital imports as a percentage of GNP are expected to be lower in the Third Plan than in the Second (6.7 per cent *vs.* 8.1 per cent), but they will still be higher than the 4.8 per cent which prevailed during the First Plan. It is also true that foreign assistance as a percentage of total development expenditure is expected to be somewhat lower in the Third Plan than in the last (*see*, Table VIII). More to the point, however, capital imports appear to be a growing proportion of total government expenditures, foreign-exchange receipts and total imports. Moreover, the amount of foreign aid requested to finance the Third Plan is 60 per cent greater than the amount received during the second-plan period.

Capital exports, in the form of repatriation of private capital, repayment of principal on foreign debts and interest charges have begun to rise at a substantial rate. In fact, private capital outflows appear to exceed the inflow, *i.e.*, Pakistan is a net capital exporter on private account. As a government spokesman has stated: "It is estimated that in 1963/64 the level of such outflow was in the neighbourhood of 150 million rupees exceeding the direct inflow of private capital by 50 million rupees" [12, p. 11].

The rate of interest on Pakistan's foreign debt varies from 0.75 per cent for I.D.A. loans to 6 per cent for German 10-year credits. At present, the average rate is approximately 3 per cent[10] and seems to be rising—although it is difficult to document this precisely. An increasing volume of debt is being incurred simply to pay off previous debts: during the First Plan the proportion of debt servicing to capital imports was 3.2 per cent: it rose to 9.4 per cent in the Second Plan and is expected to be 17.0 per cent during the Third. This can be a costly policy especially if the average rate of interest on new debts is higher than on the old.

Debt servicing also is a growing percentage of export earnings. During the First Plan only 3.8 per cent of the country's earnings of foreign exchange were used to service the debt; the proportion rose to 10 per cent in the last year of the Second Plan and is expected to be 16 per cent in the last year of the Third Plan. At this rate of increase a quarter of Pakistan's export earnings will be needed by 1974/75 to service the debt and nearly a half by 1979/80. Even this projection is optimistic, however.

The noteable feature of the Second Plan was the extent by which exports exceeded their target. Had exports grown at the planned rate of 3 per cent per annum, instead of the 7 per cent rate actually achieved, the foreign debt position would appear much worse today than it does. Had exports not grown at the rate they did, foreign-exchange earnings would have been lower and the need for capital imports consequently greater. It is probably safe to say that in the absence of an export boom debt servicing in the last year of the plan would have absorbed 12 to 15 per cent of export earnings. This speculation after the event is important because it is planned to accelerate the rate of growth of exports even further during the Third Plan to 9.5 per cent per annum[11]. Failure to meet this target would be serious, for if exports grow only 20 per cent over the plan period, for example, the ratio of debt service to exports will be 20.5 per cent in 1969/70.

b) The Foreign-Trade Targets

A detailed analysis of the balance-of-payments projections of the Third Plan is the subject for another essay [6]. All that can be done here is to indicate the broad lines of the foreign trade strategy and comment upon them. The basic information presented in Table IX will help us to do this.

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[10]The estimate was obtained by weighting 9 interest rates reported in [27] by the debt outstanding at the end of 1964. The weighted average obtained was 3.01 per cent.

[11]*See*, Appendix Table A-4 for the global targets of the Third Five-Year Plan.

TABLE IX

EXPORT TARGETS OVER THIRD PLAN

	1964/65	1969/70	Compound percentage rate of growth
	(*in million rupees*)		
Raw jute	820	750	—1.8
Raw cotton	400	550	6.7
Hides and skins	70	80	2.8
Wool	90	90	0.0
Rice	140	300	16.4
Total primary commodities	1,705	2,120	4.5
Jute manufactures	350	800	18.0
Cotton manufactures	170	350	15.6
Total manufactures	815	2,000	19.7
Invisible earnings	530	680	5.2
Total exports	3,050	4,800	9.4

Source: [5].

The first thing to notice is that exports are expected to grow almost 50 per cent faster than GNP. Thus, to use Rostow's terminology, foreign trade is to become Pakistan's leading sector. This is to be achieved by a rapid expansion of five commodity groups: rice, raw cotton, cotton manufactures, jute manufactures and other manufactures.

The second thing to notice is that "for most products, both agricultural and industrial, for which exports are planned, domestic consumption constitutes an alternative market" [31, p. 90]. This means that domestic consumption will have to be restrained and increased production channelled to export markets. This is likely to be quite difficult. First, the Planning Commission has assumed the population will grow at 2.7 per cent per annum even though there is good reason to believe that the rate is at least 3 per cent (*Cf.* p. 30 above). Thus, internal pressure for additional consumer goods is likely to be more intense than is anticipated. Secondly, "the shift from direct to indirect controls .. will be intensified during the next 5 years" [31, p. 89]. If the planners are serious, this implies that precisely at the moment when efficient discriminatory controls on consumption would be most useful in accelerating exports, the existing measures will not be improved but rather discarded in favour of instruments whose impact

is diffused and unpredictable. Insufficient consideration, for example, seems to have been given to the desirability of establishing a government trading corporation and an export quota system. Such direct controls could be powerful instruments in achieving the government's stated aim — although it must be recognised that direct controls can have undesirable distributive effects depending upon the way the controls are administered and the honesty of the civil service.

A consideration of the export targets by separate commodity groups does not lead to greater optimism. The planned 16.4-per-cent annual rate of growth of high quality rice exports appears to be too high. It is unlikely that world demand will be great enough to absorb this quantity without a substantial price decline [10].

Cotton production is expected to increase by 50 per cent during the Third Plan and exports of raw cotton are expected to grow 6.7 per cent per annum. Whether the export target can be met depends upon whether domestic supply increases by the required amount and whether purchases of cotton by the textile industry can be kept within bounds. The former problem may prove to be the most difficult.

Cotton output has substantially increased in the last few years, due primarily to private investment in tubewells. Further increases in output will depend upon a continuation of this investment as well as additional use of non-conventional inputs, particularly fertilizers. There is a danger, which seems to have been ignored, that private investment in tubewells during the next five years may not be as buoyant as is hoped. In the past, these investments have been undertaken by relatively large and wealthy farmers: 77 per cent of all tubewells are found on holdings of 25 acres or larger; 82 per cent of all tubewells were installed without recourse to borrowing [18, pp. 20-21]. It is quite possible that within the next two or three years most large farmers will have installed their tubewells. Expansion of the programme will then rest upon the small farmers — who own over half of the cultivable land in West Pakistan. These small farmers may not invest either because their financial resources do not enable them to do so or because their fragmented holdings do not justify such a large capital expenditure. For these reasons the provision of more generous credit facilities coupled with an acceleration of the process of land consolidation may be essential. Without them the chances of meeting the export target for raw cotton are less certain.

Exports of manufactured products are expected to grow 19.7 per cent per annum, *i.e.*, almost twice as fast as industrial output and three times faster than they grew over the Second Plan. If this target is achieved it would represent a complete reversal of past trends. The proportion of industrial output that is exported has declined steadily from 4 per cent at the beginning of the Second Plan to 3 per cent at the end. Now the Planning Commission has decided that the ratio should increase to "at least 5 per cent" by 1970. How this is to be

accomplished is not clearly stated. Until the commission specifies in detail the policy measures it intends to introduce to achieve such results the target for exports of manufactured goods should be viewed with scepticism.

The import targets are equally ambitious. Total imports and debt servicing are expected to grow 7.3 per cent per annum during the Third Plan as compared with 15.8 per cent during the Second. Imports, exclusive of debt servicing, are expected to grow less rapidly than GNP. This is to be achieved by restricting the rate of growth of imports of capital goods to 4.5 per cent per annum, of raw materials to 11 per cent per annum, and of consumer goods to 3.3 per cent per annum. At the same time that this is to occur the government insists that the regulation of imports will shift to indirect methods and that gradually they will be decontrolled [31, p. 123].

The gap between imports and exports has been growing steadily throughout the last ten years, and the need for capital imports has consequently been increasing. The Third Plan proposes to reverse this trend. Yet it appears that both the export and import targets are completely unrealistic, especially in the context of the government's philosophy of economic liberalism. It has already been shown above, contrary to what the Planning Commission would like to imply, that by almost any reasonable measure the Third Plan envisages an increase in Pakistan's dependence on foreign assistance. The increased dependence may have been understated, however. If the foreign-trade targets are not achieved, either greater aid will be requested or the Plan's objectives will be scaled down. In either case dependence on capital imports will increase. The only way to avoid this dilemma is to place greater stress on mobilizing the nation's resources.

SUMMARY AND CONCLUSIONS

Planning in Pakistan has been a curious exercise. It has been the intention of the government to liberalize the economy as much as possible and to redistribute income to the industrial classes in the expectation that this would lead to a high rate of domestic savings.

In the first half of the essay it is shown that the government did introduce the social and economic changes it proposed: the economy was liberalized and income was redistributed. In fact, it is argued that the redistribution of income was so pronounced that the standard of living of the average rural inhabitant is no higher today than it was fifteen years ago and it may be lower. The poor are little better off and, because of population growth, they are more numerous than when planning began. In spite of this the domestic savings rate is still very low. Using Planning Commission data—which may not be accurate but, if anything, are likely to be biased upward—it is argued that private investment in directly productive nonagricultural activities is about 1 to 3 per cent of GNP. Even if there is a substantial error in the estimate the plan strategy can only be considered a very modest success.

Income inequalities have not ensured markedly high rates of private savings; they have mostly led to privilege: the housing boom is largely confined to urban areas and the wealthy classes; imports of photographic equipment and supplies were 5 million rupees per annum during the First Plan, whereas they were running at an annual rate of 14 million rupees in 1964/65; imports of passenger motorcars were 12.6 million rupees per annum during the First Plan, whereas they soared to an annual rate of 72 million rupees in the first nine months of 1964/65 [22 ; 24]. In contrast, according to information published in the *Pakistan Observer*, only 75 million rupees were allocated by the government to assist the victims of the May-1965 cyclones and floods which killed nearly 13,000 people and made 5,00,000 homeless.

This entire social and economic system, and the planning exercise which is its manifestation, is supported and sustained by foreign assistance. A former member of Harvard's Development Advisory Service practically concedes this. He says: "It is ironical but true that the strongest prop of the planning enterprise in Pakistan is the nation's continued dependence on foreign aid" [38, p. 78]. The assertion of the Planning Commission that " . . . a liberalized economic system is highly conducive to accelerated capital formation and economic growth . . . " is not consistent with the facts [31, p. 123]. Pakistan's economic performance has depended heavily on capital imports and this dependence is increasing. The volume of external assistance requested for the Third Plan is 300 per cent higher than that obtained during the First, and the proportion of total imports financed by aid is growing as well.

The authorities are obviously pleased that "excluding consumer goods imported under PL 480 programme, consumer items constitute only about 12 per cent of total imports" [31, p. 9]. Yet the implication of this is that the planned substitution of imported consumer goods by privileged local producers has introduced a strong pro-consumption, anti-saving bias into the economy, *i.e.*, the output mix in the industrial sector is not consistent with a high savings policy [*cf.*, for example, 13]. If consumer demand is not maintained at a high level Pakistan will have excess industrial capacity! There is little choice but to continue consuming locally produced "Pakola", clocks, fountain pens and radios.

Private investment in tubewells in West Pakistan and the consequent expansion of output of raw cotton are perhaps the most encouraging recent developments in the country. Although the government did subsidize inputs and remove price controls to a large extent the planners were lucky. Private tubewell installation was unanticipated and in fact is being resisted by the government's Water and Power Development Authority, which favours licensing controls. It would be difficult to attribute the buoyancy of agricultural investment directly to the government's initiative in this field, much less to its policy of redistributing income to urban areas. "Emergency conditions" are said to have prevailed in

agriculture at the end of 1959/60; that conditions today are not catastrophic is an unplanned blessing [30, p. 128].

One suspects that capital imports have substituted rather than supplemented domestic savings, although it is impossible to predict what would have happened if foreign assistance had not been available. In M. Haq's book [8] domestic savings are a residual derived by subtracting foreign aid from desired gross investment. Saving is also treated as a residual in the Third Plan. One can scarcely disagree with Power's statement, that "it is fair to say that in Pakistan the mobilization of domestic resources has never had first priority" [35, p. 418].

In the second half of the essay it is shown that the burden of foreign debt is rising rapidly and in view of the excessive optimism of the balance-of-payments projections of the Third Plan, the debt burden in 1969/70 is likely to be higher than is anticipated. The implication of the argument is that the social and economic system which has been created and sustained with the help of foreign assistance is not viable. Continued reliance on foreign loans and private foreign investment is quite likely to lead to a situation in which debt repayment obligations and repatriation of private capital persistently grow at a faster rate than exports. This means that a growing proportion of current earnings of foreign exchange will be required to service foreign capital. The squeeze on foreign exchange earnings can only be avoided if *i*) export earnings and import substitution grow at a phenomenal rate, or *ii*) the trend in foreign assistance is reversed in favour of more grants, or *iii*) foreign debts are incurred to service past loans so that capital imports grow at an accelerating rate, or *iv*) the foreign debt is repudiated and foreign firms are nationalized.

The panacea for all development problems in Pakistan has been "more aid"[12]. Even such a sensitive analyst as John Power, who recognizes that "foreign aid can serve to forestall as well as encourage the social and institutional changes that are required", finally joins the chorus of domestic and foreign economists and insists that "Pakistan must continue to rely heavily on external financing of its development effort" [36, pp. 193, 207].

An alternative strategy would place reliance on the mobilization of domestic resources—both rural and urban—through such programmes as *i*) the acquisition of large land holdings and their consequent control by the State; *ii*) the consolidation of fragmented holdings and the formation of cooperatives; *iii*) the full mobilization of overt and seasonal unemployed labour on rural investment projects and low-cost housing—in an institutional environment in which those who contribute their effort receive the fruits thereof; *iv*) the establishment and management of State industrial enterprises[13] operating under maximum efficiency and maximum investment principles; *v*) the full use of the State's powers of taxation and control including an agricultural land tax; greater coverage, fewer exemptions and higher rates of personal income tax; higher corporation taxes; additional import controls; restrictions of the export bonus scheme and its substitution by direct controls on exports; and in some cases additional sales and other indirect taxes; *vi*) a substantial increase of outlays on rural education[14]. Almost all of these measures would tend to increase both equity and domestic savings.

[12]Perhaps most extraordinary of all in Fei's "demonstration" that—assuming high rates of population growth and everything else constant — Pakistan will experience "sudden death" if she fails to acquire the minimum foreign aid [5, p. 56]. One would have thought that by now it was generally recognized that the whole process of development consists of turning constants into variables.

Foreign aid may not, in practice, be used to encourage reform, because the way in which resources are mobilized is not independent of the institutional organization of society. Foreign assistance is largely a transaction between governments of wealthy societies (plus international agencies operating for them) and the government of an underdeveloped country. The latter, as with all governments, usually reflects the balance of power in the society and hence is likely to have an anti-reform, *pro-status quo* bias. Under these conditions aid may only strengthen the forces opposing change—regardless of whether the contributing countries want change or not. In its simplest form the argument is as follows: development requires economic reforms; economic reforms are impossible without institutional changes; foreign aid tends to strengthen institutions and thereby inhibit change; hence aid tends to retard development. If the hypothesis is correct the implication is that foreign assistance is most likely to be effective in fostering development only after (or during the period when) the necessary reforms have been (or are being) introduced, and not before.

[13]This does not imply that existing private enterprises would necessarily be nationalized or even that certain sectors would be reserved for the State. It does imply, however, that PIDC-established enterprises would not be turned over to private interests.

[14]Half the Central Government's current expenditures are on defence. The Third Plan proposes to spend 127 per cent more on armaments than on education. Annual per capita expenditure on education will be less than 6 rupees and almost none of this will be spent in the countryside.

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Appendix A

TABLE A-1

MAJOR EXPORTS, 1954/55—1964/65

Exports	1954/55	1955/56	1956/57	1957/58	1958/59	1959/60	1960/61	1961/62	1962/63	1963/64	1964/65 (est.)
	(*million rupees*)										
All exports	1,918	2,131	1,909	1,726	1,818	2,160	2,333	2,429	2,781	2,811	3,050
Raw jute	857	941	808	858	790	760	872	870	848	776	820
Manufactured jute	16	85	102	133	145	223	320	339	317	341	350
Raw cotton	496	510	362	246	223	171	195	163	401	443	400
Cotton manufactures	—	32	95	34	68	220	122	50	92	115	170
Hides and skins	45	49	51	50	61	94	79	90	81	76	70
Wool	80	85	96	78	81	83	83	87	91	97	90
Rice							54	112	125	71	140
Miscellaneous exports	258	234	186	129	161	285	204	154	326	378	480
Invisibles	166	195	209	198	289	314	409	464	500	514	530

Sources: [30 ; 32].

TABLE A-2

REAL OUTPUT AND PER CAPITA INCOME, 1949/50—1964/65
(1959/60 Prices)

Year	GNP at factor cost	Agricultural output	Total population	Rural population	GNP per capita	Rural income* per capita
	(1)	(2)	(3)	(4)	(5)	(6) col.(2)÷col.(4)
	(....*in million rupees*....)		(....*in million number*....)		(.....*in rupees*.....)	
1949/50	24466	14668	79	71.0	311	207
1950/51	25078	14859.7	80.8	72.4	312	205
1951/52	25705	15052.9	82.7	73.8	313	204
1952/53	23648	15248.6	84.6	75.2	314	202
1953/54	27007	15446.8	86.5	76.6	315	202
1954/55	27908	15654	88	78.0	316	201
1955/56	28606	15857.5	90	79.7	316	199
1956/57	29321	16063.6	92.1	81.3	316	198
1957/58	30054	16272.4	94.2	83.0	317	195
1958/59	30805	16482.9	96.4	84.6	317	195
1959/60	31439	16753	99	86.3	318	194
1960/61	32946	17339.4	101.6	88.2	326	197
1961/62	34744	17946.3	104.2	90.1	334	199
1962/63	35929	18574.4	106.9	92.0	342	202
1963/64	38637	19224.5	109.7	94.0	351	205
1964/65	40525	19895	112	95.9	360	207

Sources: Col. (1): 1949/50-1959/60: [31]. Applying a 2.5-per-cent growth rate to missing years.
1959/60-1964/65: [32].
Col. (2): [31]. Applying a 1.3-per-cent annual increase up to 1959/60 and a 3.5-per-cent increase thereafter.
Col. (3): [31]. Applying a 2.3-per-cent rate of increase over first ten years and a 2.6-per-cent rate from 1959/60.
Col. (4): [31]. For estimates at five-year intervals, interpolation in between.
Col. (5): [31]. Applying a 0.2-per-cent rate over first ten years and a 2.5-per-cent rate from 1959/60.

* Rural income per capita is understated to the extent that the output of cottage industries is excluded from our calculations. Unfortunately, virtually nothing is known about the size and rate of growth of small-scale manufacturing so we have been forced to omit entirely.

TABLE A-3

DEBT REPAYMENT OBLIGATIONS AS OF DECEMBER 31, 1963

Year	Principal	Interest	Total
	(.....*in thousand rupees*.....)		
1963/64	214,888	188,258	403,146
1964/65	223,637	222,549	446,186
1965/66	219,937	234,979	454,917
1966/67	255,388	232,085	487,474
1967/68	286,512	223,183	509,696
1968/69	294,777	210,962	505,739
1969/70	287,541	198,566	486,108
1970/71	282,129	185,729	467,859
1971/72	291,128	171,423	462,551
1972/73	313,451	157,252	470,704
1973/74	313,694	143,677	457,372
1974/75	283,532	131,538	415,070
1975/76	277,886	120,529	398,416
1976/77	257,775	109,946	367,721
1977/78	246,070	100,444	346,515
1978/79	226,949	91,801	318,751
1979/80	218,036	84,142	302,179
1980/81	202,428	76,849	279,277
1981/82	203,362	70,043	273,406
1982/83	189,720	63,132	252,853
1983/84	171,486	57,461	228,947
1984/85	173,603	52,270	225,874
1985/86	168,686	47,069	215,755
1986/87	170,417	41,899	212,317
1987/88	169,694	36,690	206,384
1988/89	160,538	31,637	192,176
1989/90	159,459	26,778	186,237
1990/91	126,809	22,403	149,212
1991/92	106,846	19,726	126,573
1992/93	109,053	17,591	126,604
1993/94	111,331	15,291	126,623
1994/95	113,685	12,944	126,630
1995/96	109,161	10,576	119,738
1996/97	99,459	8,435	107,894
1997/98	96,837	6,501	103,338
1998/99	93,750	4,773	98,524
1999/2000	82,435	3,183	85,619
2000/01	66,408	2,266	68,674
2001/02	66,602	1,767	68,369
2002/03	54,074	1,268	55,353
2003/04	22,092	928	23,019
2004/05	12,201	799	13,001
2005/06	12,264	708	12,972
2006/07	12,326	616	12,942
2007/08	12,389	523	12,913
2008/09	12,453	430	12,884
2009/10	12,517	337	12,754
2010/11	12,582	243	12,825
2011/12	12,432	148	12,881
2012/13	10,540	56	10,596

Source: [33].

TABLE A-4

GLOBAL TARGETS OF THE THIRD FIVE-YEAR PLAN

	Projected annual compound percentage rate of increase
GNP	6.5
GNP per capita	3.8[a]
Agriculture	5.0
Industry	10.0
Exports	9.5

[a]Note that population is assumed to grow at only 2.7 per cent per annum.

Source: [31].

Part 2

A Multi-Sector Programming Model for Regional Planning in Pakistan

Azizur Rahman Khan

This chapter first appeared as an article in the Spring-1967 issue of *The Pakistan Development Review* and is based on parts of Chapters 3 and 5 of Dr. Khan's doctoral dissertation, *Planning and Regional Development: The Application of Multi-Sector Programming Model to Interregional Planning in Pakistan*, submitted in 1966 to the University of Cambridge.

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A Multi-Sector Programming Model for Regional Planning in Pakistan

Azizur Rahman Khan

1. INTRODUCTION

This article presents the outline of a multi-sector, optimizing model for inter-regional planning and uses it to analyse Pakistan's Third Five-Year Plan (1965-70). This is an interregional (as distinguished from a national) model in so far as it recognizes the existence of economic regions within the nation and explicitly takes into account the interregional trade flows. Another aspect of a multi-region economy that the model reflects is that in planning for optimization the model enables the planners to maximize some objective which is a function not only of the value of national income or consumption but also of their distribution between the regions.

This is a multi-sector or detailed planning model. The economy of each region is divided into a number of producing sectors. The model takes explicitly into account the intersectoral flows. In doing so, the model reflects the implications of the differences in regional technologies and behaviour. A given consumption target would mean different vectors of consumer goods in different regions because consumption patterns are different between regions. A given final demand vector would mean different sectoral output levels and different sectoral allocation of investment in the two regions because the technological relations are different. The model is able to spell out the implications of all these factors by relating the regional and sectoral allocation of investment and foreign exchange to location of demand.

The present model does not merely provide for the feasibility of the plan but also satisfies certain efficiency criteria. In other words, this is an optimizing model which attempts to find the 'best' possible pattern of the allocation of investment and foreign-exchange resources between regions and among sectors, the 'best' being understood in the sense of maximizing a given preference function subject to the relevant constraints.

2. NOTATION

In the present formulation of the model there are two regions which we call East (representing East Pakistan, denoted by E and in the superfixes by e) and West (representing West Pakistan, denoted by W and in the superfixes by w). The productive activity of each region is divided into the following seven sectors (the letters in the parentheses denote the corresponding sectors):

(a) Agriculture, animal husbandry and forestry, briefly referred to as agriculture
(f) Food-processing industries
(m) Engineering
(b) Construction including building materials
(p) Fuel and power
(r) Other manufactures and minerals
(s) Trade, transport and other services

The choice of the number of sectors has been dictated by the consideration that it should be large enough to show a reasonable degree of disaggregation and interrelation among important types of activities and that it should be few enough for us to be able to describe its working verbally.

The following notation is used for region E. Similar notation is used for W with appropriate changes in the superfixes.

X_i^e = Production of i (i = a, f, m, b, p, r, s)

X_{ij}^e = Amount of i used as current-input for the production of j (j=a, f, m, b, p, r, s)

X_i^{ew} = Export of i to region W

X_i^{we} = Import of i from region W

$X_i^{ee} = X_i^e - X_i^{ew}$ = The part of region E's production of i, 'used' by the region itself

$Z_i^e = X_i^{ee} + X_i^{we} = X_i^e - X_i^{ew} + X_i^{we}$ = Total "domestic supply" of i (*i.e.*, that part of regional supply which originates in either of the regions)

Y_j^e = Value-added in sector j

$Y = \sum_j Y_j^e$ = Gross regional product

The above symbols denote *changes* in the corresponding variables over five-year period.

C_i^e = Private consumption of i

G_i^e = Government consumption of i

I_i^e = Fixed net investment of i

S_i^e = Increase in working capital requirement of i

D_i^e = Replacement requirement of i

E_i^e = Export of i abroad

N_i^e = Import of i from abroad

When put before C_i^e through N_i^e, the symbol d denotes changes over five-year period. Symbols without suffix i denote corresponding vectors, for example, dC^e is the vector of increase in consumption of goods of all sectors in region E over the five-year period. Symbols without superfixes e or w denote corresponding totals of two regions, for example, $dC = dC^e + dC^w$ and $Y = Y^e + Y^w$.

3. THE CONSTRAINTS OF THE MODEL

3.1 The Balance Equations

Our first set of constraints refers to the balance between availability and use of the products of each sector in each region. We write below the equations for region E. For region W the corresponding equations can be obtained with appropriate changes in the superfixes.

The first equation states the simple identity that regional domestic supply of i sector's output is parcelled out to intermediate use as current input of all sectors, net fixed investment, increase in working capital, replacement, private and public consumption and net exports abroad (all of the same region measured in terms of increases).

(i) $Z_i^e = \sum_j X_{ij}^e + dI_i^e + dS_i^e + dC_i^e + dG_i^e + dD_i^e + dE_i^e - dN_i^e$

We express the current input demand for i in sector j as linear function of the level of output in sector j. This is the standard Leontief assumption of fixed input coefficients. Note, however, that we need not necessarily assume simple proportionality since our variables denote increases.

(ii) $X_{ij}^e = a_{ij}^e X_j^e$

Import of i from the other region to this region is assumed to be a linear function of this region's domestic supply of i sector's output. Similarly the part of

the domestic supply of i obtained by region E from itself is assumed to be a linear function of region E's domestic supply of i sector's output.

$$\text{(iii)} \quad \left.\begin{aligned} X_i^{we} &= r_i^{we} Z_i^e \\ X_i^{ee} &= r_i^{ee} Z_i^e \end{aligned}\right\} \left(r_i^{we} + r_i^{ee}\right) = 1$$

This, or some variant of this, has been a standard assumption of a number of interregional input-output models[1]. This, however, amounts to the assumption that the entire volume of interregional trade is 'non-competitive'. If one considers potential import-substitutability this is certainly not an entirely satisfactory representation of the character of trade between the two regions of Pakistan. But given the present structures of the regional economies, they are mostly non-competitive. East's exports to West consist mainly of such goods as jute manufactures, tea, newsprint, paper and matches which are not produced in West now and are unlikely to be produced in large quantity in future. West's exports to East consist largely of raw cotton, cotton textiles and grains such as wheat. These are not being produced in East at the moment (except for a relatively small amount of cotton textiles) and are unlikely to be produced in large quantity (again except possibly for cotton textiles) in future. This relative non-competitiveness seems to be the main explanation of the fact that their coefficients have remained stable in Pakistan over relatively long periods of time[2]. Another way to justify the assumption is to regard the r's as the "planned" coefficients based on partial studies and *a priori* reasoning about interregional comparative advantage[3].

Next we have the identity that regional output of i is either "absorbed" within the region or exported to be "absorbed" in the other region.

$$\text{(iv)} \quad X_i^e = X_i^{ee} + X_i^{ew}$$

Substituting equations (iii), (ii) and (i) in turn into (iv) we get:

$$\text{(v)} \quad X_i^e = \sum_j r_i^{ee} a_{ij}^e X_j^e + \sum_j r_i^{ew} a_{ij}^w X_j^w + r_i^{ee}(dI_i^e + dS_i^e + dC_i^e + dG_i^e + dE_i^e - dN_i^e + dD_i^e) + r_i^{ew}(dI_i^w + dS_i^w + dC_i^w + dG_i^w + dE_i^w - dN_i^w + dD_i^w)$$

In order to express investment requirement endogenously we assume that any new output would require additional capacity which has to be created through

[1] *See*, for example, [3, chapter 4]. Similar but not identical assumptions are made by [8] and [5].

[2] These coefficients for 1959/60 and for 1964/65 are pretty much the same. These coefficients are likely to be more stable when we have only two regions than when we have more because in the two-region case the source of supply and the origin of demand are less in doubt.

[3] Chenery treats similar coefficients as policy variables in [2]. It should be intuitively obvious that a change in these coefficients would result in a change in the required pattern of interregional allocation of investment and output.

additional net investment. This can be justified by assuming that either there is no excess capacity or that the present rate of capital-utilization is normal in some sense and is likely to obtain in future. It is easily recognised that this assumption is of doubtful validity but is necessary if the problem imposed by the complete absence of information about the rates of utilization is to be avoided.

The amount of investment of new fixed capital, by industry-of-origin, is a linear function of the expansion of outputs of the producing sectors: $I_i^e = \sum_j b_{ij}^e X_j^e$, where b_{ij}^e is the fixed capital coefficient. But in our balance equations (v) we have changes in investment (dI and dS) and not total investment over the five-year period to which I refers. In order to obtain dI from I we make the assumption, following Jan Sandee[4], that investment rises by an amount Q every year: $I_{it}^e = I_{io}^e + Qt$ (where I_{it}^e and I_{io}^e are respectively I_i^e in year t and base-year). Thus $I_i^e = \sum_{t=1}^{5} I_{it}^e = 5I_{io}^e + 15Q$ or $5Q = dI_i^e = 1/3\, I_i^e - 5/3\, I_{io}^e$. We, therefore, have an equation for dI_i^e and a similar equation for dS_i^e.

$$\text{(vi)} \quad dI_i^e = 1/3 \sum_j b_{ij}^e X_j^e - 5/3\, I_{io}^e$$

$$\text{(vii)} \quad dS_i^e = 1/3 \sum_j s_{ij}^e X_j^e - 5/3\, S_{io}^e$$

Summing these two equations, we obtain

$$\text{(viii)} \quad dI_i^e + dS_i^e = 1/3 \sum_j k_{ij}^e X_j^e - 5/3\, I_{io}^{'e}$$

where $k_{ij}^e = b_{ij}^e + s_{ij}^e$ and $I_{io}^{'e} = I_{io}^e + S_{io}^e$

[4] *See* [13]. Pakistan's Third Plan approximately conforms to this assumption at the aggregate level; annual phasing of investment is such that total investment increases every year by about a thousand million rupees [10]. One could use other kind of stock-flow conversion factor for numerical extrapolation of investment by assuming that investment rises *smoothly* in some other manner from the base to the target year. To give an example, let

e^{5r} = investment index in the terminal year, with the annual exponential growth rate = r.

$\int_{t=o}^{5} e^{rt}dt$ = total investment index over the five years.

Then target-year investment is the following proportion of total five-year investment

$$e^{5r} \Big/ \int_{t=o}^{5} e^{rt}dt = r/(1 - e^{-5r}) \text{ so that we have}$$

$$dI_i^e = \left(\frac{r}{1 - e^{-5r}}\right) \sum_j b_{ij}^e X_j^e - I_{io}^e \text{ and so on.}$$

We use the stock-flow conversion factor on the basis of the assumed growth of investment of the type $I_t = I_o + Qt$ because, as just stated, the Third Plan (to which we apply the model) assumption roughly corresponds to this kind of hypothesis. For an example of the use of the hypothesis $I_t = e^{rt}$, *see* [6]. The basic assumption underlying the use of stock-flow conversion factor is that investment rises *smoothly* in some manner. One can easily think of situations in which this will not hold, *e.g.*, wartime mobilization, technological indivisibility, *etc.*

In obtaining equations (vi) and (vii), we have related investment in a fiscal year to increase in output in the same fiscal year. In order to be realistic, one must, however, take into account lags. Investment will not provide capacity production for some time to come. Either we must relate investment with output a year or two hence, or we may make a rough allowance by increasing the working capital in capital-supplying sectors. The latter amounts to assuming that the capital-supplying sectors maintain the capital goods as inventories until they attain production[5]. For want of information such allowance must be based on simple rules of thumb derived on the basis of limited enquiry in the field. If it is found that the lag is, say, one year, the working capital coefficient (S^e_{ij} if we are considering the i-*th* capital-supplying sector) has to be increased by one. This would be similar to the assumption that investment of i sector's product in year 0 creates capacity output in year 1. We adopt this procedure for its great simplicity and assume the gestation lag to be *on the average* one year for engineering capital and one and half year for construction.

Substituting equation (viii) into equation (v) we obtain the following set of balance equations for region E; we have a similar set of balance equations for region W which can be obtained by appropriate changes in the superfixes.

$$\text{(ix)}\quad X^e_i = r^{ee}_i \sum_j \left(a^e_{ij} + 1/3k^e_{ij}\right)X^e_j + r^{ew}_i \sum_j \left(a^w_{ij} + 1/3k^w_{ij}\right)X^w_j + r^{ee}_i\left(dC^e_i + dG^e_i + dD^e_i + dE^e_i - dN^e_i - 5/3I'^e_{io}\right) + r^{ew}_i\left(dC^w_i + dG^w_i + dD^w_i + dE^w_i - dN^w_i - 5/3I'^w_{io}\right)$$

For reasons stated below, balance equations for services sectors would need adjustment. Thus, the above equations describe the first twelve constraints of the model—one for each of the remaining six sectors in each of the two regions.

3.2 Adjustment in the Balance Equation for the Services Sectors

In the application of our model we measure all variables and coefficients, including the foreign and interregional trade entries, at purchasers' prices so that each industry is assumed to pay the trade and transport costs on all its sales of output, and the value of these services together form the trade and transport input into that industry.

There exists a discrepancy between the imports at purchasers' price and the foreign-exchange cost of imports and the difference is accounted for by duty, tax and trade and transport inputs required to take the imported goods to their users within each region. This means that an expansion of imports from abroad or from the other region would require additional regional output of trade and transport services, the amount of which would be determined endogenously via the trade and transport input coefficient into imports. In the output equation

[5]The method is suggested in [7].

for the services sector trade and transport input into imports must be accounted for.

$$X^e_s = \sum_j a^e_{sj} X^e_j + \sum_j T^{we}_j + \sum_j H^e_j + dC^e_s + dG^e_s$$

where, the first term on the right is total intermediate demand for services;

T^{we}_j=region E's trade and transport output used as input required to take imports of j from W to various users in E;

H^e_j=trade and transport required similarly for imports from abroad; and

dC^e_s and dG^e_s=consumption demand for services in East respectively by private and public sectors.

All the above elements are in terms of increases over the five-year period.

We assume that region E's trade and transport required per unit of j import from W into E is fixed

$$T^{we}_j = t^{we}_j X^{we}_j$$

whence we have, by using (iii),

$$T^{we}_j = t^{we}_j r^{we}_j Z^e_j$$
$$= t^{we}_j r^{we}_j \left[\sum_i \left(a^e_{ji} + 1/3k^e_{ji}\right)X^e_i\right] + t^{we}_j r^{we}_j\left(dC^e_j + dG^e_j + dE^e_j + dD^e_j - dN^e_j - 5/3I'^e_{jo}\right)$$

We similarly assume

$$H^e_j = h^e_j\, dN^e_j$$

Thus we have the output equation for services sector as linear function of all sectoral outputs and imports:

$$X^e_s = \sum_j a^e_{sj}X^e_j + \sum_j t^{we}_j r^{we}_j \sum_i \left(a^e_{ji} + 1/3k^e_{ji}\right)X^e_i + \sum_j t^{we}_j r^{we}_j\left(dC^e_j + dG^e_j + dE^e_j + dD^e_j - dN^e_j - 5/3I'^e_{jo}\right) + \sum_j h^e_j dN^e_j + dC^e_s + dG^e_s$$

We have a similar equation for X^w_s. These two, together with the twelve balance equations mentioned under 3.1, define the first fourteen constraints of the model. These 14 balance equations are shown in matrix form in Table XVI.

3.3 Other Constraints

The next set of constraints refers to private consumption. The minimum increase in total private consumption in each region may be specified as a target.

Relative regional sizes of such targets may be based on the notion of the desirable reduction in the disparity of the regional standards of living[6]. The minimum increase in private consumption demand of various sectors' products is given by this target via the expenditure elasticities of demand[7].

$$(15 - 20)\quad dC_i^e \geqslant e_i^e \left(C_{io}^e \Big/ \sum_i C_{io}^e \right) \sum_i \overline{dC}_i^e$$

$$(21 - 26)\quad dC_i^w \geqslant e_i^w \left(C_{io}^w \Big/ \sum_i C_{io}^w \right) \sum_i \overline{dC}_i^w$$

where e_i^e = expenditure elasticity of demand for i in East

$C_{io}^e / \sum_i C_{io}^e$ = base-year consumption proportion of i in East.

In this particular application we define minimum necessary increase in national consumption to be 31.5 per cent (third-plan target) and obtain its regional breakdown on the assumption that per capita consumption disparity would have to be reduced by a fifth (third-plan objective about the reduction in regional inequality in terms of income). Subtracting public consumption we obtain minimum target increase in private consumption in each region—6,138.5 million rupees in East and 4,882.7 million rupees in West.

The next set of constraints refers to imports. Increase in total foreign-exchange expenditure is limited by the sum of the increases in exports and foreign assistance.

$$(27)\quad \sum_j l_j^e\, dN_j^e + \sum_j l_j^w\, dN_j^w \leqslant \sum_j dE_j^e + \sum_j dE_j^w + \text{increase in foreign assistance.}$$

Foreign-exchange cost per unit of import of j in East at purchasers' price is denoted by l_j^e.

Due to the special nature of the construction and fuel and power sectors, upper limits must also be specified for the import of their products. Imports of construction sector's products consist of cement and other construction materials and cannot exceed the current self-inputs of construction sector.

[6]This has to be related to constraints 43 and 44 shown below. One may also introduce additional constraints to provide that the *relative* increases in the two regions' total consumption are not greatly dissimilar to the levels stipulated in setting the targets initially.

[7]This follows from the definition of expenditure elasticity (e_i^e) which is given by

$$e_i^e = \frac{dC_i^e}{\sum_i dC_i^e} \cdot \frac{\sum C_{io}^e}{C_{io}^e} \quad \text{from which we have}$$

$$dC_i^e = e_i^e \left[C_{io}^e \Big/ \sum_i C_{io}^e \right] \sum_i dC_i^e$$

on the basis of which we define the constraints.

Certain products of fuel and power sector are importable (*e.g.*, coal and oil) while others are non-importable (*e.g.*, electricity). We assume that incremental ratio of importable fuel to total fuel is the same as the average base-year (1964/65 which is the base year of the Third Plan and also of our exercises) ratio. This does not appear unrealistic. What proportion of new vehicles and machines would use oil rather than some other kind of fuel can reasonably be estimated from the pattern of use at present. We assume that all fuels except electricity, natural gas and firewood are importables (.686 and .522 respectively in East and West of total fuel used in 1964/65).

$$(28)\quad dN_b^e \leqslant a_{bb}^e\, X_b^e$$

$$(29)\quad dN_b^w \leqslant a_{bb}^w\, X_b^w$$

$$(30)\quad dN_p^e \leqslant \beta_1 \left[\sum_j \left(a_{pj}^e + 1/3k_{pj}^e \right) X_j^e + dC_p^e + dG_p^e + dE_p^e - 5/3I_{po}^{\prime e} \right]$$

$$(31)\quad dN_p^w \leqslant \beta_2 \left[\sum_j \left(a_{pj}^w + 1/3k_{pj}^w \right) X_j^w + dC_p^w + dG_p^w + dE_p^w - 5/3I_{po}^{\prime w} \right]$$

where $\beta_1 = .686$ and $\beta_2 = .522$.

Minimum level of imports of engineering and fuel and power need not be specified because the model will automatically favour their import, capital-income ratio being very high for these sectors. Import of agricultural products (unprocessed grains, *etc*). under PL 480 is estimated by the Third Plan to go up by about 60 million rupees [10, pp. 94-95]. We assume that this aid cannot be converted into some other kind of aid so that increase in imports in terms of foreign-exchange cost of agricultural goods must be at least 60 million[8].

$$(32)\quad l_a^e\, dN_a^e + l_a^w\, dN_a^w \geqslant 60.0$$

Minimum import of food, construction material and other manufactures and minerals has to be specified as equal to the increase in the "non-competitive imports" of these goods. We do not have enough information to obtain precise estimates of such non-competitive imports. But in the base year in Pakistan there were considerable amounts of competitive imports of the products of all these sectors so that it is a fair assumption that *increase* in imports of these products must at least be non-negative.

$$(33)\quad dN_f^e \geqslant 0 \qquad (36)\quad dN_f^w \geqslant 0$$

$$(34)\quad dN_b^e \geqslant 0 \qquad (37)\quad dN_b^w \geqslant 0$$

$$(35)\quad dN_r^e \geqslant 0 \qquad (38)\quad dN_r^w \geqslant 0$$

[8]We are also assuming (for want of information) that base-year non-PL 480 agricultural imports are non-competitive. This being a small quantity, the assumption is not so harmful.

The upper limit on investment can be specified either by putting a fixed ceiling ($I \leqslant \bar{I}$) or by putting an upper limit on the marginal rate of investment $\left[dI \leqslant \alpha \left(\sum_j v_j^e X_j^e + \sum_j v_j^w X_j^w \right)\right]$. Since one of our purposes is to compare our exercises with the Third Plan, we assume that the upper limit of total gross investment over the third five-year plan period is given at the level stipulated by the Plan[9].

$$(39)\quad 52{,}000.0 \geqslant \sum_i \sum_j k_{ij}^e X_j^e + \sum_i \sum_j k_{ij}^w X_j^w + \sum_{t=1}^{5} \bar{D}_t^e + \sum_{t=1}^{5} \bar{D}_t^w$$

If some incremental self-sufficiency is not postulated for the engineering sector, which supplies the entire non-construction capital goods, then the model would favour the satisfaction of the demand for this sector's products through imports (as far as permissible by the foreign-exchange constraint) rather than by domestic production because of its very high capital requirement per unit of value-added. The Third Plan aims at attaining some self-sufficiency in this sector. One can discern a number of arguments in favour of this objective from the Third Plan itself; export earnings are unlikely to grow fast enough in future and are rather uncertain; foreign assistance is uncertain too and the perspective plan has the objective of being free of the necessity of foreign assistance and so on. It is, therefore, unwise to depend on imports for the entire supply of machinery for investment; domestic capacity for these goods should be expanded gradually[10].

The Third Plan aims at achieving a 45-per cent incremental self-sufficiency in capital goods. We, therefore, require that in *incremental* terms national production of engineering sector must be at least 45 per cent of national use of this sector's products. It would be desirable to specify certain degree of regional self-sufficiency in this sector as well for similar reasons, but such specification should generally be below the national level as long as some interregional trade

[9]The rationale of this constraint is that unless we put an upper limit on total investment there is nothing in the model which will prevent the terminal-year investment and income from being very high. This would mean that in the intervening years consumption would have to be curtailed to the required extent—perhaps below certain 'feasible' level. The specification of an upper limit on investment would be a safeguard against this. Note that this constraint puts an upper limit on the terminal capital stock.

The limit on investment in our model has to be set on the basis of independent considerations such as the desirable volume of terminal capital, capacity to mobilize domestic and foreign savings and judgments about the feasible maximum investment (minimum consumption) in the intervening years based perhaps on aggregative exercises.

[10]The Planning Commission puts forward an additional justification: "The past experience, particularly during the first-plan period, shows that it is fairly difficult to obtain a high rate of saving from the economy by concentrating on the production of consumption goods" [10, p. 34]. In the present model we simply assume that the government is able to keep consumption within the specified limits and do not go into the problem of the administrative feasibility of alternative policies to restrain consumption. If it is found that capital-goods-oriented industrialization provides a higher rate of saving, then of course it is an additional justification for such policy. For an argument that this may actually be the case in Pakistan, *see* [11].

is possible, so that regional comparative advantage criterion may have some role to play. The Third Plan does make the provision for the decentralisation of capital goods complex but the actual regional targets are not specified. We arbitrarily require minimum regional incremental self-sufficiency in engineering goods to be 30 per cent.

$$(40)\quad X_m^e + X_m^w \geqslant .45 \left[\sum_j \left(a_{mj}^e + 1/3k_{mj}^e\right) X_j^e + \sum_j \left(a_{mj}^w + 1/3k_{mj}^w\right) X_j^w + dC_m^e + dC_m^w + dG_m^e + dG_m^w + dE_m^e + dE_m^w + dD_m^e + dD_m^w - 5/3\left(I_{mo}'^e + I_{mo}'^w\right)\right]$$

$$(41)\quad X_m^e \geqslant .30 \left[\sum_j \left(a_{mj}^e + 1/3k_{mj}^e\right) X_j^e + dC_m^e + dG_m^e + dE_m^e + dD_m^e - 5/3I_{mo}'^e \right]$$

$$(42)\quad X_m^w \geqslant .30 \left[\sum_j \left(a_{mj}^w + 1/3k_{mj}^w\right) X_j^w + dC_m^w + dG_m^w + dE_m^w + dD_m^w - 5/3I_{mo}'^w \right]$$

The Third Plan sets out the objective of reducing the current interregional disparity in per capita output by about a fifth. There are reasons to believe that this is the minimum reduction in disparity which is aimed at. We should also introduce a constraint showing the maximum desirable reduction in disparity. This is necessary because a too rapid reduction in disparity may mean a demoralisingly low rate of growth for West and hence be politically and socially undesirable. We stipulate that the maximum permissible reduction in inequality in per capita income would be by a third.[11]

$$(43)\quad 1.069 \sum_j v_j^e X_j^e - \sum_j v_j^w X_j^w \geqslant 1{,}195.6$$

$$(44)\quad 1.03 \sum_j v_j^e X_j^e - \sum_j v_j^w X_j^w \leqslant 2{,}002.6$$

Government consumption, exports, foreign assistance and replacement are exogenously given. For the first three we use third-plan figures (disaggregated

[11]We have base-year inequality $(Y_o^w/H_o^w)/(Y_o^e/H_o^e) = 1.344$ (Y^e = regional product in East, H^e=population in East, similarly Y^w and H^w, subscript=time period). We must have $(Y_t^w/H_t^w)/(Y_t^e/H_t^e) \leqslant 1.275$ if disparity has to be reduced by at least a fifth. But $H_t^w/H_t^e = 58.6/69.9$, so that $Y_t^w/Y_t^e \leqslant 1.069$ from which we obtain $1.069\Delta Y^e \geqslant \Delta Y^w + Y_o^w - 1.069Y_o^e$. Substituting the values of Y_o^w and Y_o^e we get (43). Similarly the condition that disparity in per capita income should not be reduced by more than a third gives (44).

Why not specify limits of incremental inequality in terms of consumption rather than income so that production may be located purely on efficiency considerations and distribution may be taken care of by interregional income transfers? The answer seems to be the following. It is unlikely that such income transfer would be feasible for any reasonable length of time both politically and from the standpoint of fiscal policy. The poorer region may not like it even for a short period because such policy would limit its future capacity for growth.

where necessary on the basis of relevant complementary information); replacement estimates are based on the trend of gross investment in the past and assumed life tables for various kinds of capital equipment.

3.4 Constraints on the Agricultural Sector

The treatment of agriculture, for its vastness and peculiarities, presents problems. First, one has to decide about the type of relationship to use. Is it justified to assume for the agricultural sector the standard input-output relation which allows for no substitution among inputs? Certainly, the assumption is too strong; agricultural inputs do not always seem to stand in any fixed relation to one another and to agricultural output, in the way inputs into manufacturing activities seem to do.

Is it then justified to assume a production function of the perfect-substitutability among inputs type? Here too, one faces formidable difficulties. First, although substitution is perhaps possible over a *considerable* range between *some* factors, the assumption of unlimited *perfect* substitutability among *all* factors is as implausible as that of *perfect* complementarity. Secondly, the actual estimation of the production functions with the property of substitution requires a great deal of experimental data and not just the picture of the economy at one or a few points of time. For Pakistan we do not have any such information.

The more general production functions which suffer less from the above criticisms cannot be used either because they cannot be incorporated in the simple input-output linear programming framework or because even their very crude statistical estimation requires much more information than is available.

Considering the above we decide to stick to the usual fixed coefficients assumption and try to give it some amount of formal justification by the following kind of reasoning: agriculture may be presumed to have a number of alternative processes. Once a process (presumably the best) is chosen, it can be described by a set of fixed input coefficients.

As the use of some factor inputs increases more than others, there would almost certainly be diminishing returns. More important, as agricultural expansion is accelerated, there is the extreme likelihood of diminishing returns to all (or most) factor inputs and of the "returns to scale" to diminish more, the faster the rate at which agriculture is being driven. The reason the assumption of this kind of "diminishing returns to scale" seems plausible is that in the production function we are not able to include all factors which contribute to output. Notable omissions are the supply of land of unchanged average quality and the adaptation of the farmers to changed pattern of factor use (which takes

time). These factors are unlikely to increase in proportion to other factor inputs. To reflect the difficulty of increasing the agricultural output at the margin, we use marginal coefficients for most inputs into agriculture higher than the corresponding average coefficients.

Finally the extent of "diminishing returns to scale" in agriculture is likely to depend on the rate of expansion that is being attempted. If agriculture is being driven at 10 per cent per year the marginal coefficients would almost certainly have to be higher than if agriculture is being driven at 5 per cent per year. Thus with respect to each set of marginal coefficients it is sensible to specify an upper limit on agricultural expansion. In our example we stipulate maximum possible rates of expansion respectively at 6.5 and 6.0 per cent for East and West Pakistan[12]. The higher rate for East is justified by the widely prevalent belief that it is easier to obtain an increase in agricultural output in East than in West.

$$(45)\quad X_a^e \leqslant (1.065)^5\, \bar{X}_{ao}^e - \bar{X}_{ao}^e$$

$$(46)\quad X_a^w \leqslant (1.060)^5\, \bar{X}_{ao}^w - \bar{X}_{ao}^w$$

where $\bar{X}_{ao}^e$ and $\bar{X}_{ao}^w$ are benchmark base-year figures (*not* increases in the base year).

It should be emphasized that the incremental capital coefficients for agriculture, though assumed higher than average, insufficiently reflect the difficulty of expanding this sector. Ensuring domestic production and import of inputs would not be enough, their application would require great effort on the part of the government through the provision of extension services and credit facilities. In our model extension services are included under public expenditure whose composition must undergo appropriate change.

4. THE OBJECTIVE FUNCTION

The main objectives of the Third Five Year Plan are increasing national product, reducing regional disparity in income, achieving certain targets with respect to employment and export, attaining a certain degree of self-sufficiency in the production of capital goods and certain "social objectives such as diminishing inequalities in the distribution of income, wealth and economic power" [10, pp. 39-40].

In the following excercises, the objective the optimizing models set out to maximize is a function of the regional products. Certain other objectives are, however, taken into account by the introduction of appropriate constraints: re-

[12]This means that at the national level we are assuming the maximum possible rate of growth of agriculture to be about 1.25 percentage points higher than the planned rate of growth postulated by the Third Plan.

moval of disparity in regional incomes by a certain amount and the achievement of a certain degree of self-sufficiency in the production of capital goods are provided for in this way. The two objectives we cannot take into account are employment and income distribution. These two are essentially the same, however. Increasing employment even at the cost of some material output could conceivably be desirable for its distributional effects only. The neglect of these factors amounts to the assumption that the desirable income distribution may be attained by other means such as taxation and government expenditure, the specific measures relating which may be planned without reference to the details of the present model. This assumption is not entirely satisfactory but is made because there is no simple way of incorporating the problem of income distribution into the present model.

Thus our objective is to maximize 'utility' or 'welfare' which is a function of national output and its distribution between the regions. The question of interregional distribution can be introduced in one of the two ways. The first is to define the objective function as the simple sum of regional products and define the permissible upper and lower limits of incremental inequality as in the constraints (43) and (44) above. Alternatively the objective function could be defined as the weighted sum of regional products ($U = L\sum_j v_j^e X_j^e + (1 - L)\sum_j v_j^w X_j^w$ where the weights L and (1 — L) are proportional to 'marginal utilities' attached to the regional outputs) and it could be maximized subject to the usual constraints but *without* the interregional constraints of the type (43) and (44).

Let us illustrate by referring to Figure 1. EE′ is the production possibility curve defined by the constraints (1) to (42) and (45) to (46) (but *not* the interregional constraints that (43) and (44) denote) which indicates various efficient combinations of Y^e and Y^w. If the objective is to maximize the simple sum of the regional products, the maximand is the straight line VV′ with slope −1 and the optimum solution would be given by A, the point of tangency between VV′ and EE′.

This solution, however, does not take into account the important consideration that there may be a (presumably political) limit of interregional inequality and/or that the planners may want to attach greater importance to the generation of output in the poorer region.

One way to introduce the question of the interregional distribution of incremental output is to introduce constraints of the type shown above in (43) and (44) defining a lower and an upper limit on the incremental income disparity between the regions. In Figure 1 these constraints are denoted by the straight lines JJ′ and KK′. The new optimum must be within that part of the production possibility curve which lies between the lines JJ′ and KK′. If the original opti-

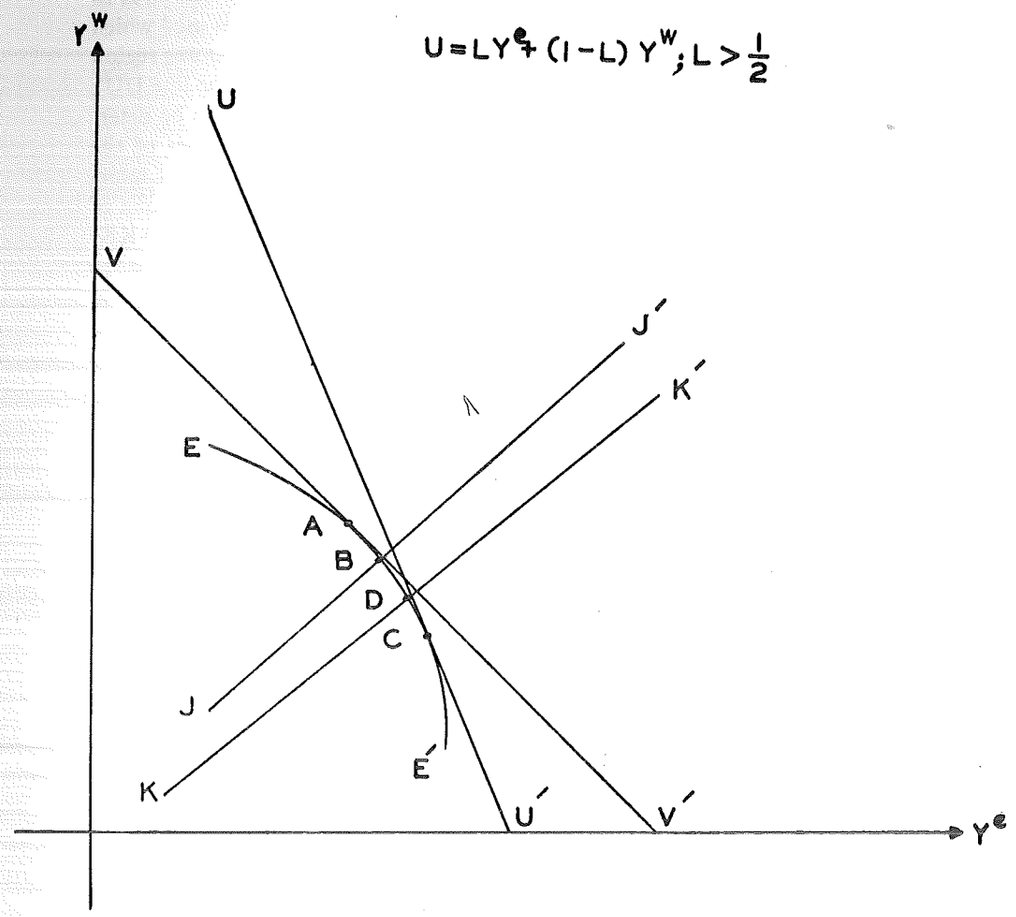


Figure 1

mum A were strictly within this region, then the constraints JJ′ and KK′ would be irrelevant (*i.e.*, non-binding), otherwise the new optimum would lie on one of the lines defining the interregional constraints. In Figure 1 it is at the point B, that of intersection between JJ′ and EE′.

The other way of introducing the question of intrregional distribution is to use an interregional welfare function. If a linear welfare function is used which attaches a higher weight ("marginal utility") to the output of the poorer region (which is East), the maximand would be of the shape indicated by the line UU′, steeper than VV′. If we want the extent of interregional disparity to be determined by the production possibility surface and the marginal utilities of the regional incomes alone, the constraints showing the permissible range of interregional disparity (JJ′ and KK′) must be removed. This is because the point of tangency between UU′ and EE′ may lie outside the range between JJ′ and KK′ (as it does at point C in the Figure) in which case the new optimum without the interregional constraints (point C) and the new optimum with the interregional constraints (point D) would be different.

Note that the points A, B and C are on the efficiency frontier; by varying the values of the weights assigned to the regional products in the interregional welfare function, additional points on the production possibility curve may be obtained. This would enable us to discover the approximate shape of the production possibility frontier in the relevant range.

The final choice of a plan would still require a decision about the 'desirable weights', *i.e.*, a 'desirable' ratio of marginal utilities of regional incomes, but once the shape of the efficiency frontier is known, such choice is made a great deal easier. This is because the efficiency locus would tell what 'sacrifice' in terms of national product is associated with any given change in the interregional welfare function (*i.e.*, in the slope of the line UU′ in the Figure). The decision-making authority will be able to use this information in arriving at their choice.

The following are the maximizing exercises we carry out:

1) The basic optimizing model (BOM) maximizes the sum of the regional products subject to the constraint that the interregional disparity in terms of per capita output must be removed by at least a fifth and at most a third:

$$\text{Max } U = \sum_j v_j^e X_j^e + \sum_j v_j^w X_j^w$$

2) The welfare-maximizing model (W-max model) maximizes an interregional welfare function in which the marginal utility of East's regional product is 20 per cent higher than the marginal utility attached to West's regional product[13] subject to no other constraint that specifies a predetermined amount by which the interregional disparity must be removed:

$$\text{Max } U = L\sum_j v_j^e X_j^e + (1-L)\sum_j v_j^w X_j^w \quad \text{where } L/(1-L) = 1.2,$$

$$\text{or} \quad \text{Max } U = .545\sum_j v_j^e X_j^e + .455\sum_j v_j^w X_j^w$$

3) The GDP-maximizing model maximizes the simple sum of the regional products subject to *no* other constraint that specifies a predetermined amount by which the interregional disparity must be removed. The maximand is the same as in the BOM but the BOM constraints showing the permissible range of reduction in interregional inequality are removed from the GDP-maximizing model.

4) The third-plan allocation model ("TFYP model") maximizes the sum of the regional products with the third-plan regional allocation of investment given as independent constraints but with *no* other constraint about the permissible range of reduction in interregional inequality. Thus the maximand is the same as in the BOM but there are the following differences between the two models regarding the constraints subject to which the objective is being maximized: *a*) the BOM constraint on the upper limit on total *national* investment is replaced by two separate constraints showing investment in each region at the levels postulated by the Third Five-Year Plan ($I^e = 27{,}000$ and $I^w = 25{,}000$), and *b*) the BOM constraints on the permissible range of reduction in interregional disparity are removed from the TFYP model because the reduction in disparity would not follow from the given regional allocation of investment.

In terms of Figure 1, the BOM represents the point B, the W-max model the point C and the GDP-maximizing model the point A. Note that all these three are points on the efficiency frontier. The relative position of these three points would give an indication of the shape of the production possibility curve in the relevant range. It is not known whether the TFYP model is also an efficient point on the same frontier because in this model two new constraints have been introduced.

[13] The final choice of the value of L seems to be a matter of political decision and its possible range will depend on the political machinery which is being used to determine it. A value of L, much in excess of 0.5, would have little chance of being accepted by the present national legislature (in which the regions have equal representation) but would have a much better chance of being accepted in a national referendum based on universal suffrage (if only because Easterners are more numerous). The machinery to decide on the value of L has to be devised after taking into account various political constraints. In general a value of L, greatly different from 0.5, can not be obtained without weakening political goals such as greater national integration. The decision about the value of L has to be revised from time to time; once regional per capita levels of living get closer, there would be less justification to have a value of L much different from 0.5. At the moment the highest political authorities in Pakistan seem to have reached the general consensus of having an L greater than 0.5. The higher marginal utility attached to East's income is justified by the lower initial per capita income there. It is worthwhile to experiment with alternative values of L because by doing so one makes the problem of selecting an L easier by spelling out the implications of alternative Ls. More on this later.

5. THE DATA

The model puts considerable demand for statistical data. For its application, the model requires information about the following:

a) Incremental current input coefficients $\left(\text{the } a_{ij}^{e}\text{'s and } a_{ij}^{w}\text{'s}\right)$ matrices for the two regions;

b) Incremental fixed and working capital coefficients $\left(b_{ij}^{e}, b_{ij}^{w}, s_{i}^{e} \text{ and } s_{ij}^{w}\right)$ matrices for the two regions;

c) Interregional trade/supply ratios;

d) Base-year magnitudes about sectoral outputs and components of final demand;

e) Expenditure elasticities of demand;

f) Trade and transport input coefficients into imports and foreign-exchange cost coefficient of imported goods; and

g) Replacement demand for various kinds of capital.

The methodology followed in obtaining these coefficients is too long to describe in this article. This is set out in details in [4, Chapter 4 and statistical appendix to Chapter 4]. Tables I to VIII show these coefficients and data.

6. SOLUTIONS OF THE OPTIMIZING EXERCISES AND THEIR COMPARISON

Tables XI to XIV summarise the solutions of the four optimizing exercises. It is of some interest to compare the four solutions with respect to some of their broad features.

The first important finding is that the BOM reduces the interregional inequality in per capita output by a fifth. This means that in the BOM the constraint showing the lower limit on the permissible range of reduction in interregional inequality (constraint (43)) is binding. The GDP-maximizing model is the reformulation of the BOM without the constraints on incremental interregional disparity. Its solution indicates an aggravation of interregional inequality by the end of the Third Plan. To speak in terms of Figure 1, the solution of the BOM lies on the line JJ'. If the constraint (43) (denoted by JJ') is removed, the solution moves somewhere in the direction of A—northwest of the solution of the BOM.

The reduction of inequality by a fifth means that East has about 43 per cent of gross investment (in the BOM). Thus we are faced with the finding that if we set out to maximize GDP without introducing constraints which secure a minimum allocation of investment to East so as to reduce the interregional inequality by at least a predetermined amount, the model does not favour East in the

allocation of investment. How do we reconcile this with the fact that the overall incremental capital-income ratio is considerably lower in East than in West?

A verbal explanation may be attempted by advancing the following kind of reasoning: lower capital-income ratio in East derives mainly from East's lower ratio for agriculture. For most other sectors, East's ratios are considerably higher than West's (Table X). Agriculture, however, has got an upper limit in each region beyond which it cannot be driven. Once this limit is hit, it no longer remains advantageous to allocate more investment to East.

The next important finding refers to the value of the national product in the various maximizing exercises. As can be seen from the tables showing the four solutions, interregional distribution of the incremental GDP varies greatly between the maximizing models. Yet the GDP remains pretty much the same for all these solutions. Plotting the first three solutions (the BOM, the W-max model and the GDP-maximizing model) on Figure 2, one can obtain the approximate shape of the production possibility curve in the relevant range[14]. Throughout the known range, the slope of curve does not deviate much from —1. In other words, the rate of transformation between the regional products is approximately unity in the known range. One expects the slope of the production possibility line to be like this around the GDP-maximizing point. But here this slope obtains over a rather wide range. In other words, GDP-maximizing points are spread over a relatively wide range. No simple verbal explanation of the phenomenon suggests itself, but one is led to conclude that even when the agricultural ceiling is hit in East, relative advantage of West over East must be very slight indeed.

The upshot of the above is that for fairly small changes in objectives one can obtain plans with greatly different regional shares of investment and incremental output. Thus by changing the value of L from 0.5 (in GDP-max model) to 0.545 (in W-max model), East's share of gross investment can be increased by about 41 per cent. Even with virtually unchanged objectives in terms of GDP one could justify widely varying plans. From the point of view of maximizing GDP it involves no appreciable gain or loss if one moves from the BOM (point b on Figure 2) to the point of unconstrained maximization of GDP (point a) or to the W-max (point d).

The fact that over a rather wide range of the production possibility curve the value of GDP is almost the same does not mean that all these points are equally desirable. The slope of the production possibility curve indicates the rate of transformation, but the choice of an optimum point is dictated by the equality of the rate of transformation and the rate of substitution (the slope of the plan-

[14]The TFYP model is shown on the Figure by the point C. As already stated, it may not be on the efficiency frontier, but does not seem to be much inside.

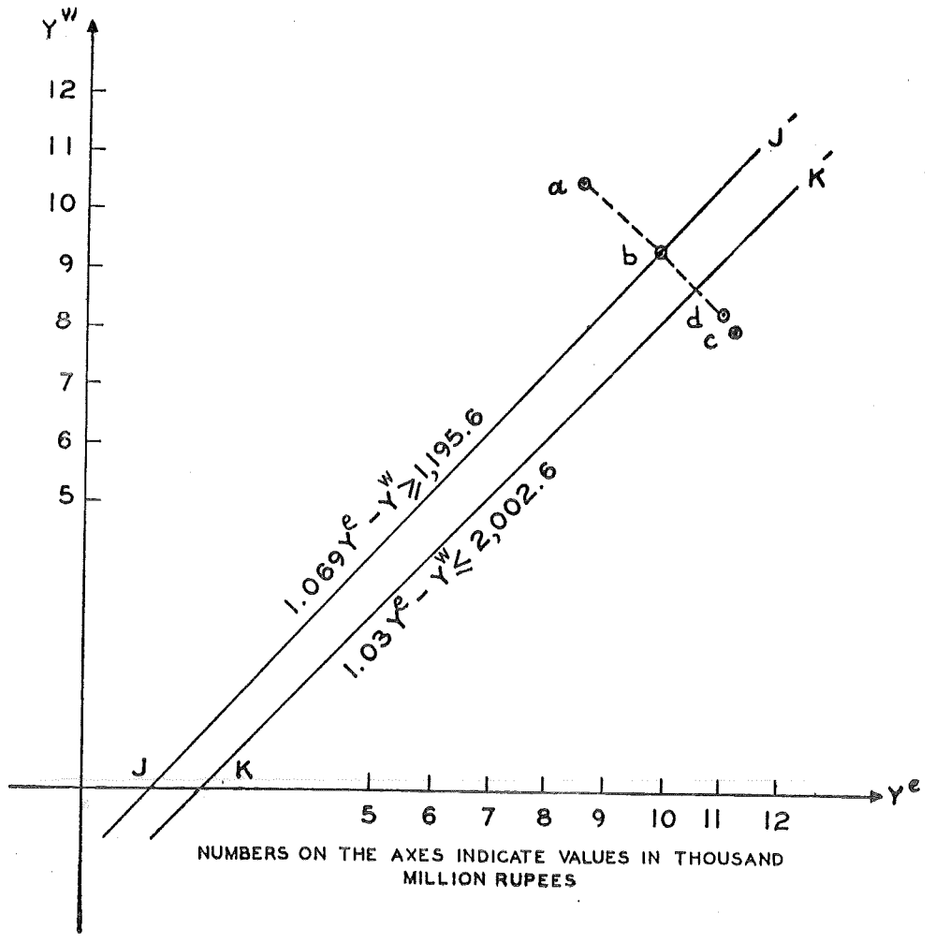


Figure 2

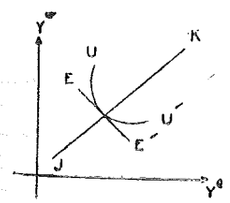
ners' "social indifference curve" indicating the relative valuations of the regional products at different levels of incremental interregional inequality)[15].

Thus once the efficiency frontier in the relevant range is known, the planners, in order to decide whether a particular point on the efficiency locus represents a "desirable" plan, must ask whether the transformation rate at the point also indicates a sensible rate of substitution between (*i.e.*, a sensible ratio of the marginal utilities of) the regional products and whether the point lies within the political tolerance limits.

Thus, one could argue that the point a is irrelevant to the planners. Compared to the BOM, it indicates a much worse interregional distribution of income (leading to the further *relative* impoverishment of the poorer region) without any corresponding gain in total GDP. If such a worse interregional distribution is to be accepted by the planners, the only justification must be considerable gain in terms of total GDP. In other words, at the level of incremental inequality denoted by the point a, the rate of substitution shown by the planners' "social indifference curve" (*i.e.*, U^e/U^w, where U^e = marginal utility of East's income *etc.*) would be considerably greater than 1 whereas the rate of transformation (in the direction of the BOM) would be 1.

On the basis of similar logic, a movement from the BOM in the direction of the W-maximizing solution (point d) would be desirable unless such movement is in excess of the permissible political limits because it would provide more to the poorer region without any appreciable reduction in total GDP. In the BOM such limit has been *arbitrarily* defined as the reduction in inequality in per capita output by a third, the point of intersection between KK′ and the efficiency frontier.

Although shifting of resources between regions provides no significant change in GDP in the relevant range, reallocation of resources among sectors does provide marked change in output. This can be shown by comparing the maximizing exercises with the Third Plan (keeping in mind that the later is not strictly comparable with our exercises). All the optimizing exercises give significantly more GDP from no greater investment as compared to the Third Plan. For example, the BOM gives about 44 per cent increase in GDP compared to 38 per cent provided in the Third Plan. This can be largely explained by the fact that



[15]Note that the "social indifference curve" is defined only within the range between the constraints showing the political tolerance limits of incremental inequality. Note also that the uniqueness of the optimum would require that either the rate of substitution is −1 only along a very narrow range and significantly different from −1 elsewhere (like UU′ in the adjacent figure) or that the political tolerance limit is very narrow (the limiting case being the complete overlapping of the upper and lower boundaries of incremental inequality like the line JK).

the optimizing exercises provide a more efficient allocation of investment and foreign-exchange resources among sectors under the assumptions we make[16].

Let us broadly indicate the main differences between sectoral allocation provided by the optimizing exercises and those provided by the Third Plan. East's agriculture in all the optimizing exercises grows at the rate indicated by the constraint on the upper limit. West's agriculture grows at the maximum possible rate in the BOM and GDP-max models and slightly slower in the other two exercises. Agriculture claims just over a quarter of gross investment compared to just under 24 per cent proposed by the Third Plan[17].

Table XV shows the broad pattern of investment allocation among the non-agricultural sectors in some of our optimizing exercises and in the Third Plan. The third-plan investments are gross while ours are net. We show in Table VIII total replacement for each kind of capital and not the replacement demand for each sector. We can of course roughly estimate the latter following the same method and using the same kind of information. But we avoid this additional work because we can make our point without this. If, however, we assume that the share of replacement in gross investment is same for all non-agricultural sectors (which is unlikely to give greatly inaccurate figures because total replacement in these sectors is a fairly small proportion of total investment because of the fact that much of the capital stock is "young"), then gross sectoral investments can be found by stepping up net investments by about 5 per cent.

The optimizing exercises indicate much smaller allocation of investment to fuel and power and other manufacturing (and possibly to food processing as well) and considerably more to services, construction and engineering as compared to the Third Plan. A particularly noticeable feature of the optimizing exercises is the spectacularly fast rate at which construction sector has to grow. In the BOM the construction sector has to grow by 138 per cent over the five-year period for Pakistan as a whole (which is not much different from the rate at which the other optimizing models want it to grow). Much of it is caused by investment demand by other sectors and demonstrates how high a proportion of investment consists of construction[18].

[16]The smaller GDP in the Third Plan, as compared to the optimizing exercises, could conceivably be *partly* explained by the possible use of a set of capital coefficients different from ours. The reason we think that this is not the whole explanation is that we tried to "solve" the Third Plan (as far as we could find out its targets and assumptions) by using the first 14 balance equations and found that the *overall* regional capital coefficients were almost exactly the same as those assumed by the Plan. *See* [4, chapter 5].

[17]The Third Plan allocates 15.4 per cent of investment to "agriculture". But the Plan concept of agricultural investment is rather curious: investment in irrigation is shown under water and power sector while certain costs relating to fertilizers are regarded as capital inputs in agriculture. For the last point, *see* [9, chapter 1]. In the past about 60 per cent of investment in water and power was found to be investment in agriculture (*see* [1]). Using this ratio and assuming that about 5 per cent of the investment shown in the Plan under agriculture consists of cost relating to the distribution of fertilizer, we find that the third-plan allocation to agriculture is about 23.7 per cent of total gross investment.

[18]This is something Reddaway notices for India [12, p. 98].

A comparison of the solutions indicates that the reduction in interregional inequality would require smaller effort in terms of East's share of total investment than is supposed by the Plan. The BOM reduces the interregional inequality by a fifth (which is the third-plan objective) but requires the allocation of only about 43 per cent of investment to East compared to the third-plan allocation of 52 per cent. Using the third-plan allocation in our framework we find that the interregional disparity is reduced by nearly a half—much more than a fifth which is the third-plan objective.

This comparative ease in securing output increase in East derives largely from the fact that the ceiling in agricultural output has been set at a relatively high level and that East's agriculture needs least capital to expand. But although its capital requirement is low, such a big agricultural programme would require organizational reform. Over a five-year period extensive land-reform measures are unlikely to produce effective results. So the main burden has to be borne by other organizational reforms. Ensuring domestic production and import of inputs would not be enough. Their application in a small-peasant-ownership-dominated agriculture would require great effort on the part of the government through the provision of credit and extension services. If it is found necessary to lower the ceiling on East's agricultural expansion, the relative ease of securing a given reduction in interregional inequality would gradually disappear.

In the BOM, the marginal saving rate would have to be lower in East (0.25) than in West (0.30) while at the national level it would have to be 27 per cent—slightly higher than 26 per cent postulated by the Third Plan. In the W-max and TFYP models, incremental saving rates in East (0.32 and 0.37 respectively) have to be considerably higher than in West (0.25 and 0.22). Except in the GDP-max model, East would require a very great acceleration of investment (from 11 per cent of regional output in the base year to 19.5 per cent in the BOM and about 25 per cent in the TFYP model in the terminal year) while in West it requires relatively small acceleration (from 18 per cent of regional output in the base year to 21.6 per cent in the BOM and 18 per cent in the TFYP model in the terminal year). Given the well-known fact that private investment propensity is much higher in West, this means that a large share of public investment has to be allocated to East[19].

Another important feature of the optimizing exercises is that they all favour the allocation of a bigger share of foreign exchange to East Pakistan. Imports are favoured in those sectors in which domestic production uses up relatively more capital. Such sectors are mainly fuel and power, engineering and other manufactures, services being non-importable. For these sectors East's capital-income ratios are more often greater than West's.

[19]East has indeed a bigger share of the public-sector investment in the Plan, but the present allocation presupposes that private investment in the two regions would be equal. For this, considerable preferential treatment to the private sector in East would almost certainly be necessary.

7. SOME CONCLUDING REMARKS

In view of the results presented above, it seems justified to claim that the model is capable of analysing some of the planning problems in a multi-region economy. Once the planners in such an economy have defined their objective or welfare function and made decisions about exogenous factors, such as the maximum rate of investment and the availability of foreign exchange and the provision of minimum consumption, the model provides the allocation of investment and foreign exchange between the regions and among the sectors within each region so as to maximize welfare.

It is easily recognized that the present model indicates the allocation of resources only among the broad sectors and regions whereas practical planning must concern itself with many detailed features of the economy. Planners, however, may find it advantageous to *plan in stages* (*i.e.*, first determine some of the most important variables and later determine others relating to the detailed features) particularly if the state of statistical information and the capacity to handle computational burden are undeveloped (as they certainly are in Pakistan). This in effect is the well-known scientific method of successive approximations. The main advantage of this method is the economy of effort and the ability to produce a solution where a better and more general method of producing a solution does not yet exist.

The solutions of the exercises of this kind are numerically sensitive to the estimates of the structural coefficients. In the present application, the estimated coefficients are far from satisfactory. But we do not think that the numerical exercises are purely illustrative. This is because the estimated coefficients are believed at least to indicate the order of magnitudes of the structural relationships they represent. Secondly, if the errors in estimation are random (as we hope they are), then with our highly aggregated sector classification some kind of averaging of errors should leave the estimates relatively free of any systematic bias.

We do not claim that the results will be quantitatively very accurate, nor do we know the probable extent of error. But the solutions can perhaps serve as broad guides for the allocation of investment and foreign exchange. In general it may be advisable for the Plan-executing authority to adhere to these broad limits and require that a special case must be made by pointing out the invalidity of one or more assumptions on which the exercise is based if these limits are to be exceeded.

Some results of the numerical exercises are of course interesting and instructive as qualitative deductions even if the actual magnitudes of such deductions are not considered to be very accurate. To illustrate, let us consider the following: the current input coefficients matrices and the expenditure elasticities clearly show

that East Pakistan's technology and consumption demand are more agriculture-oriented than West's. As a direct consequence of this, the model indicates that (from purely feasibility consideration) if East is to grow faster than West then East's agriculture must grow even faster than West's. From the standpoint of optimality considerations the conclusion is reinforced by the fact that it is easier to secure increase in agricultural output in East than in West in terms of capital input requirement. That it is easy to forget such fundamental qualitative facts in planning is manifested by the third-plan decision to drive West's agriculture faster than East's while at the same time having the objective of securing a higher rate of overall growth in East than in West.

The use of models in analyzing any actual planning process necessarily involves a certain degree of abstraction. As more and better data become available and the capacity to handle computational burden is increased, it should be gradually possible to reduce te degree of abstraction and make closer approximation of the planning process.

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TABLE I

INCREMENTAL CURRENT-INPUT COEFFICIENTS FOR THE THIRD FIVE-YEAR PLAN

Supplying sectors ↓ / Using→ sectors	A	F	M	B	P	R	S
A. East Pakistan							
A	.179	.736	.221	.155	—	.256	—
F	.004	.001	—	—	—	.001	—
M	.005	—	.221	.046	.058	.028	.005
B	—	—	—	.106	—	—	.046
P	—	.002	.022	.004	.297	.019	.021
R	.024	.005	.022	.111	.017	.270	.023
S	.032	.069	.049	.013	.042	.144	.062
B. West Pakistan							
A	.126	.653	.105	.025	—	.162	—
F	.024	.009	—	—	—	.003	—
M	.014	—	.316	.072	.040	.011	.010
B	—	—	—	.183	—	—	.011
P	—	.007	.027	.018	.163	.020	.067
R	.048	.054	.063	.204	.020	.320	.024
S	.045	.090	.078	.054	.186	.251	.044

TABLE II

INCREMENTAL FIXED-CAPITAL COEFFICIENTS

Supplying sectors ↓ / Using→ sectors	A	F	M	B	P	R	S
A. East Pakistan							
M	.051	.120	.298	.068	2.794	.335	.506
B	.516	.044	.222	.008	2.752	.213	2.739
B. West Pakistan							
M	.136	.119	.357	.115	2.525	.319	.562
B	1.220	.058	.192	.030	1.760	.131	1.835

TABLE III

INCREMENTAL WORKING-CAPITAL COEFFICIENTS

	A	F	M	B	P	R	S
			A. East Pakistan				
A	.135	.050	.159	.034	—	.056	—
F	.002	.204	—	—	—	—	—
M	—	—	2.079	.010	.023	.006	—
B	—	—	—	.968	—	—	.002
P	—	—	.015	.001	.390	.004	.001
R	—	—	.015	.024	.007	.364	.001
S	—	—	—	—	—	—	—
			B. West Pakistan				
A	.069	.079	.080	.005	—	.036	—
F	.005	.144	—	—	—	.001	—
M	—	—	1.614	.015	.023	.022	.001
B	—	—	—	1.193	—	—	.001
P	—	.001	.017	.004	.200	.004	.006
R	—	.007	.041	.043	.012	.330	.002
S	—	—	—	—	—	—	—

TABLE IV

INTERREGIONAL TRADE/SUPPLY RATIOS FOR 1964/65

i	r_i^{ee}	r_i^{we}	r_i^{ew}	r_i^{ww}
A	.988	.012	.022	.978
F	.982	.018	.002	.998
M	.820	.180	.006	.994
B	1.000	—	—	1.000
P	.982	.018	—	1.000
R	.805	.195	.050	.950
S	1.000	—	—	1.000

TABLE V

EXPENDITURE ELASTICITIES AND MARGINAL CONSUMPTION COEFFICIENTS (M.C.C.)

	East Pakistan		West Pakistan	
	Expenditure elasticity	M.C.C.	Expenditure elasticity	M.C.C.
A	1.25	.358	1.29	.393
F	.65	.334	.58	.229
M	1.81	.005	1.25	.014
P	1.25	.010	1.25	.028
R	1.81	.163	1.25	.199
S	1.31	.130	1.26	.137

TABLE VI

i	t_i^{we}	t_i^{ew}	h_i^e	h_i^w
A	.295	.166	.251	.185
F	.362	.098	.361	.096
M	.048	.048	.071	.068
B	—	—	.200	.200
P	.313	—	.448	.294
R	.231	.231	.159	.159

TABLE VII-A

POSSIBLE STATE OF AFFAIRS IN 1964/65 IN EAST PAKISTAN

(in million rupees: current purchasers' price)

	A	F	M	B	P	R	S	$\sum_j X_{ij}$	Private consumption	Public consumption	Fixed investment	Working capital increase	Replacement	Exports	Imports	Trade & transport into imports
A	2,819.8	6,599.1	79.8	261.7	—	735.4	—	10,495.8	5,097.3	—	—	162.4	—	326.8	329.5	..
F	63.0	9.0	—	—	—	2.9	—	74.9	9,171.4	91.7	—	63.7	—	31.3	466.8	..
M	78.8	—	66.5	77.7	6.0	80.4	28.6	338.0	56.1	36.7	461.1	51.3	78.3	6.3	696.8	..
B	—	—	—	179.0	—	—	262.9	441.9	—	—	853.7	295.4	170.1	—	72.6	..
P	—	17.9	7.3	6.8	30.7	54.6	120.0	237.3	140.5	55.0	—	8.7	—	—	303.0	..
R	94.5	44.8	7.3	187.4	1.8	775.6	131.5	1,242.9	1,615.9	458.4	—	67.3	—	1,480.2	1,992.2	..
S	504.1	618.7	16.2	22.0	13.2	413.6	354.4	1,942.2	1,757.8	1,192.0	—	—	—	—	—	824.2
$\sum_i X_{ij}$	3,560.2	7,289.5	177.1	734.6	51.7	2,062.5	897.4	14,773.0	17,839.0	1,833.8	1,314.8	648.8	248.4	1,844.6	3,860.9	824.2
V_i	12,192.6	1,676.7	153.9	953.9	86.8	810.0	4,818.8									
X_i	15,752.8	8,966.2	331.0	1,688.5	138.5	2,872.5	5,716.2									

TABLE VII-B

POSSIBLE STATE OF AFFAIRS IN 1964/65 IN WEST PAKISTAN

A	1,652.5	5,277.0	117.7	78.2	—	1,092.0	—	8,217.4	5,766.8	—	—	129.1	—	329.1	1,327.0	..
F	314.8	72.7	—	—	—	20.2	—	407.7	7,439.3	163.0	—	117.3	—	193.4	239.5	
M	183.5	—	278.7	225.3	66.0	74.1	86.7	914.4	208.0	130.4	1,009.8	96.6	170.6	83.2	1,671.3	..
B	—	—	—	572.6	—	—	95.4	668.0	—	—	1,613.4	458.9	407.9	0.2	19.7	
P	—	56.6	25.4	56.3	269.0	134.8	581.0	1,123.1	410.4	163.0	—	67.4	—	35.5	149.4	..
R	209.8	436.4	59.3	638.3	33.0	2,157.0	208.1	3,741.9	3,014.4	978.1	—	134.5	—	1,365.9	2,494.1	..
S	590.2	727.3	73.5	168.9	306.9	1,691.9	381.5	3,940.2	2,060.4	1,825.7	—	—	—	—	—	844.8
$\sum_i X_{ij}$	2,950.9	6,570.0	554.6	1,739.6	674.9	5,170.0	1,352.7	19,012.7	18,899.3	3,260.2	2,623.2	1,003.8	578.5	2,007.3	5,901.0	844.8
V_i	10,164.5	1,511.2	387.1	1,389.1	975.1	1,570.7	7,318.4									
X_i	13,115.4	8,081.2	941.7	3,128.7	1,650.0	6,740.7	8,671.1									

Note: Imports and exports include interregional flows.

TABLE VIII

COMPONENTS OF FINAL DEMAND

(million rupees)

Sector	West Pakistan			East Pakistan		
	dG	dE	dD	dG	dE	dD
A	—	108.4	—	—	85.9	—
F	69.0	260.9	—	38.8	102.0	—
M	55.2	—	185.2	15.5	—	40.2
B	—	—	9.3	—	—	28.6
P	69.0	1.2	—	23.3	—	—
R	358.7	568.5	—	194.1	525.3	—
S	827.9	—	—	504.5	—	—

TABLE IX

MINIMUM INCREASE IN CONSUMPTION OVER THE THIRD-PLAN PERIOD

(million rupees)

Sector	East Pakistan	West Pakistan
A	2,197.6	1,918.9
F	2,050.3	1,118.1
M	30.7	68.4
P	61.4	136.7
R	1,000.5	971.7
S	798.0	668.9

TABLE X

INCREMENTAL CAPITAL-VALUE-ADDED RATIOS

Sector	East Pakistan	West Pakistan
A	.931	1.925
F	2.235	2.182
M	5.996	5.599
B	1.970	3.164
P	10.181	7.648
R	3.468	3.532
S	3.854	2.852

TABLE XI

SOLUTION OF THE BASIC OPTIMIZING MODEL (BOM)

	Sector	East Pakistan	West Pakistan
OUTPUT	A	5,828.5	4,436.9
	F	2,231.4	1,503.6
	M	187.6	640.9
	B	3,892.4	2,770.3
	P	64.5	282.2
	R	672.2	4,243.9
	S	3,067.7	3,772.8
CONSUMPTION	A	2,197.6	1,991.7
	F	2,050.3	1,118.1
	M	30.7	68.4
	P	61.4	136.7
	R	1,000.5	971.7
	S	1,379.0	892.2
IMPORT	A	80.4	—
	M	389.5	622.7
	P	136.9	310.3
	R	1,997.3	203.6
Aggregate capital-income ratio		2.25	3.15
Incremental saving rate		24.5%	30.3%
Regional product (increase)		9,923.5	9,411.1
Gross investment		22,349.4	29,650.6
Increase in the use of foreign exchange		1,501.0	791.0

Note: All values are in million rupees at 1964/65 prices.

TABLE XII

SOLUTION OF THE W-MAXIMIZING MODEL

	Sector	East Pakistan	West Pakistan
OUTPUT	A	5,828.5	4,232.5
	F	2,232.7	1,497.1
	M	451.2	397.5
	B	4,484.3	1,876.9
	P	78.2	251.2
	R	1,853.9	3,984.8
	S	3,297.7	3,392.5
CONSUMPTION	A	2,197.6	1,918.9
	F	2,050.3	1,118.1
	M	30.7	68.4
	P	61.4	136.7
	R	1,000.5	971.7
	S	1,332.9	668.9
IMPORT	A	572.2	—
	M	596.2	441.6
	P	167.5	277.0
	R	1,039.1	438.7
Aggregate capital-income ratio		2.36	3.14
Incremental saving rate		31.8%	25.1%
Increase in GRP		10,915.9	8,361.6
Gross investment		25,728.4	26,271.6
Increase in the use of foreign exchange		1,545.1	746.9

Note: All values are in million rupees at 1964/65 prices.

TABLE XIII

SOLUTION OF THE GDP-MAXIMIZING MODEL

Sector		East Pakistan	West Pakistan
OUTPUT	A	5,828.5	4,436.9
	F	2,231.4	1,505.4
	M	89.7	834.3
	B	2,655.9	3,835.7
	P	55.9	325.4
	R	644.9	4,818.2
	S	2,352.6	4,371.1
CONSUMPTION	A	2,356.2	1,918.9
	F	2,050.3	1,118.1
	M	30.7	68.4
	P	61.4	136.7
	R	1,000.5	971.7
	S	798.0	1,198.2
IMPORT	A	—	82.1
	M	185.6	941.4
	P	118.4	357.3
	R	1,892.1	95.4
Aggregate capital-income ratio		2.14	3.17
Increase in regional product		8,563.8	10,628.2
Gross investment		18,299.0	33,701.0
Increase in the use of foreign exchange		1,208.0	1,084.0

Note: All values are in million rupees at 1964/65 prices. Note that GDP for this exercise is actually .007 less than in the BOM. This slight discrepancy must be due to rounding error because this exercise can not give a smaller maximand than the BOM. We have made every effort to assure us that this is due to no other reason than rounding error made by the computer.

TABLE XIV

SOLUTION OF THE THIRD-PLAN ALLOCATION MODEL

Sector		East Pakistan	West Pakistan
OUTPUT	A	5,828.5	4,144.3
	F	1,362.2	1,477.5
	M	780.3	124.3
	B	4,436.9	1,671.8
	P	87.6	241.3
	R	3,038.1	3,858.9
	S	3,161.2	3,362.5
CONSUMPTION	A	2,197.6	1,918.9
	F	2,050.3	1,118.1
	M	30.7	68.4
	P	61.4	136.7
	R	1,000.5	971.7
	S	929.3	668.9
IMPORT	A	323.0	—
	F	827.4	—
	M	640.4	465.4
	P	190.1	266.5
	R	—	752.1
Aggregate capital-income ratio		2.43	3.11
Incremental saving rate		36.5%	22.0%
Increase in regional product		11,103.7	8,028.6
Gross investment		27,000.0	25,000.0
Increase in foreign exchange used		1,364.7	927.3

Note : All values are in million rupees at 1964/65 prices.

TABLE XV

INVESTMENT IN NON-AGRICULTURAL SECTORS: THIRD PLAN AND THE OPTIMIZING EXERCISES

Sector	Gross TFYP Investment		Net Investment in the			
			BOM		TFYP-allocation model	
	(million rupees)	(% of total)	*(million rupees)*	(% of total)	*(million rupees)*	(% of total)
M	1,208	2.3	1,998	4.2	2,461	5.2
P	4,533	8.7	1,660	3.5	1,613	3.4
R+F	10,993	21.1	5,696	12.1	7,319	15.5
S+B	22,916	44.1	27,273	57.9	25.651	54.5

TABLE XVI

THE 14 BALANCE EQUATIONS CAN BE WRITTEN, BY COLLECTING THE COEFFICIENTS, IN THE FORM AX + F = X.

WE GIVE BELOW THE ELEMENTS OF THE MATRIX A. ROWS AND COLUMNS ARE IN FOLLOWING ORDER: A, F, M, B, P, R, S, IN EAST FOLLOWED BY A, F, M, B, P, R, S, IN WEST

.221	.744	.271	.164	—	.272	—	.003	.015	.003	.001	—	.004	—	—
.005	.068	—	—	—	.001	—	—	—	—	—	—	—	—	—
.018	.033	.831	.059	.818	.116	.143	—	—	.006	.001	.005	.001	.001	.001
.172	.015	.074	.431	.917	.071	.960	—	—	—	—	—	—	—	—
—	.002	.027	.004	.419	.020	.021	—	—	—	—	—	—	—	—
.019	.004	.022	.096	.015	.315	.019	.002	.003	.004	.011	.001	.022	.001	.001
.034	.073	.061	.020	.054	.164	.065	—	—	—	—	—	—	—	—
.003	.009	.003	.002	—	.003	—	.146	.664	.129	.026	—	.170	—	—
—	.001	—	—	—	—	—	.026	.057	—	—	—	.003	—	—
.004	.007	.182	.013	.179	.026	.031	.059	.040	.967	.114	.884	.117	.197	.197
—	—	—	—	—	—	—	.407	.019	.064	.591	.587	.044	.623	.623
—	—	—	—	.008	—	—	—	.007	.033	.019	.230	.021	.069	.069
.005	.001	.005	.023	.004	.076	.004	.046	.053	.073	.207	.023	.409	.024	.024
—	—	—	—	—	—	—	.046	.093	.079	.057	.186	.257	.044	.044

Note: — means that the coefficient is less than .0005.

A Programming Model for Reduction of Import Dependence of Pakistan

Syed M. Naseem

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Syed M. Naseem is at present a Reader in Economics at the University of Islamabad. He is grateful to Professor Gustav Ranis, Stephen Resmick, Andrea Maneschi and Howard Pack for their advice and comment during the writing of dissertation. He is specially thankful to Dr. Azizur Rahman Khan of the Pakistan Institute of Development Economics for his painstaking comments and invaluable encouragement and advice in publishing this article. The author also acknowledges the help of Professor Alfred Conrad of the Harvard University in obtaining 1960/61 Input-Output Table for Pakistan which plays a crucial role in the study.

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A Programming Model for Reduction of Import Dependence of Pakistan

S. M. Naseem

INTRODUCTION

The present study consists, in the main, of formulating, implementing and interpreting the results of a model which attempts to explore with the help of available data the possibilities of import substitution in Pakistan from 1963/64 to 1972/73. The model is designed to assess the realistic limits to the process of import substitution in the context of growth—taking into consideration such realistic factors as the growth of per capita consumption, export possibilities, mobilization of domestic savings and the availability of foreign economic assistance. Although in a formal sense the model is deterministic, the variation of certain exogenous elements and parameters generates enough information on the behaviour of the model to indicate the extent of substitutability and trade-offs between strategic economic aggregates which is so crucial in evaluating the different policy objectives a planner may wish to pursue.

The focus of our model is on import substitution. This does not mean that other problems or objectives of economic development are unimportant. However, it is in the nature of model-building to isolate the chosen problem to the abstraction of others. The model does not take into account all the relevant scarcities, *e.g.*, skilled labour, organizational ability, *etc.*, nor does it seek to achieve all the complex—and sometimes conflicting—objectives the nation may set for itself, *e.g.*, maximization of employment, reduction in income inequality, *etc*. Even in the sphere of foreign trade, the model is not as compre-

hensive as it otherwise might be. Although the imports in the model are generated endogenously, exports are treated exogenously. This asymmetry, common to many similar models of growth and trade, is known to arise from the inelasticity of demand for exports which cannot be endogenously accommodated in a linear model. Although it was possible, in principle, to treat exports endogenously it would have added a completely new dimension to the problem and involved a separate empirical exercise far beyond the scope of the present study. We did, however, work with two estimates of export growth to see the effects of "export promotion" in our model.

One of the distinguishing features of our model is the imposition of realistic constraints in the model to ensure minimum levels of imports of each category. The model distinguishes three different kinds of imports of each category: *a*) investment imports related to the level of investment which in turn is related, *via* the accelerator, to changes in the level of output; *b*) interindustrial imports, related to the levels of output; *c*) consumption imports, determined as the excess of total imports over investment and interindustiral imports. The model requires that the demand for first two kinds of imports must *always* be met.

The theoretical basis for imposing the above kind of restrictions on imports is the phenomenon of a specific foreign-exchange bottleneck which lies behind the recent "two-gap" theories of economic growth. If certain essential imports are needed in fixed proportions for domestic production and if exports are exogenously given, there is bound to arise a situation where domestic savings cannot be transformed into productive investment due to lack of imported inputs. Empirical evidence suggests that "shortage of maintenance imports has resulted in unused capacity in both India and Pakistan" [13]. Of course, the problem of unused capacity is part of the wider problem of misallocation of resources — but neglect of the realistic constraints on import requirements contributes to such misallocation.

If the foreign-exchange constraint does inhibit growth in a country then it can be overcome by import substitution or increased foreign aid—assuming again that the maximum is already being done to increase exports. The supply of foreign aid, however, is not infinite and its availability to a particular country is certainly restricted. Import substitution is, thus, the most likely policy to adopt.

However, import substitution is a means to achieving economic growth and not an end in itself. The intensity of the import-substitution programme depends on the rate of growth which the economy aims to achieve. We have treated the total consumption expenditures as exogenous in our model and by varying the rate of growth of consumption one can see the effect of changes in

consumption growth on total import requirements and other macroeconomic variables.

The achievement of a given growth rate of consumption also gives rise to certain requirements of domestic savings; these requirements will depend not only on the growth-rate target but also on the intensity of the import-substitution programme. If all but the most essential imports are to be substituted by domestic production, the requirements of domestic savings are likely to be very high and possibly beyond the means of the developing country. Our model, therefore, ensures that the savings requirements of any import-substitution programme do not exceed those which the country is capable of mobilizing.

The basic model used in the study is a straightforward finite-horizon linear programming model. Models with similar structure have been used by Bruno [2], Chenery [3], Khan [9], Manne [11], Sandee [18] and Weisskopf [21] to solve a variety of planning problems. The use of a finite-horizon in a model of economic growth — which is supposedly a continuing process — is conceptually awkward. Ideally, a model involving growth and choices in the future should have infinity as its horizon. However, infinite-horizon programming— attractive though it is conceptually — is immensely difficult, computationally. Even if computational techniques were available, it would still be immensely difficult to specify the appropriate technology, welfare or cost function being optimized.

Most economy-wide planning models project the state of affairs from a given base-year to a given target-year. The intervening years are treated essentially as a single period. The problem of optimality or even consistency for the intervening years of the model is ignored. The comparison between the initial and target years is in the nature of comparative statics.

By conducting a sensitivity analysis on the various exogenous elements and parameters of the model, a variety of results is generated and analyzed. The essential elements of the sensitivity analysis are: *a*) consumption growth-rates, varying from 4 per cent to 8 per cent; *b*) two different exports targets; *c*) alternative assumption about availability of foreign aid and domestic savings.

The paper is structured in the following way. Section A describes the formal structure of the model. Section B discusses data sources and empirical implementation of the model. Section C presents the results and discusses their economic significance.

A. ALGEBRAIC FORMULATION OF THE MODEL

In the following we shall give a mathematical formulation of our model. First, we formulate the basic model in which the availability of domestic savings and foreign aid is unrestricted. Subsequently, constraints on the availability of

each of these aggregate resources are introduced in two separate variants of the model.

The necessary notation is introduced in the following:

VARIABLES

(All variables are valued in constant rupees).

Endogenous

$X_t = \{ {}_iX_t \} = n \times 1$ vector of domestic outputs

$Z_t = \{ {}_iZ_t \} = r \times 1$ vector of import

$J_t = \{ {}_iJ_t \} = n \times 1$ vector of investment demands

$J_t^m = \{ {}_iJ_t^m \} = r \times 1$ vector of import component of investment demands

Z_t = total imports

$\bar{J}_t$ = total investments

$\bar{J}_t^m$ = import component of total investment

Exogenous

$C_t = \{ {}_iC_t \} = n \times 1$ vector of household and government demands

$E_t = \{ {}_iE_t \} = r \times 1$ vector of exports

$\bar{C}_t$ = total consumption expenditures

$\bar{E}_t$ = total exports

PARAMETERS

$A = \{ a_{ij} \} = n \times n$ matrix of current input-output coefficients

$M = \{ m_{ij} \} = r \times n$ matrix of current import coefficients

$\bar{A} = \{ \bar{a}_{ij} \} = n \times n$ matrix of current domestic coefficients

$\hat{B} = \{ \hat{b}_{ij} \} = n \times n$ matrix of fixed capital coefficients

$B^m = \{ b_{ij}^m \} = r \times n$ matrix of imported capital coefficients

$\bar{N} = \{ \bar{n}_{ii} \} = n \times n$ diagonal matrix of inventory coefficients

$B = \{ b_{ij} \} = n \times n$ matrix of capital coefficients

$\beta = \{ \beta_j \} = 1 \times n$ vector of sectoral capital-output ratios

$\bar{B} = \{ \bar{b}_{ij} \} = n \times n$ matrix of domestic capital coefficients

IDENTITIES

Some of the variables and parameters defined above are related with one another by means of identities. We list the identities in the following, briefly commenting on their significance where necessary.

(*a*) *Endogenous Variables*

(i) $\bar{Z}_t \equiv \sum_{i=1}^{r} {}_iZ_t$

(ii) $\bar{J}_t \equiv \sum_{i=1}^{n} {}_iJ_t$

(iii) $\bar{J}_t^m \equiv \sum_{i=1}^{r} {}_iJ_t^m$

(*b*) *Exogenous Variables*

(i) $\bar{C}_t \equiv \sum_{i=1}^{n} {}_iC_t$

(ii) $\bar{E}_t \equiv \sum_{i=1}^{r} {}_iE_t$

Identities (a) and (b) merely show the way economy-wide aggregate are obtained from sectoral variables.

(*c*) *Parameters*

(i) $\underset{n\times n}{A} \equiv \underset{n\times n}{\bar{A}} + \underset{n\times r}{I^*} \underset{r\times n}{M}$

where I* is an n × r matrix, whose first r rows form an r × r identity matrix and the remaining (n—r) rows form a null matrix[1]. In plain words, this identity means that for sectors 1 to r, an overall input-output coefficient a_{ij} is composed of a domestic input-output coefficient $\bar{a}_{ij}$, and an import coefficient, m_{ij}; and for sectors (r + 1) to n, the overall input-output coefficient is identical with the domestic input-output coefficient.

In our model the role of imports as essential intermediate inputs for the domestic production processes is clearly brought out within the framework of interindustry analysis. The level of intermediate imports in each sector is determined not by an overall import coefficient for that sector but by a set of coefficients—one for each consuming sector.

Each of the overall input-output coefficients, the a_{ij}'s, is thus split into two components — a domestic and an import coefficient.

$$a_{ij} = \frac{X_{ij}}{X_j} = \frac{\bar{X}_{ij} + M_{ij}}{X_j} = \frac{\bar{X}_{ij}}{X_j} + \frac{M_{ij}}{X_j} = \bar{a}_{ij} + m_{ij}$$

The total interindustry flow of i-*th* commodity to j-*th* sector, X_{ij}, is decomposed into the domestically produced part, $\bar{X}_{ij}$, and the imported part, M_{ij}.

The assumption of separate, fixed coefficient for domestic and imported input is more restrictive than the original Leontief assumption of fixed coefficient for all inputs (regardless of origin). In the short run, this assumption does not do any serious violence to reality and, in fact, by relating interindustry imports to the level of production takes much of the guessing out of the total import requirements of the economy. However, the static framework is no longer adequate if the economy itself is undergoing structural change through investment and import substitution. Thus, the assumption of constancy of the input-output and import coefficients becomes invalid in the face of changes in technology (changes in a_{ij}'s) and in import-intensity (changes in m_{ij}'s) of production—which must take place in the long run. Insofar, however, as the constancy of the input-output coefficients is a plausible assumption, the double-celled method is conceptually and computationally a more efficient (in the sense of predictive accuracy) method than all the others. For purposes of development planning in underdeveloped countries with persistent balance-of-payments problems, this seems to be the most appropriate model to use.

(ii) $B \equiv \hat{\bar{B}} + \bar{N}$

This identity merely says that the matrix of capital coefficients is formed by summing fixed capital coefficients and inventory coefficients.

[1]The operator I* has to be used in order to make it possible to sum matrices $\bar{A}$ and M which do not have the same dimension.

(iii) $\bar{\bar{B}} \equiv B - I^* B$

where I* has already been defined (see footnote 1). This identity gives the relation between domestic, overall and imported capital coefficients.

and (iv) $\beta_j \equiv \sum_{i=1}^{n} b_{ij}$ for $j = 1, 2 \ldots\ldots\ldots, n$

The economy is assumed to be divided into a total of n sectors. Sectors 1 to r are internationally trading and sectors (r+1) to n derive their total supply solely from domestic sources of production.

The Basic or Unconstrained Model[2]

The basic model consists of two sets of constraints. The first set consists of the demand-and-supply balance equations based on the interindustry coefficients matrix, *viz.*,

$$(1—A)\, X_t + I^* Z_t = C_t + I^* E_t + J_t \qquad (1)$$

The left-hand side of each equation in the above set represents the total supply of goods and services of each sector—either through domestic production or imports or both—and the right-hand side the final-demand uses to which they can be put.

To derive the increments[3] from the base period, 0, to the terminal period, T, we put t=T and t=0 in (1) and subtract to get:

$$(I—A)\,(X_T - X_o) + I^*(Z_T - Z_o) = (C_T - C_o) + I^*(E_T - E_o) + J_T - J_o \qquad (2)$$

putting

$$X_T - X_o = x = \{ x_i \} \qquad (3)$$

and

$$(C_T - C_o) + I^*(E_T - E_o) + I^* Z_o - J_o = y = (y_i) \qquad (4)$$

we get

$$(I—A)\, x + I^* Z_T - J_T = y \qquad (5)$$

[2]The model is basic in the sense that all the constraints used in this model also form part of the other models developed subsequently. It is unconstrained in that no restrictions are placed on the availability of the aggregative resources — foreign or domestic — for the financing of investment.

[3]The model is formulated in terms of increments in, rather than absolute values of, domestic production variables in order to avoid the all-or-nothing character of solutions yielded by linear models. The implicit assumption in such a formulation is that the supply of domestic factors of production in the initial year is inelastic and can be substituted by imports only at the margin.

The Investment Assumption

In all projective models it is usual to determine the level of investment endogenously. In the interperiod model the rationale for investment in each year is provided by the simple unlagged accelerator, linking investment to incremental output levels through capital-output ratios. But in the terminal year of a finite-horizon model, whether single or interperiod, the accelerator is of little help — unless one is willing to extrapolate growth beyond the horizon on the basis of a balanced-growth assumption. We have, however, found it more satisfactory to adopt the assumption originally due to Manne [11] whereby investment in the terminal year is a fixed proportion of the total investment during the period. This proportion depends on the length of the horizon, the assumed rate of growth of investment and the gestation period of investments.

Let investment in the initial year be J_o and let us assume that the rate of growth of investment is r so that the terminal-year investment, $J_T = e^{rT}J_o$, and total investment during the period,

$$\int_{t=o}^{T} J_t\,dt = \int_{t=0}^{T} e^{rT}J_o\,d_t = \frac{1}{r}(e^{rT} - 1)\,J_o$$

The stock-flow conversion factor (the ratio of terminal-year investment to total investment during the period), assuming no gestation lag, is given by

$$\frac{J_T}{\int_{t=0}^{T} J_t\,dt} = \frac{e^{rT}\,J_o}{\frac{1}{r}(e^{rT}-1)J_o} = \frac{r}{1-e^{-rT}}$$

(multiplying both numerator and denominator by re^{-rT}).

We now use an assumption regarding investment activity in the terminal year, T, discussed below. The assumption postulates that investment in capital good i in the T-*th* period is a fraction k (a scalar, the stock-flow conversion factor) of the total incremental capacity of that capital good during the period 0 to T, *i.e.*,

$$J_T = kB_x \tag{6}$$

Substituting (6) in (5), we get

$$(I-A-kB)\,x + I^*\,Z_T = y \tag{7}$$

We shall call (7) as the input-output or balance equations of our model.

Import Constraints

The second set of constraints in the model is designed to prevent imports from varying freely. It ensures that the domestic production process does not

encounter a bottleneck due to inadequate supply of essential imports of raw materials and investment goods.

In order to derive the essential or minimum import requirements of raw materials or intermediate goods we use the intermediate-import requirements matrix, M. For computing the investment requirements we make use of imported capital-output matrix B^m and make the following assumption for imported capital goods in the terminal year in the spirit of (6) above.

$$J_T^m = kB^m x \tag{6a}$$

Our import constraints for the terminal year, thus, become

$$Z_T \geq MX_T + kB^m x$$

$$\geq M(X_o + x) + kB^m x$$

or $$-(M + kB^m)\,x + Z_T \geq MX_o$$

putting $MX_o = w = (w_i)$ we get

$$-(M + kB^m)\,x + Z_T \geq w \tag{8}$$[4]

Combining the input-output balance equations (7) and the import constraints (8) our programming problem can be stated as[5]:

Objective Function 1: Minimize $\bar{Z}_T$ (terminal-year imports)

Objective Function 2: Maximize $\bar{C}_T + \bar{E}_T + kB_x - \bar{Z}_T$ (terminal-year national income)

subject to: $$(I-A-kB)\,x + I^*\,Z_T = y \tag{7}$$

$$-(M + kB^m)\,x - Z_T \geq w \tag{8}$$

$$x_i,\ {}_jZ_T > o \quad \text{for } i = 1, 2, \ldots, n;\ j = 1, 2, \ldots, r$$

[4] MX_o or w is the vector of raw-material imports in the base year and thus consists of constant terms only.

[5] The constraints of the model may be written more compactly in matrix notation as follows:

$$\left[\begin{array}{c|c} (1-A-kB)_{n\times n} & I^*_{n\times r} \\ \hline -(M+kB^m)_{r\times n} & 1_{r\times r} \end{array}\right] \left[\begin{array}{c} x_{n\times 1} \\ \hline Z_T{}_{r\times 1} \end{array}\right] \begin{array}{c} = \\ \hline \geq \end{array} \left[\begin{array}{c} y_{n\times 1} \\ \hline w_{r\times 1} \end{array}\right]$$

Choice Elements in the Model

In order to see clearly the choices provided by the model between different activities let us introduce an $r \times 1$ vector of non-negative variables $R = (R_i)$ to convert the r inequalities of (8) into strict equalities. We can, thus, rewrite our constraints in the following way:

$$(I - A - kB)\, x + I^{*} Z_T = y \qquad (7)$$

$$-(M + kB^{m})\, x + Z_T - R = w \qquad (9)^{6}$$

$$x,\ Z_T,\ R > 0$$

This is a system of $(n + r)$ equations and $(n + 2r)$ variables, which can be identified as follows:

Equations	*Name*	*Number*
(5)	input-output	n
(6a)	import demand	r
Total		$(n + r)$
Variables		
x	incremental domestic production	n
Z_T	terminal-year total imports	r
R	terminal-year nonessential imports	r
Total		$(n + 2r)$

In the optimal solution—assuming one exists for our problem—each of these variables will either assume a positive or a zero value. Also, the number of positive variables in the optimal solution will be equal to the number of independent equations in the system, barring degeneracy [7, pp. 97-98]. Thus, only $(n + r)$ variables will be at a positive level and the remaining r will be at a zero level in the optimal solution.

This property of the optimal solution can be used to illuminate the choice elements in the model. It is possible for us to tell on the basis of the structure of our model which of the endogenous variables of the model *will be* at a positive level. The effective choice of the model will then be restricted to the remaining variables — r of them will turn out to be zero in the optimal solution.

[6] R can be interpreted as a vector of nonessential imports, since $R = Z_T - (M + kB^{m})x + w = Z_T - (Mx + w) - (kB^{m})\, x$ = total imports in year T — (raw-material imports in year T) — (import component of investment demands in year T).

In our model the last (n—r) elements of the vector x represent the incremental domestic production levels of the noninternationally trading sectors. In order to satisfy the various final and intermediate demands for the output of these sectors the last (n—r) variables in the vector x will have to be at a positive level — as long as final demands of some sectors increase between the base and terminal years — since domestic production is the only source of supply in these sectors[7]. The vector Z_T will be positive (*i.e.*, *all* its elements will be greater than zero) if we assume that w, the vector of raw-material imports in the initial year, is positive[8]. This condition is easily verified in the empirical implementation of our model. This leaves us only with the first r elements of vector x and the vector R (which also has r elements). The effective choice of the model is confined to these 2r variables — r of which will be at a positive and the other r will be at a zero level in the optimal solution. The model's choice mechanism is, thus, restricted to determining the extent to which incremental domestic output can replace nonessential imports in each sector.

In view of the above, the following mutually exclusive possibilities can arise in any internationally trading sector i ($i = 1, 2, \ldots, r$)

(a) $x_i > o,\ R_i = o$

(b) $x_i = o,\ r_i > o$

(c) $x_i > o,\ R_i > o$

(d) $x_i = o,\ R_i = o$

The possibility (d) can be ruled out on *a priori* ground since the incremental final demands will have to be met either by increases in domestic output ($x_i > o$) or by a level of imports beyond the barely essential level ($R_i > o$). Possibility (a) implies that domestic production in the i-*th* sector will be able to meet all intermediate and final demand requirements, other than those of essential imported inputs. The second polar possibility is (b) in which all *incremental* intermediate and final demands are met entirely by imports, and incremental domestic production is zero. Possibility (c) takes a middle position between the two polar possibilities (a) and (b). However, in our basic or unconstrained model this possibility is ruled out because the number of degrees of freedom (*i.e.*, the number of x_i and R_i variables that can be positive) is just equal to the number of internationally trading sectors. If both x_i and R_i are positive in any sector it will imply that in some other sector j possibility (d) will hold, *i.e.*, both x and R will have to be zero. But as we have seen earlier, this possibility is

[7] Since ours is a projective model, the final demands of all sectors increase, though with varying intensity—depending on the postulated growth rate of total consumption and the sector's expenditure elasticity.

[8] This is a sufficient and not a necessary condition.

ruled out. The effective sectoral choice in our basic or unconstrained model, thus, reduces to (a) and (b) only[9].

The Savings-Constrained Model

The unconstrained model formulated above implicitly assumes that domestic savings are available in elastic supply and whatever requirements of this aggregate resources the optimising solution may generate will be met by the economy. The model does not take into account the institutional limits to the mobilization of domestic savings and does not ensure that the import-substitution programme will optimize the use of this resource. In order to introduce this realistic element into our model we impose an additional constraint limiting the marginal savings rate in the economy.

The savings constraint which distinguishes this model from the basic model is of the form

$$S_T - S_o \leq s\,(Y_T - Y_o) \tag{10}$$

where $s = \dfrac{S_t - S_{t-1}}{Y_t - Y_{t-1}}$ is the *maximum* marginal savings rate the economy is considered capable of[10],

$$\text{and } S_t \equiv \bar{J}_t = \bar{Z}_t + \bar{E}_t \tag{11}$$

$$Y_t \equiv \bar{C}_t + \bar{E}_t + \bar{J}_t + \bar{Z}_t \tag{12}$$

$$\text{or } J_T - \bar{Z}_T + \bar{E}_T - S_o \leq s\,(\bar{C}_T + \bar{E}_T + \bar{J}_T - \bar{Z}_T) - sY_o. \tag{13}$$

Rearranging the terms so that those involving endogenous variables (unknown) are on the left-hand side and those involving base-year and exogenous variables (constant) are on the right, we have:

$$(1 - s)\bar{J}_T - (1 - s)\,\bar{Z}_T \leq (S_o - SY_o) + s\bar{C}_t - (1 - s)\,\bar{E}_T \tag{14}$$

Substituting (6) into (a) (iii) on page 103 and the result into (14), we have

$$(1 - s)\ kBx - (1 - s)\,\bar{Z}_T < (S_o - sY_o) + s\bar{C}_t - (1 - s)\,\bar{E}_T \tag{15}$$

since $o \leq s \leq 1$, we can divide both sides by (1—s) to get:

$$kBx - \bar{Z}_T < \left\{(S_o - sY_o) + s\bar{C}_T\right\} - \bar{E}_T$$

$$\text{or } \underset{1\times1}{-k}\ \underset{(n\times1)}{B}\ \underset{(n\times1)}{x} + \underset{(1\times1)}{\bar{Z}_T} \geq \left\{(sY_o - S_o) - s\bar{C}_T\right\} + \bar{E}_T \tag{16}$$

[9]In the savings-constrained and foreign-aid-availability models, described below, the degree of freedom is increased by one if the new constraint is effective and possibility becomes admissible.

[10]The value of s and *all* the base-year variables, *i.e.*, variables with time subscript 0, is assumed to be known.

which is the final form in which the savings constraint is imposed. The other constraints of the model and the objective functions are the same as those in the basic (unconstrained) model, *i.e.*, (7) and (8) and objective functions 1 (minimization of terminal-year imports) and 2 (maximization of terminal-year national income).

Foreign-Aid-Availability Model

Another variant of our basic model is based on the assumption that a certain proportion of the total resources needed to undertake the development programme can be met by reliance on foreign assistance[11]. Again, this also corresponds to the facts of life and the developing country can take advantage of the availability of such assistance, even though its long-term goal may be to reduce dependence upon such aid.

We can also look upon the foreign-aid constraint as resulting from the decisions of aid-giving countries. In that event, however, it would be more logical in the framework of our model to maximize national income rather than to minimize total imports. Maximizing national income in our model is equivalent to maximizing domestic savings[12]. In the empirical implementation of our models we have tried both objective functions and found that although in the unconstrained case the solutions to both objective functions are the same, in the case of foreign-aid-availability cases the solutions are different.

Let the postulated minimum ratio between foreign and total investment be λ, then our foreign-aid constraint takes the form:

$$\bar{Z}_T - \bar{E}_T \geq \lambda\bar{J}_T \tag{17}$$

Again substituting the value of $\bar{J}_T$ from (1) and (2), transposing the constant terms to the right-hand side we get:

$$\underset{1\times1}{-(k.\lambda)}\ \underset{(1\times n)}{B}\ \underset{(n\times1)}{x} + \underset{(1\times1)}{\bar{Z}_T} \geq \underset{(1\times1)}{\bar{E}_T} \tag{18}$$

The other constraints of the model are (7) and (8) the same as in the basic (unconstrained) model. The objective functions of this model are also the same as those of the basic (unconstrained) model.

[11]The ratio of foreign aid to investment has often been suggested as a criterion by aid-givers to determine the performance and, hence, the future needs of the recipient country. This ratio, on which the recipient may have little influence, is likely to depend on the size, stage of development and geographic and political importance of the country.

[12]This follows from the fact that consumption is an exogenous variable in our model and that the maximum value of two linear functions is the same if they differ only by a constant term (exogenously given terminal-year consumption, in our case).

The Dual Problem

In this subsection we shall discuss the dual problem with respect to the single-period programming model minimizing total imports (objective function 1) in the terminal year. We shall try to give an economic interpretation to the dual variables or "shadow prices" of the problem.

Corresponding to our primal problem there is the dual problem:

$$\text{Minimize} \quad \sum_{i=1}^{n} p_i^x y_i + \sum_{i=n+1}^{n+r} p_i^z w$$

subject to

$$\left[\begin{array}{c|c} I - A - .15B & I^* \\ \hline -M + .15B^m & I \end{array}\right] \left[\begin{array}{c} p^x \\ \hline p^z \end{array}\right] \leq \left[\begin{array}{c} (0) \\ \hline (1) \end{array}\right] \qquad (19)$$

where p^x is an $n \times 1$ vector of dual variables associated with the n input-output balance equations and p^z is an $r \times 1$ vector of dual variables associated with the r import equations and (0) is an $n \times 1$ vector consisting of zero elements (being the coefficients corresponding to domestic production activities in the objective function) and (1) is a $r \times 1$ vector consisting of unit elements (being the coefficients corresponding to importing activities in the primal objective function).

In the previous section we elaborated the choice mechanism through which the model decides to include or exclude domestic production and importing activities. The inclusion or exclusion of a particular activity in the optimal solution is also indicated by the "shadow prices" or the dual variables.

Each activity in a linear programme can be represented by a column vector of coefficients showing the per unit costs of (or revenues from) running the activity at a unit level. If the activity is included in the optimal solution (*i.e.*, if the corresponding variable is at a positive level) then the cumulative product of its coefficients and the corresponding shadow prices should be exactly equal to its coefficient in the cost function. Let α_{ij} be the per unit requirement of resource i or running the j-*th* activity, then if activity j is to be included in the optimal solution we must have $\sum_{i=1}^{n} \alpha_{ij} \pi_i = c_j$ where π_i is the dual variable associated with the i-*th* resources and c is the revenue obtained by operating the activity at a unit level and $\sum_{i=1}^{n} \alpha_{ij} \pi_i \leq c$ if the j-*th* activity is not included in the optimal solution [6].

The economic meaning of this is that an activity is profitable (and hence included in the optimal solution) only if its net marginal revenue is equal to its marginal cost and is not profitable (and hence excluded from the optimal solution) if its net marginal revenue falls short of its marginal cost.

The shadow prices associated with each constraint represent the marginal reduction in the value of the minimand which can be achieved by relaxing the i-*th* constraint by 1 unit. Thus, if the final demand of sector i is reduced by 1 unit the value of total imports is reduced by p_i^x, the price corresponding to the input-output balance equation of the i-*th* sector. The prices corresponding to the second group of constraints, *i.e.*, the import constraints measure the costs of having to import certain fraction of intermediate and investment goods rather than produce them domestically; they can be interpreted as the prices of specific factors whose scarcity prevents complete import substitution. The constraints on domestic savings and foreign aid can also be similarly interpreted. The shadow prices of the domestic-savings constraint reflect the scarcity of domestic savings which prevents complete import substitution. The shadow price of the foreign-aid constraint, on the other hand, reflects the scarcity of foreign aid which prevents further substitution of domestic savings by foreign aid and determines the lower limit of the import-substitution process.

The theorem that if a particular activity is included in the optimal solution its marginal cost must equal its marginal revenue, enables us to analyse the cost structure of each domestic production activity in terms of the shadow prices of the model.

If the incremental domestic production activity to produce the j-*th* sector's output is included in the optimal solution then the following should hold[13].

$$p_j^x = \sum_{i=1}^{n} (a_{ij} + .15b_{ij})\, p_i^x - \sum_{i=1}^{r} (m_{ij} + .15b_{ij}^m)\, p_i^z = 0 \qquad (20)$$

But since all the import activities are likely to be at a positive level, we have from (19)

$$\left(\frac{I^*}{I}\right)' p = (1), \text{ where } p = \left(\frac{p^x}{p^z}\right)$$

$$\text{or} \quad p_{i+n}^z + p_i^x = 1 \qquad (21)$$

for $i = 1, 2, \ldots, r$

and hence:

$$p_j^x - \sum_{i=1}^{n} (a_{ij} + .15b_{ij})\, p_i^x - \sum_{i=1}^{r} (m_{ij} + .15b_{ij}^m)\, (1 - p_i^x) = 0$$

[13] In the following the value of the stock-flow conversion factor, k, is assumed to be .15.

$$\text{or} \quad p_j^x - \sum_{i=1}^{n} \left[\left(a_{ij} - m_{ij}\right) + .15\left(b_{ij} - b_{ij}^m\right) \right] p_i^x - \sum_{i=1}^{r} \left(m_{ij} + .15b_{ij}^m\right) = 0$$

$$\text{or} \quad p_j^x - \sum_{i=1}^{n} \left[\bar{a}_{ij} + .15\left(\bar{b}_{ij}\right) \right] p_i^x + \sum_{i=1}^{r} \left(m_{ij} + .15b_{ij}^m\right)$$

$$\text{or} \quad p_j^x = \sum_{i=1}^{n} \left[\bar{a}_{ij} + .15\bar{b}_{ij} \right] p_i^x + \sum_{i=1}^{r} \left(m_{ij} + .15b_{ij}^m\right) \qquad (22)$$

The left-hand side represents the net marginal revenue of the j-*th* domestic product activity and the right-hand side represents its marginal cost. The cost structure of the domestic production activity can be analysed in the following way:

COST STRUCTURE OF A DOMESTIC PRODUCTION ACTIVITY

Category: Origin / Current	Capital	Total
Domestic $\sum_{i=1}^{n} \bar{a}_{ij}\, p_i^x$	$\sum_{i=1}^{n} .15\,\bar{b}_{ij}\, p_i^x$	$\sum_{i=1}^{n} \left(\bar{a}_{ij}\, p_i^x + .15b_{ij}\, p_i^x\right)$
Foreign $\sum_{i=1}^{r} m_{ij}$	$\sum_{i=1}^{r} .15b_{ij}^m$	$\sum_{i=1}^{r} \left(m_{ij} + .15b_{ij}^m\right)$
Total $\sum_{i=1}^{n} \bar{a}_{ij}\, p_i^x + \sum_{i=1}^{r} m_{ij}$	$\sum_{i=1}^{n} .15\bar{b}_{ij}\, p_i^x + \sum_{i=1}^{r} .15b_i^m$	$\sum_{i=1}^{n} \left(\bar{a}_{ij}\, p_i^x + .15b_{ij}\, p_i^x\right) + \sum_{i=1}^{r} \left(m_{ij} + .15b_{ij}^m\right)$

Since from (21) $p_i^x < 1$, it follows that the use of imported, rather than domestic, current inputs requires the payment of a premium $= (1 - p_i^x)$. The pricing of capital and the interpretation of the stock-flow conversion factor also emerges very clearly from the above table. The expressions

$$\sum_{i=1}^{n} b_{ij}\, p_i^x \quad \text{and} \quad \sum_{i=1}^{r} b_{ij}^m p_i^z$$

represent the total value of the (incremental) capital stock according to the implicit shadow prices of the model. In effect, this capital is rented out for use by activity j at a rate given by the stock-flow conversion factor of .15, which can be interpreted as the implicit gross rate of interest in the model.

B. EMPIRICAL IMPLEMENTATION

The empirical implementation of an economy-wide model such as ours requires the estimation of a large number of parameters and exogenous variables involved in the various equations and constraints of the model. Since the estimation of each of these hundreds of parameters and exogenous variables is itself a task involving considerable time and labour we had to rely a great deal on available data in the field[14].

In this section, we outline the sources of data and methodology employed for the implementation of our models. Part I discusses the degree of aggregation of sectors and the aggregated input-output table on which most of the computations are based. Part II describes the estimation of the other parameters of the model. Part III is devoted to the discussion of the estimates of the exogenous variables of the model, *e.g.*, consumption and exports. All statistical tables are attached in Appendix A.

I. Sectoral Aggregation and the Input-Output Matrix

The degree of sectoral aggregation adopted in our empirical implementation of the single-period models was influenced by our desire to keep the computational burden within manageable limits and by the degree of agggregation of the available input-output table on which our programming model crucially depended. Although a larger number of sectors could be distinguished, we decided to divide the economy into twelve sectors by the aggregation of some groups of the thirty sectors into which the economy is divided by Conrad, Stern and Tims in their interindustry relations table for 1960/61. Our sectoral classifications and that of the original table are compared in Table I. The first eight sectors of our model derive their total supplies from both domestic production and imports, while the total supplies of the last four are made up entirely of domestic production.

The 12×12 current input-output coefficients (matrix A, Appendix Table A-1) was obtained by the aggregation of the corresponding 30×30 table prepared by Conrad *et. al* [5]. The aggregation was performed with the base-year values of gross output of the sectors being aggregated as weights[15].

II. Other Parameters of the Model

(*a*) *The Current Import Coefficients Matrix M:* A fundamental contribution of the Conrad-Stern-Tims study [5] was to separate imports from interindustry flows matrix for 1960/61 and construct a 16×30 interindustry import

[14]To a large extent, the degree of the sophistication of our model was conditioned by the availability of data on the economy of Pakistan.

[15]The aggregation procedure is the same as given in [4, p. 36, equation 2.14].

TABLE I

COMPARISON OF SECTORAL CLASSIFICATION WITH THE ORIGINAL TABLE*

Our sector number	Name of the sector	Corresponding sectors/sectors in Conrad *et. al*
	International	
I	Agriculture	1, 19
II	Mining	2
III	Food processing	3
IV	Textiles	4, 7, 8
V	Wood and paper manufactures	5, 6
VI	Chemicals	9, 10, 11
VII	Machinery	12, 13, 14, 15
VIII	Transport equipment	16
	National	
IX	Construction	18
X	Small-scale manufactures	20, 21
XI	Electricity and gas	22
XII	Services (including government services)	23-30

*The original input-output tables also had a "Miscellaneous" manufacturing-industries sector (sector 17 in the Conrad table). Such sectors, as is well known, are always a problem in interindustry studies as they represent a conglomerate mass whose functional characteristics cannot be identified with any of the constituent sectors, nor with any other sector in the table. In order to overcome this "nuisance" aspect of the miscellaneous industries sector we distributed the total value of gross output of this sector among the other manufacturing sectors (sectors 2-16) and combined the coefficients of this sector with those of each of the latter in proportion to the value of gross output of the "miscellaneous" sector falling in a sector's share and its own value of gross output, respectively.

coefficients matrix. The 8×12 import coefficients matrix in Appendix Table A-2 has been obtained by aggregating the Conrad *et. al* import coefficients matrix. The aggregation procedure and the sector correspondence between our import matrix and the Conrad matrix is the same as that for the overall input-output coefficients matrix A, outlined earlier[16].

(*b*) *The Matrix of Capital Coefficients B:* The 3×12 matrix of fixed

[16]The matrix was used by Conrad *et. al* to project the raw-material import requirements per unit final demand for each sector and is given by $M(I - A)^{-1}$, where M is the import coefficients matrix, $(I - A)^{-1}$ is the Leontief inverse.

capital coefficients (Appendix Table A-3)[17] and the inventory coefficients in Appendix Table A-3a are derived not from Pakistan sources—to the best of our knowledge no such table based entirely on Pakistani resources was available at the time the present study was carried out—but on the basis of two such matrices prepared for India at the Indian Statistical Institute [12;18]. The three sectors producing capital goods in our classification are Sectors VII (machinery), VIII (transport and communication equipment) and IX (construction). Suitable adjustments were made in adapting the two Indian tables to our sectoral classification scheme. The total capital-output ratio for each sector was obtained as a sum of fixed and inventory. These coefficients are given in Appendix Table A-3b.

(*c*) *The Matrix of Capital Import Coefficients* B^m*:* The 2×12 matrix of capital import coefficients is derived from the matrix of fixed capital coefficients in the following way: Sector IX (construction) is excluded as it is a purely domestic sector. The coefficients of Sectors VII (machinery) and VIII (transport equipment) are multiplied by 0.8 The latter is done on the assumption that 80 per cent of each of the capital stocks of Sectors VII and VIII, used in each sector, are of imported origin. While the basis of this assumption on the aggregate level is empirically sound, the assumption that each stock has the same import intensity in each sector is rather arbitrary[18]. However, in the absence of detailed information on the composition of different capital stocks it is hard to remove this arbitrariness.

(*d*) *The Stock-Flow Conversion Factor:* In the previous section, we discussed the significance of the stock-flow conversion factor in order to derive the level of investment activity in the terminal year. To recapitulate, the stock-flow conversion factor is the ratio of terminal-year investment in capital good i to the total increment in the stock of capital goods during the period. If we further assume that this conversion factor is the same for all capital goods then the stock-flow conversion factor is also the ratio between terminal-year total investment and the sum of investments during the period.

Since our planning period is ten years of duration, T=10. We have seen that the value of k depends on the assumed rate of increase of investment. We have assumed the value of k=.15, which corresponds to the rate of growth of investment of about 9 per cent per annum. Since the stock-flow conversion factor can also be interpreted as the "shadow rate of return on capital" our assumption implies that this rate will be 15 per cent for the Pakistani

[17]Appendix Table A-3 can be considered as a 12×12 matrix with all but three rows having zero elements.

[18]For instance, the *Third Five-Year Plan* [17] gives the following figures; output of investment goods in 1965, 340 million rupees [17, Table 2, p. 20]; imports of capital goods in 1965, 2,015 million rupees [17, Table 6, p. 24], giving us a ratio of nearly 0.8.

economy during the period. On both accounts the assumption of the 15-per-cent figure does not seem unreasonable[19].

(*e*) *The Planning Period and the Base Year:* The model formulated in the last section is stated in terms of increments over the planning period. We, therefore, had to choose a base year and the length of the planning period in order to get the terminal year. We chose the year 1962/63 as the base year for the empirical implementation of our model, since that was the most recent year for which most of the data we needed were available. The choice of ten years as the length of the planning period is also the time-worn practice in all finite-horizon planning.

For the base year 1962/63 we generated the values of the endogenous elements (*e.g.*, J_o, MX_o) internally rather than taking their actual values in that year. The logic behind this kind of procedure in the implementation of a theoretical model is the desire to get an internally consistent set of variables. The input-output table from which most of the parameters of our model were derived related to the year 1960/61 and the first year of our model was 1962/63. We, therefore, needed to extend the input-output projections to 1962/63 in order to get consistent estimates of MX_o and J_o vectors[20].

The extension was performed by assuming a modest rate of growth of 5 per cent per annum in all the variables in the initial year. Although theoretically a little awkward and difficult to justify the assumption is computationally very convenient[21].

By making this assumption we ensure that the available data for the base year 1962/63 are consistent with our model and, when the actual values for the exogenous variables are inserted, the model exactly reproduces the 1962/63 input-output table. For any future year, the model will produce a consistent set of sectoral accounts once a set of values for its exogenous variables is inserted. However, the model cannot be used to provide consistent "back-casts" for years prior to 1962/63 as the model is not designed to explain Pakistan's economic history.

The choice of the 5-per-cent growth rate for the base year — not in itself implausible — was influenced by our desire to conduct a sensitivity analysis on

[19]Manne [11] has used a value of .15 for the conversion factor in his study on Mexico and a value of .17 for the consistency model on India. Weisskopf [21] has used two conversion factors, .14 and .18 for his import-substitution model on India. (All the models had 10-year time horizon.) Weisskopf has noted the relative insensitivity of the qualitative nature of his results to changes in the value of the conversion factor.

[20]J. Sandee [18, p. 15] adopts a similar, though different in detail, approach to extrapolate the "assumed state of affairs" in 1960—the first year of his model—from the input-output table relating to 1953/54.

[21]It is easy to show that with the stated assumption $X_o=(I-A-.05)^{-1}\ (C_o + E_o - Z_o)$ and $J_o = .05BX_o$. The estimation of C_o, E_o and Z_o is described below.

rates of growth between 4 per cent to 8 per cent per annum. Neither the choice of the pattern nor that of the rate of growth in the initial year is likely to be of great consequence to the terminal-year solution since the planning horizon is sufficiently long.

III. The Estimation of Exogenous Elements in the Model

Besides the fixed coefficients of the model, we also had to estimate the exogenous variables of the model in order to get a determinate solution for the unknowns of the problem, *viz.*, the domestic production increases import levels in the terminal year. Since the purpose of our model was not to give a unique and deterministic solution of the unknowns but to provide a milieu of choices, we also conducted a sensitivity analysis on the model by changing the final demand vectors of the problem. Thus, the solutions obtained are in the nature of conditional predictions: given certain assumptions about the growth of final demand elements, what will be the effect on the choices between domestic production and imports.

Thus, in order to compute the 12×1 vector y, (Eq. (4)) we need to have an estimate of consumption expenditures, exports, imports, investment and total output of each sector in the initial year. In addition, we have to estimate consumption expenditures and exports for the terminal year. Imports, investment and total outputs in the terminal year are endogenously determined. We shall detail below how each of the seven exogenous vectors was estimated.

(*a*) *C_o, Sectoral Consumption Expenditures in the Initial Year:* The sectoral distribution of domestic consumption expenditures has been estimated from a variety of sources. Although some unofficial estimates of gross national expenditure have been made in the aggregate, sectoral breakdowns of such expenditures are not available.

In arriving at the sectoral breakdowns, we have relied mainly on production and foreign-trade statistics, deriving consumption expenditures as a residual between the total availability of a commodity (domestic production plus imports) and exports, investment changes in stocks and interindustrial uses.

For many commodities and sectors we have used the per capita "availability" figures in East and West Pakistan for 1959, worked out at the Pakistan Institute of Development Economics [16] and adjusted the figures for price changes from 1959/60 to 1962/63. Multiplying the regional per capita figures thus obtained by regional population figures for 1962/63, and adding we have obtained the national consumption figures for Sectors I to VIII. For Sectors IX to XII we have relied mainly on the national income figures for these sectors. Column (4) of Appendix Table A-4 gives the estimate of sectoral consumption expenditures in the initial year.

(*b*) *Z_o, E_o, Sectoral Distribution of Imports and Exports in the Initial Year:* These are derived from the published sources on foreign-trade statistics [15]. The only manipulation involved was to reclassify the figures into the mould of our sectoral classification. Columns (2) and (5) of Appendix Table A-4 give the sectoral distribution of imports and exports, respectively, in 1962/63.

(*c*) *C_t, The Vector of Consumption Expenditures in the Terminal Year:* The projections of consumption expenditures in 1972/73 were based on the rates of growth of total consumption and expenditure elasticities of the goods and services of different sectors. Instead of assuming a single rate of growth, we conducted a sensitivity analysis on the model with growth rates ranging from 4 per cent to 8 per cent at 0.5-per-cent intervals. This was done to add richness to the variety of results, since the rate of growth of consumption is often an instrument the planners have to choose and work with.

The formula used for projecting consumption expenditures of each category was derived from the assumption of a logarithmic relationship between per capita consumption of a particular category and per capita total expenditure, *i.e.*,

$$\left(\frac{{}_iC_t}{P_t}\right) = \frac{\left(\sum_{i=1}^{n} {}_iC_t\right)^{\eta_i}}{P_t}$$

where C_t is the value of consumption expenditure on the goods and services of the *i-th* sector, P_t is the population at time t, η is the total expenditure elasticity of sector i's goods and services. Taking logs and differentiating both sides of the above expression with respect to time, we have:

$$r_{ci} = (1 - \eta_i)\,\rho + \eta_i\, r_c$$

where r_{ci} is the annual rate of growth of consumption expenditures on sector i's goods and services, ρ is the annual rate of growth of population, and r_c is the postulated annual rate of increase of total consumption expenditures[22].

A wide variety of empirical estimates is available on total expenditure or income elasticities of individual commodities in underdeveloped countries. Such estimates have also become available for Pakistan recently. However, our task was more than that of choosing the estimates of individual elasticities. We also had to obtain the aggregate elasticity of each sector as a weighted average of the elasticities of individual commodities produced by it. This was by no means an easy task and we had to rely considerably on our personal judgement in combining the available estimates to obtain the sectoral elasticities. The

[22]The value of ρ, the annual growth rate of population, used in the present estimates is 2.6 per cent — the same used by the Pakistan Planning Commission.

elasticities finally chosen for use in the implementation of the model are given in Appendix Table A-6.

Having obtained r_{ci} we applied it to the initial levels of sectoral consumption expenditures given in Appendix Table A-4 to obtain the ten-year consumption increases, *i.e.*,

$$({}_iC_{10} - C_o) = \left\{(1+r_{ci})^{10} - 1\right\} {}_iC_o$$

These are given in Appendix Table A-5.

(*d*) *E_{10}, The Vector of Exports in the Terminal Year:* The estimates for exports in the final year were derived by applying the rates of growth of sectoral exports implicit in the estimates given in [8] to the sectoral distribution of exports in the initial year (Appendix Table A-4). The estimates of exports in the final year are given in Column (1) of Appendix Table A-7. A more optimistic forecast of exports is obtained by raising all sectoral export targets in the terminal year by 10 per cent and is given in Column (2) of Appendix Table A-7.

The right-hand side vector of our programming problem y changes with each growth rate in the first 12 of its elements and remains invariant in the last eight (consisting of interindustrial import requirements in the initial year, w). Appendix Table A-8 gives the value of the y vector for different rates of growth. As already indicated, w vector is given in Appendix Table A-4.

C. COMPUTATIONAL RESULTS OF THE SINGLE-PERIOD MODEL

In this section we discuss the computational results obtained by the various runs of the single-period model. The section is divided into four parts. In Part I we describe the various runs of the model according to the changes in the different essential parameters and outline the relationships between the sectoral and macroeconomic results of the model. Part II discusses the general characteristics of the results in summary form. Part III analyses, in detail, the macroeconomic results and the relationships revealed by them between the two major resource scarcities, *viz.*, domestic savings and foreign aid. Part IV discusses the microeconomic or sectoral results in detail and with reference to the pricing and the dual problem.

The large variety of optimal solutions obtained by the present exercise can be considered to represent alternative strategies of import substitution. Our model should, thus, be considered as a convenient device for generating alternative solutions and not as a deterministic model pointing towards a single optimal strategy. The result can be used by a planner to choose from among the many

alternative import-substitution strategies they represent, enabling him to explore in great quantitative detail the implication of his assumptions or targets.

I. Classification of Results

Table II below gives a summary classification of the various runs of the single-period linear programming model which differ in the specification of the constraints, sensitivity to the choice of objective function, exogenous variables (such as the consumption and export targets, changes in coefficients, savings and foreign-aid ratios). All four groups have at least 20 constraints: 12 input-output balance equations and 8 import constraints. Group II has an additional constraint on the maximum marginal rate of savings—which is postulated at 20 per cent and 15 per cent, respectively, in cases A and B. Groups III and IV have an additional constraint on the minimum foreign-aid to total-investment ratio. All models were run with two objective functions: *i*) minimization of total terminal-year imports; and *ii*) maximization of terminal-year national-income. In all models, other than those where a minimum foreign-aid to total investment ratio was specified, the solutions to the two objective functions were identical. Group III and Group IV results differ when only the objective function is changed, other things remaining the same, and are hence presented separately. We have tried two estimates of terminal-year exports in a limited number of cases to see the effect of "export expansion" in the model. Two cases (Cases C and D of Group I) in which import coefficients have been lowered in the terminal year have also been tried for the unconstrained model.

A selection of the results of these runs is presented in Appendix B in four sets of tables for each case[23]. (The case and group numbers are indicated at the head of each table.) The first set, Appendix Table B-1 for each case, summarizes the macroeconomic aggregates based on the optimal solution to each individual run. The second set of tables, Appendix Table B-2, gives the optimal solution consisting of the incremental output of each sector. The third set, Appendix Table B-3, gives the value of terminal-year total imports in each sector and the fourth set, Appendix Table B-4, gives the value of non-essential imports in each sector (given by the value of the 'surplus' variables in the optimal solution).

Derivation of Macroeconomic Aggregates: The optimal solution to each of the several linear programmes, listed in Table II, gives two sets of values of the variables from which, in the main, our macroeconomic aggregates are constructed. These are: *a*) the values of the incremental outputs of each of the 12 sectors given in Appendix Table B-2; and *b*) the values of terminal-year

[23]In Appendix B, solutions to only four formulations of the model (*viz.*, Group I, case A; Group II, case A; Group III, case B; and Group IV, case A) are given. Other solutions can be obtained on request from the author.

TABLE II

CLASSIFICATION OF SINGLE-PERIOD MODEL RUNS

Name	Additional constraints	Objective function	Export performance	Import coefficients	Consumption growth rates (%)
Group I					
(Basic or unconstrained)					
Case A	*nil*	1, 2	$\bar{E}_{10}$=4679.6	No change	4, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0
Case B	*nil*	1, 2	$\bar{E}_{10}$=5147.6	No change	4, 6, 8
Case C	*nil*	1, 2	$\bar{E}_{10}$=4679.6	All import coefficients 50% of the initial level	4, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0
Case D	*nil*	1, 2	$\bar{E}_{10}$=4679.6	Import coefficients of capital goods-producing sectors reduced to zero	4, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0
Group II					
(Savings-constrained)					
Case A	Max. marginal rate of savings = 20%	1, 2	$\bar{E}_{10}$=4679.6	No change	4, 4.5, 5.0, 5.5 6.0, 6.5, 7.0, 7.5, 8.0
Case B	Max. Marginal rate of savings = 15%	1, 2	$\bar{E}_{10}$=4679.6	No change	4, 5, 6, 7, 8

(*Continued*)

TABLE II — *Contd.*

Name	Additional constraints	Objective function	Export performance	Import coefficients	Consumption growth rates (%)
Group III					
Foreign-aid availability I					
A	Min. For. Aid to total investment ratio = 30%	1	$\bar{E}_{10}$=4679.6	No change	4, 4.5, 5.0, 5.5 6.0, 6.5, 7.0, 7.5, 8.0
B	Min. For. Aid to total investment ratio = 40%	1	$\bar{E}_{10}$=4679.6	No change	4, 5, 6, 7 and 8
B1	Same as above	1	$\bar{E}_{10}$=5147.6	No change	4, 6 and 8
Group IV					
Foreign-aid availability II					
A	Min. For. Aid to total investment ratio = 30%	2	$\bar{E}_{10}$=4679.6	No change	4, 4.5, 5.0, 5.5, 6.0 6.5, 7.0, 7.5, 8.0
B	Min. For. Aid to total investment ratio = 40%	2	$\bar{E}_{10}$=4679.6	No change	4, 5, 6, 7 and 8
B1	Same as above	2	$\bar{E}_{10}$=5147.6	No change	4, 6 and 8

Objective Function 1 = Minimization of total terminal-year imports.
Objective Function 2 = Maximization of national income in the terminal year.

imports of the eight different categories given in Appendix Table B-3. Since consumption and exports are exogenously given, imports and investment are the only other variables needed to derive the various macroeconomic aggregates, such as foreign aid, domestic savings and national income.

Total Investment: This is obtained in the model by making use of the relationship between terminal-year investment level and the incremental productive capacity assumed in Section A and the value of stock-flow conversion factor, k (=.15).

Total investment in the terminal year is, thus, determined by multiplying the ten-year incremental output of each sector by .15 of the aggregate capital-output ratio of that sector and summing the result over the 12 sectors. Thus

$$J_{10} = .15 \sum_{j=1}^{12} \beta_j x_j$$

where $\bar{J}_{10}$ is total investment in the terminal year and β_j is the aggregate capital-output ratio of sector j.

Total value of imports in the terminal year is merely the sum of the value of endogenously determined imports of each of the eight categories.

$$\bar{Z}_{10} = \sum_{i=1}^{8} {}_iZ_{10}$$

The value of consumption expenditures in each run depends directly on the rate of growth of consumption postulated in it.

$$\bar{C}_{10} = \bar{C}_o\ (1+r_c)^{10}$$

where $\bar{C}_{10}$ and $\bar{C}_o$ are total consumption expenditures in terminal and initial periods, respectively, and r_c is the yearly rate of consumption growth (*see*, Section B, for the derivation of $\bar{C}_o$ and r_c).

The total value of exports in the terminal year, whose sectoral breakdown is exogenously given, is merely the sum of the sectoral export levels.

$$\bar{E}_{10} = \sum_{i=1}^{8} {}_iE_{10}$$

Foreign aid in the terminal year is defined as the difference between terminal-year imports and exports.

$$F_{10} = \bar{Z}_{10} - \bar{E}_{10}$$

Domestic savings in each run are given as the difference between total investment and foreign aid.

$$S_{10} = \bar{J}_{10} - F_{10}$$

National income in the terminal year is obtained as the sum of exogenously given terminal-year consumption and endogenously determined domestic savings

$$Y_{10} = \overline{C}_{10} + S_{10}$$

II. Salient Features of Different Results

The large variety of results obtained (a selection of which is presented here) are intended to derive economically meaningful generalizations about the effect of making the different changes on the exogenous variables and parameters — which can, to some degree, be influenced by public policy — on the final outcome in the terminal year.

The differences among Groups I to III for identical assumptions about exports, import coefficients and consumption growth, arise from the effect of imposing an additional constraint regarding the availability of foreign aid or domestic savings. The primary effect when an additional constraint becomes binding in a linear programme is, of course, to increase the value of the minimand or decrease the value of the maximand. That this, in fact, is the case can easily be verified by comparing the value of imports in comparable cases of each of the group for any rate of growth of consumption. A few illustrative examples are given below.

TABLE III

VALUE OF IMPORTS IN THE OPTIMAL SOLUTIONS

Group	Case	r=.04	r=.05	r=.06	r=.07	r=.08
I	A	4407.4	5389.5	6502.3	7761.3	9149.5
II	A	4832.6	5690.2	6711.6	7814.0	9150.5
III	A	6199.4	6808.0	7552.4	8390.6	9417.2
IV	A	6540.8	7173.3	7877.0	8636.7	9516.2

The maximum degree of import substitution is possible when there are no supply limits on the availability of either kind of resources. If there are limits on the degree to which domestic savings can be mobilized, maximum possible import substitution can not be undertaken as additional foreign resources are needed to supplement domestic savings. If the high proportion of total investment can be financed by foreign aid, the need for domestic savings is reduced and import substitution need not be carried to its limit. By the same token, the value of imports is higher in Case B than in Case A of Group II since the maximum marginal rate of savings in the former is lower (15 per cent) than in the latter (20 per cent). For the same reason Case B of Group III is always

(for identical assumptions regarding export levels, import coefficients and consumption growth) more import-oriented than Case A. In general, Case B of Group III, *ceteris paribus*, always gives the most import-oriented solution among all other cases in Groups I-III. Case A of Group I, on the other hand, gives the least import-oriented or most favourable to domestic-production solutions. The two can, thus, be regarded as polar cases for each set of other assumptions, *i.e.*, relating to export levels, import substitution and consumption growth.

In Table IV we contrast the level and structure of investment and imports of these two polar cases for a number of consumption growth rates. The corresponding values for the intermediate cases fall, naturally, between those of the two polar solutions[24].

The table points up the interesting, though obvious, relationship between import substitution and industrialization. Total industrial investment — defined as investment in Sectors II-VII — is higher in both absolute and relative terms in Group I, where import substitution is greatest. Industrial investment in Group I accounts for about a third of all investment and this ratio is relatively independent of the rate of growth of consumption. On the other hand, for Group III, this ratio, which is only about 17 per cent at the 4-per-cent growth rate, rises to about 30 per cent when the growth rate is raised to 8 per cent. Thus, higher consumption growth rates, which raise the demand for the output of industrial sectors through the operation of Engel's law, call for a high ratio of industrial investment, which in turn promotes import substitution even when the condition for the supply of foreign aid is very favourable. In the unconstrained model the ratio of industrial investment is high even at low growth rates as import substitution is being pushed to its maximum possible limit.

Table IV also shows the difference between Group I and Group III solutions with respect to the level and composition of imports in the terminal year. Not only is the level of imports in Group III solutions uniformly higher than those of Group I, for all growth rates, the composition of the imports in the two groups also points out the degree of austerity of the polar regimes they represent. Whereas Group I imports consist only of the essential investment and intermediate-goods imports and no other imports, as much as half of Group III imports are devoted to consumer goods[25].

III. The Substitutability between Domestic and Foreign Resources

The macroeconomic results derived for the different cases are presented in Appendix Table B-1 for each case. Apart from providing a consistent

[24]The relative position of the different import-minimizing solutions is fairly fixed. The following is their ranking in decreasing order of import-orientation: unconstrained case, savings-constrained case with maximum marginal rate of saving=20 per cent, savings-constrained case with maximum M.R.S. = 15 per cent.

[25]These are principally the imports of consumer durables though in solutions of Group III, for low growth rates, other consumer-good imports are also indicated.

TABLE IV

COMPARISON OF POLAR CASES

Identification		Investment		Imports				Domestic savings
Group case	Rate of growth of consumption	Total	Industrial II-VII	Total	Material	Capital	Other	Foreign aid	
I A	.04	6984.9	2190.0 (31.4)	4407.4	3016.9	1390.5 (31.5)	0	—272.3	7257.2
III B	.04	4848.2	750.6 (15.5)	6617.6	1845.8	887.8 (27.9)	3884.0 (13.4)	1938.6	2909.6
I A	.05	8965.3	2848.3 (31.8)	5389.5	3606.1	1783.4 (33.1)	0	709.9	8225.4
III B	.05	6657.2	1235.1 (18.6)	7342.5	2253.0	1299.2 (30.7)	3790.3 (17.7)	2662.9	3894.2
I A	.06	1116.3	3617.7 (32.4)	6502.3	4282.9	2219.4 (34.2)	0	1822.4	9338.9
III B	.06	8767.0	1916.4 (21.9)	8183.0	2955.3	1737.7 (36.1)	3490.0 (21.2)	3503.4	5263.4
I A	.07	13596.0	4502.2 (33.1)	7761.3	5061.0	2700.3 (34.8)	0	3081.7	10514.3
III B	.07	11302.9	2882.5 (25.5)	9196.3	3894.1	2265.7 (42.3)	3036.5 (24.6)	4516.7	6786.2
I A	.08	16256.4	5325.1 (33.5)	9149.5	6160.0	2989.5 (32.7)	0	4469.9	11786.4
III B	.08	14263.1	4152.7 (29.1)	10379.2	5109.8	2871.9 (49.2)	2397.5 (27.7)	5700.0	8563.1

Note: Figures in parentheses are percentages of total. Absolute values are in millions of rupees.

picture of the macroeconomic aggregates, these tables can be used to see the trade-offs between domestic and foreign resources for achieving a given targeted growth rate of consumption. For this purpose we plot in Figures 1—3 the foreign resources, represented by the value of the foreign-trade deficit, on the vertical axis and domestic savings, average and marginal saving rates, respectively, representing the domestic effort on the horizontal axis for each of the cases in Groups I-III, as listed in Table III. By joining the different points corresponding to each growth rate of consumption we obtain a family of iso-consumption curves. These contours show the different minimal combinations of foreign aid and domestic savings which result in the same consumption growth rate[26]. These curves have downward slopes like ordinary production isoquants and their slope measures the trade-off between the two kinds of resources at a given point.

These contours show that domestic savings are easily substitutable for foreign aid when the ratio between the former and the latter is low. For any ratio of foreign aid to domestic savings, the substitutability of domestic savings, as represented by the slope of these contours, diminishes as the rate of growth of consumption increases. This reflects the fact that as consumption targets are raised the requirements of intermediary and investment-goods imports rise and with fixed export targets the foreign-exchange gap becomes more and more important to the economy relative to domestic savings.

The extreme right-hand point of each of these contours represents the unconstrained case, where the import requirements are lowest and domestic savings requirements highest. Beyond this point domestic savings are not substitutable for foreign aid as the implied import requirements are at the minimum level needed to sustain the given rate of consumption growth. Any attempt to step up domestic savings effort at the expense of foreign aid beyond this point can be successful only if a lower growth rate of consumption is acceptable. Otherwise domestic savings will be dissipated due to lack of complementary imported inputs needed to transform them into productive investment. Thus, a given *level of foreign aid* can support a unique *maximum* growth rate of consumption regardless of the complementary domestic savings resource. However, a given *level of domestic savings* can sustain a growth rate of consumption only if the necessary amount of complementary foreign aid can be obtained.

[26]In drawing these curves we have left out runs of Group IV in which the objective function was the maximization of national income rather than the minimization of imports (and, hence, of foreign aid). The resultant foreign aid and savings combination in these cases is not minimal. As can be seen by a comparison with a case where, *ceteris paribus*, the objective function is minimization of imports, the imports in these cases are higher. Also, since exports and consumption are exogenous, maximization of national income is equivalent to the maximization of domestic savings. The point corresponding to such a case will always lie above the minimal foreign aid-domestic savings contour corresponding to a given consumption growth rate. Also excluded are runs with higher export targets of 5147.6 and changes in import coefficients.

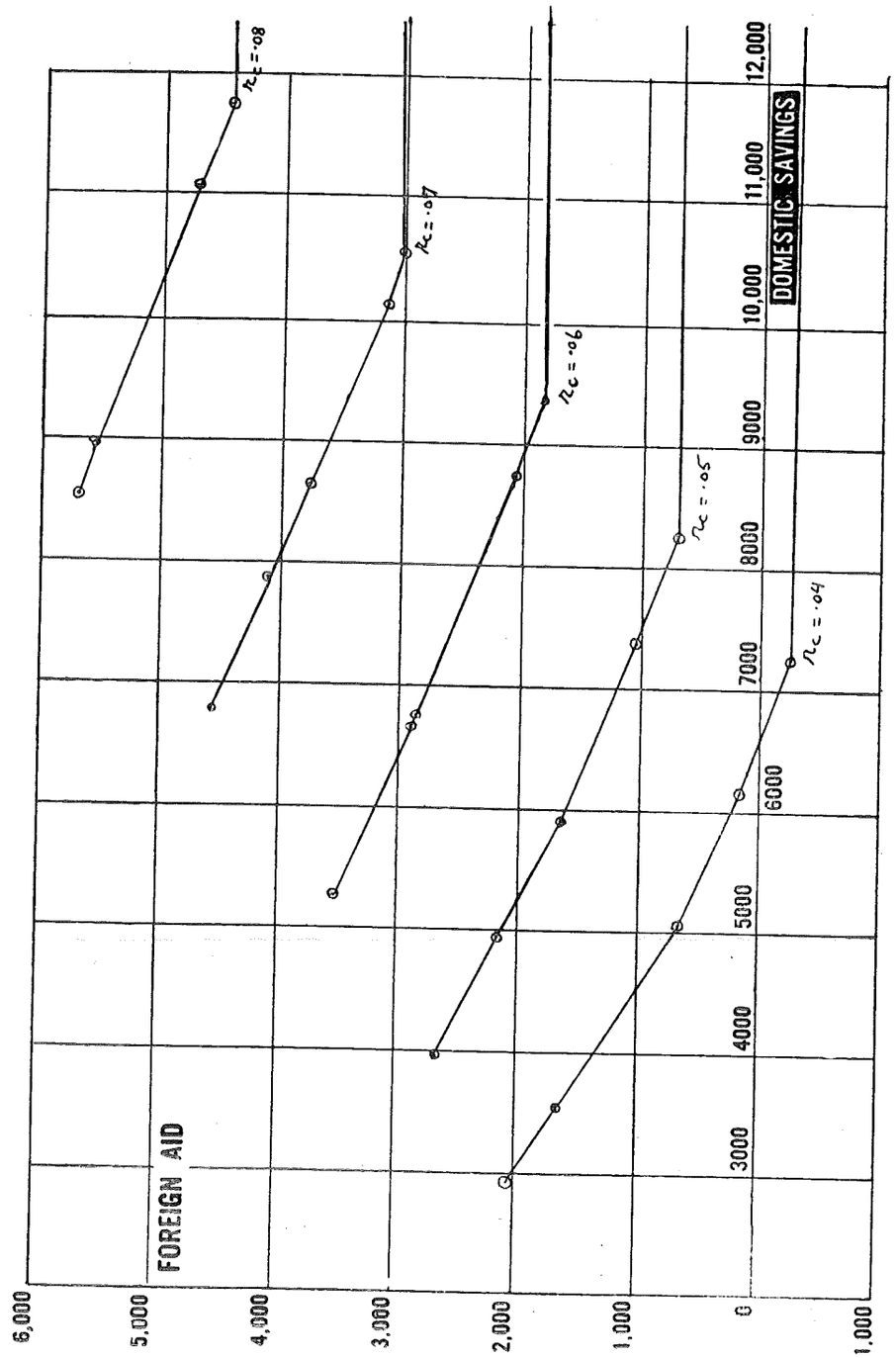

Figure 1. Trade-Off betwee

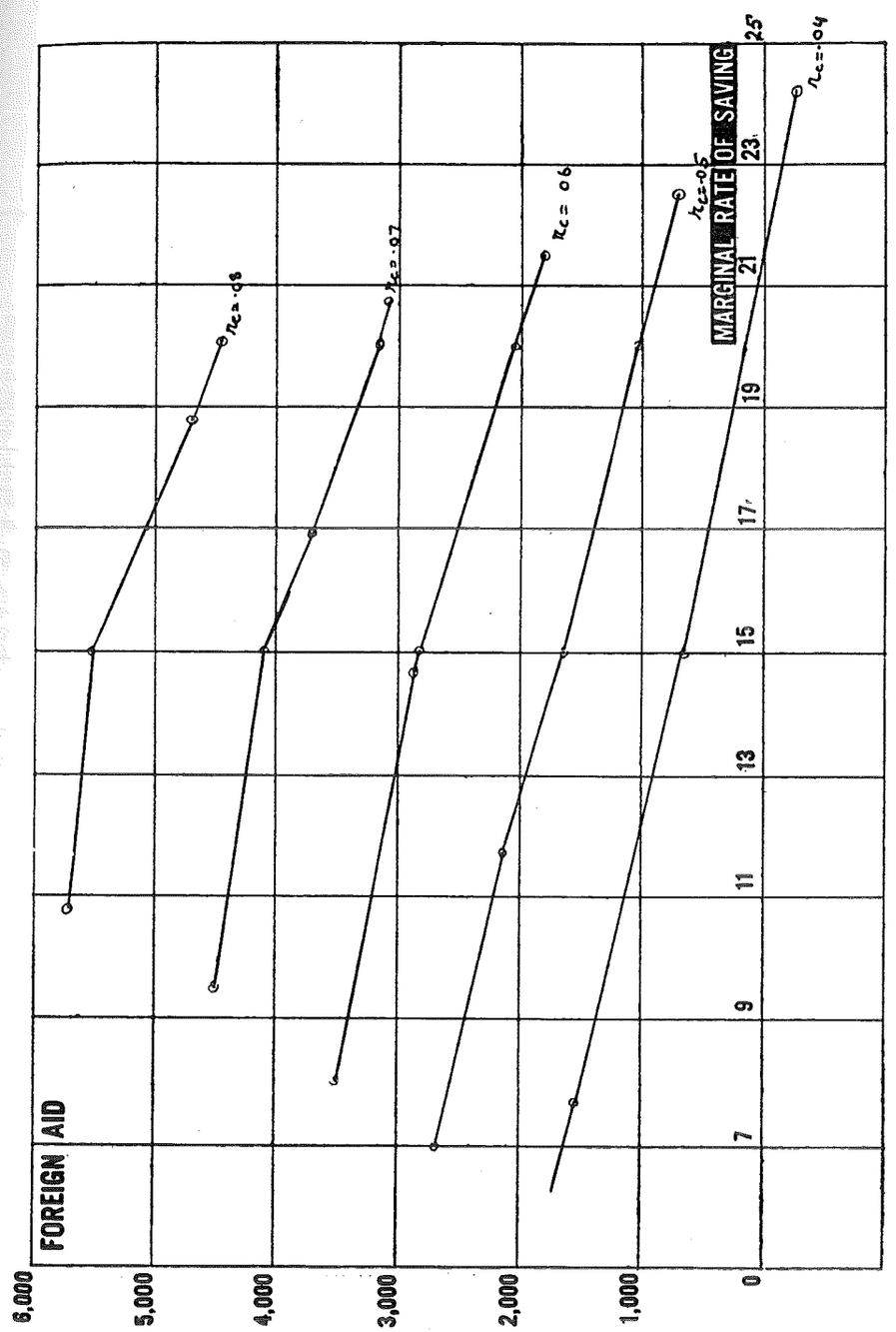

Figure 2. Relationship between Foreign Aid and Marginal Rate of Savings.

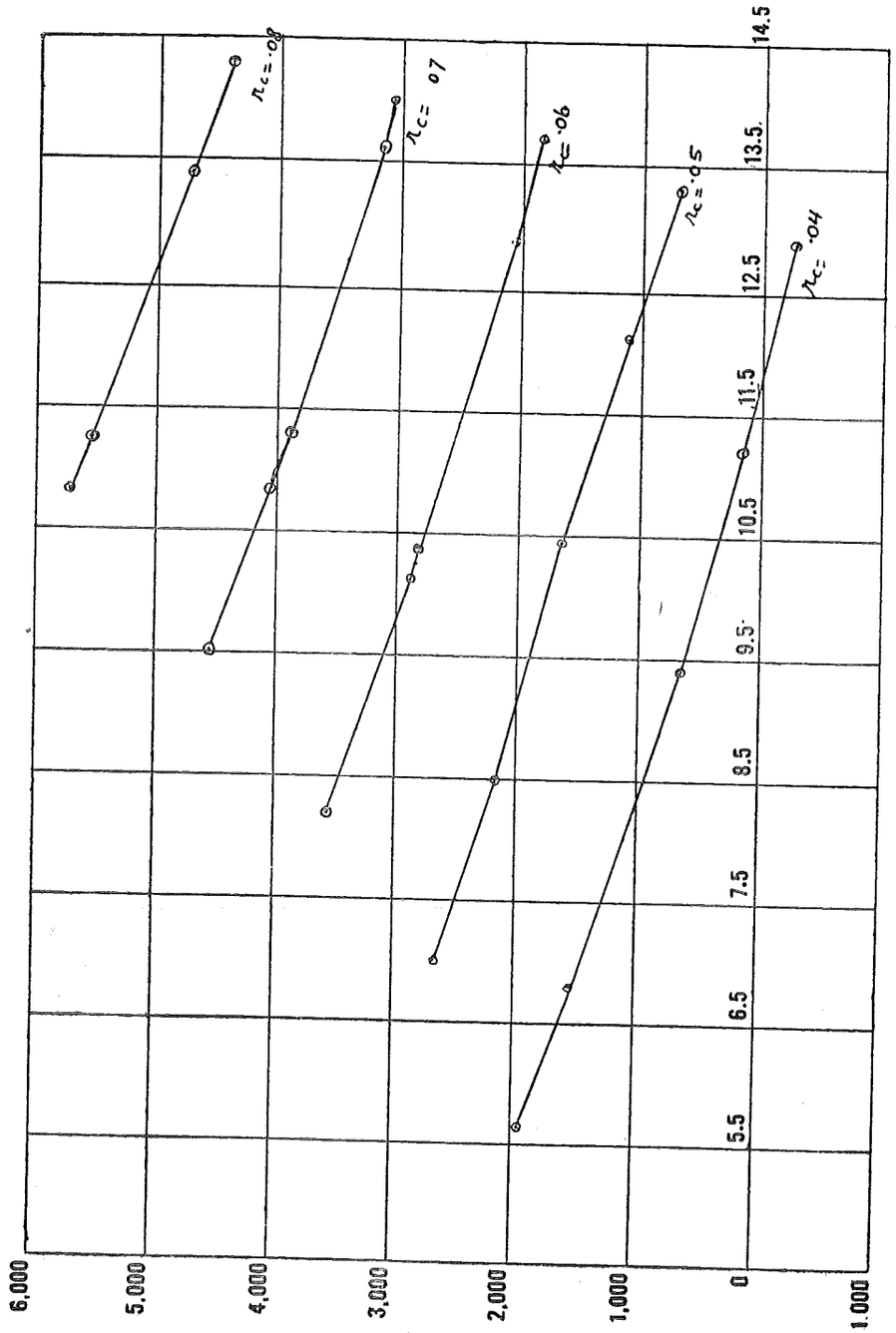

Figure 3. Relationship between Foreign Aid and Average Rate of Savings.

The extreme left-hand point on each contour is represented by the case in which the foreign-aid to total-investment ratio is equal to 40 per cent. It is, of course, possible to extend these contours leftwards by postulating a higher value for this ratio. This could have also been done by postulating a value for the maximum marginal rate of saving lower than 15 per cent[27]. The length of the contours in Figures 1—3 gets smaller and smaller as the consumption growth rate increases, reflecting the fact that the variation in the value of the two variables plotted gets smaller and smaller as the consumption growth rate increases. As the targeted rate of consumption is increased the requirements of domestic savings and foreign aid both increase and the differences between the two extremal cases progressively narrow down. For instance, the 5-per-cent target of consumption growth can be sustained, on the one hand, by a combination of foreign-aid to total-investment ratio of 40 per cent and an average savings ratio of 7 per cent or, on the other hand, by a combination of 2.5 per cent and 13.5 per cent, respectively, of the two ratios. The raising of the target rate to 8 per cent requires 40 per cent and 10.8 per cent, respectively, in Group III, Case B and 27.5 per cent and 14.3 per cent of the two ratios in Group I, Case A.

The slopes of the iso-consumption curves in Figures 1—3 also reflect the shadow price of foreign exchange. For the ratio of the increment in domestic savings to the decrease in foreign aid, holding consumption and exports constant, can be regarded as the rate of transformation of rupees into foreign exchange through the process of import substitution. Our empirical results show that to replace a million rupee worth of foreign exchange the Pakistani economy needs to generate 1.5 to 3.0 million rupee worth of domestic savings. This rate varies according to the consumption target postulated and the ratio of foreign aid to domestic savings available, as discussed earlier. In terms of savings rates, a billion rupee worth of foreign aid can enable the economy to reduce the average savings rate by 3 to 4 per cent and the marginal savings rate by 6 to 9 per cent[28].

We may now address ourselves to the problem of assessing, in the light of our results, the relative importance of the two aggregate resource scarcities in the economy — domestic savings and foreign aid. In an optimizing model, such as ours, the two resource "gaps" are the same and the necessary import substitution to equalise the two gaps has already taken place through the process of import substitution. However, the different runs of our model give us the requirements for the two resources and we can use our judgement as to whether they are realistic in the Pakistani context.

We have seen earlier that, for a given level of foreign aid, there is a maximum rate of saving which can be translated into productive investment, and

[27] All cases of foreign-aid to total-investment ratio of 40 per cent yield marginal savings rates less than 15 per cent.

[28] Bergsman and Manne in [1] calculate this rate for India at "roughly two rupees" during 1965/66 through 1975/76. Weisskopf's study for India [21] also gives similar results.

hence also a maximum target of consumption growth in the terminal year. Conversely, for a given target of consumption growth there is a minimum requirement of foreign aid. These maximum (realizable) savings and minimum foreign-aid combinations are given by the solution of the unconstrained cases. Figure 1 shows that the maximum rate of growth of consumption achievable with no foreign aid is a little over 4 per cent. The average and marginal saving rates corresponding to this situation are 13 per cent and 24 per cent, respectively. For achieving a 6-per-cent consumption growth rate target the minimum foreign-aid requirement is roughly the same as in the initial year although the average savings rate needed to achieve this target is 13.7 per cent or more than double than in the initial year. For the 8-per-cent consumption growth target the minimum foreign-aid requirement is about 2.5 times the initial level and the average domestic savings rate needed is 14.26 per cent.

We, thus, see that if the foreign-aid requirements are to be kept at a minimum, the economy needs to generate marginal saving rates ranging between 20 per cent to 24 per cent and average saving rates ranging from 13 per cent to 14.25 per cent. Whether these maximum realizable rates of savings suggest that there exists in the Pakistani context the possibility of a loss of potential savings depends directly on what the orders of magnitudes of these rates in fact are and whether the country is, in fact, capable of achieving them. No definitive estimates of these rates are available although the Planning Commission and other related sources have provided some educated guesses about them which put the marginal saving rates in the 20-24 per cent and the average saving rates in the 12-14 per cent range. To the extent that the economy can generate rates higher than these, it is possible for the phenomenon of foreign-exchange bottleneck to arise in the Pakistani situation. A comparison with similarly situated countries like India and Burma shows that the Pakistani economy is capable of generating higher saving rates.

On the other hand, however, it must be pointed out that the maximum realizable saving rates, described above, are yielded by the model when it is assumed that the import coefficients in the terminal year remain unchanged. As has been pointed out earlier this assumption limits the possibilities of import substitution in the model, essentially, to that of consumption goods. The two cases in which import coefficients were lowered — Group I, Cases C and D — show that as high as 17-22 per cent average savings rate (corresponding to 30-35 per cent marginal saving rates) may be needed in order to undertake any serious import-substitution programme. To that extent it can be argued that the effective constraint in the Pakistani context is that of domestic savings and not of foreign exchange.

IV. Sectoral Outputs and Imports in the Terminal Year

In this subsection we analyse the sectoral composition of total outputs and imports in the terminal year given by the different runs of our model.

Appendix Table B-2, for each case, shows the levels of incremental outputs in each sector in the terminal year. Appendix Table B-3 shows the sectoral levels of imports in the terminal year and Appendix Table B-4, for each case, shows the level of nonessential imports in the terminal year[29].

Due to the rather high degree of aggregation of our sectors it is not possible to attach very great operational significance to our sectoral results. Even though the more damaging consequences of the all-or-nothing character of sectoral solutions are avoided by formulating the model in terms of increments over the ten years, the high degree of aggregation makes the assumption of linearity a little distant approximation to reality. Also, from the point of view of the planner desirous of finding out which of the thousands of projects he should choose in order to pursue the import-substitution strategy efficiently, the sectoral results of this highly aggregative nature are not likely to be of immediate help. Nevertheless, the present results provide a valuable insight into the nature of choices between domestic production and imports available to the economy.

As pointed out in subsections B and C of this section, the unconstrained model solutions, Group I, provide the greatest opportunity for import substitution. The level of incremental domestic production is the highest among all groups, for each growth rate, and the level of imports of each category is the lowest. Also, only the most essential imports of intermediate and investment goods are undertaken and there is no import of consumption goods.

The fact that all incremental domestic outputs are at a positive level is itself significant. It implies that, in the absence of any constraints on the availability of domestic savings and foreign aid, all domestic production activities are feasible and more economical than (nonessential) imports. Although this result is in conformity with similar results obtained by Manne for Mexico [11] and Weisskopf for India [21], the contrary possibility cannot be ruled out either on theoretical or empirical grounds. Theoretically, there is nothing in the model to prevent it from discarding some of the incremental domestic production activities in favour of imports. Empirically, it has been conjectured by Soligo and Stern [19] that in the Pakistan context, there may be several industries whose establishment has led to negative value added — in that the direct and indirect per unit costs of such industries may be higher than the domestic price of the commodities produced, net of the implicit subsidy afforded through protection[30].

[29] In the jargon of linear programming, Appendix Tables B-2 and B-3 represent the value of the non-slack variables and Appendix Table B-4 that of slack variables in the import constraints. The slack variables associated with the foreign aid or savings constraint are always zero since this constraint is always found to be effective in all runs of our model.

[30] Since our model does not take tariff protection into account, any such domestic production activities will be "priced out" and their activity level in the optimal solution will be zero

The unconstrained model provides only one pattern of domestic production and imports for all growth rates; *i.e.*, the optimal basis rates remain the same, regardless of the growth rate of consumption and, hence the final demand vector. This invariance of the optimal basis is due to the applicability, in the unconstrained model, of the well-known substitution theorem on open Leontief input-output systems [10]. The theorem can be summarized to state that the optimal choice of activities in an open Leontief system is independent of the levels of final demand if there is only a single basic resource scarcity. In the unconstrained model the only basic resource scarcity is foreign exchange and, hence, the optimal basis does not change with changes in the final demand levels.

The savings-constrained and foreign-aid availability models, on the other hand, present more interesting optimal solutions from the point of view of choice between imports and domestic production. Incremental domestic production in some sectors is unprofitable and it is cheaper to satisfy all incremental demands for the output of that sector by direct imports. As a general rule, the lower the rate of growth the larger is the number of sectors where incremental domestic production levels are zero or where nonessential imports are at a positive level, and the larger the ratio of nonessential to total imports. This implies that at higher consumption growth rates a larger degree of import substitution is called for in the face of a limit on the availability of savings of foreign aid. The explanation for this in the savings-constrained model (Group II solutions) is that low rates of consumption growth, in general, lead to low growth rates of national income and, since savings are related to incremental national income, to low levels of savings, which constrains the economy from carrying import substitution farther. For Group III solutions the explanation is that the maximum available foreign aid, which is related to total investment, permits a relaxation of domestic savings effort at low growth rates and reduces the need for import substitution.

For the same reason the Group II solutions, with a lower marginal savings rate, and Group III and Group IV solutions, with a higher foreign-aid to investment ratio, have a larger number of sectors where incremental domestic outputs are at a zero level or nonessential imports at a positive level and the ratio of nonessential to total imports is higher. Thus, it can be seen that in Group II solutions with 15-per-cent maximum marginal rate of savings (Case B) there are two domestic sectors whose incremental outputs are at a zero level and three sectors where nonessential imports are at a positive level at 4-per-cent growth rate of consumption; for higher growth rates only one sector where domestic incremental output is at a zero level and two sectors where nonessential imports are at a positive level. For, the higher marginal savings rate of 20 per cent domestic incremental production of only one sector is at a zero level — that too only at the low growth rates of 4 and 4.5 per cent. At these low growth rates, two sectors have nonessential imports, while at higher growth rates all incremental

domestic production activities are at a positive level and there is only one nonessential importing sector. In fact, for the 8-per-cent growth rate, the solution is almost identical to that of Group I, Case 1 for the same growth rate.

In Group III, Case B (foreign-aid to total-investment ratio 40 per cent) solution for 4-per-cent rate of growth as many as four sectors have incremental domestic production at zero level and five sectors have nonessential imports at a positive level. At 5-6 per cent growth rate, the number of such sectors are two and three respectively. At 7-8 per cent growth rate, only one sector has incremental domestic production at a zero level and only two have nonessential imports at a positive level. For this group, Case A (foreign-aid to total-investment ratio 30 per cent) solutions are qualitatively the same for growth rates up to 5.5 per cent as those for Case B, but for higher growth rates fewer incremental domestic production levels are zero and nonessential import levels positive. At 7.5-8 per cent growth rates in the solutions for this case, all domestic production sectors are at a positive level and nonessential imports are positive for only one sector.

It is interesting to note which of the sectors show incremental domestic production at a zero level and nonessential imports at a positive level in the various solutions[31]. The most sensitive sector in this respect is Sector VIII (the transport equipment sector). Out of the total 28 runs in Group II and Group III all show positive nonessential imports for this sector. In more than half of the runs incremental domestic output in this sector is at a zero level. The next least viable incremental domestic production activity is that for producing the output of Sector VII (the machinery sector). In seven out of 28 runs incremental domestic production in this sector was at a zero level and in 19 runs the imports of this sector's output were above the essential level. The other three sectors susceptible to savings or foreign-aid constraints are Sectors V (wood products), VI (chemicals) and IV (textiles). Table V gives, in summary from, the data described above.

Table V also reflects on the relative profitability of the various domestic production activities. The interpretation of the results summarized above is that Sectors VIII and VII are not profitable when there is a scarcity of savings or foreign aid. The reason for this is obviously the high capital cost of these activities — their capital coefficient is the highest of the eight internationally trading sectors.

[31]Group IV solutions show incremental outputs in all sectors at all growth rates at a positive level. The only nonessential imports occur in the agriculture sector. One is tempted to call this solution as the "PL 480" solution. Foreign aid is utilized to import foodgrains and domestic resources diverted to increase investment.

TABLE V

NUMBER OF RUNS IN WHICH SECTORS DOMESTIC OUTPUT IS AT A ZERO LEVEL (OR NONESSENTIAL IMPORTS AT A POSITIVE LEVEL)

	Sector	Group II		Group III		Total
		Case A	Case B	Case A	Case B	All cases
VIII	Transport equipment	2 (9)	5 (5)	7 (9)	5 (5)	19 (28)
VII	Machinery	0 (2)	1 (5)	3 (7)	3 (5)	7 (19)
V	Wood products	0 (0)	0 (0)	1 (1)	2 (3)	3 (4)
VI	Chemicals	0 (0)	0 (0)	1 (3)	1 (2)	2 (5)
IV	Textiles	0 (0)	0 (0)	0 (1)	0 (1)	0 (2)
No. of runs		9	5	9	5	28

A satisfactory discussion of the relative profitabilities of different domestic activities can be given only in terms of the dual variables generated by the different optimal solutions of the primal problem. As pointed out earlier in this Section, the solution to Group I, Cases A and B runs all produce a single optimal basis. Group II solutions produce two optimal bases for each of Case A (marginal rate of saving=20 per cent) and Case B (marginal saving=15 per cent). Group III solutions have four distinct optimal bases for each of Case A (foreign-aid to total-investment ratio=30 per cent) and Case B (foreign-aid to total-investment ratio = 40 per cent). The values of the dual variables resulting from 10 of these optimal bases are given in Appendix Table B-5[32].

When the objective function is the minimization of imports the shadow prices corresponding to each input-output balance equation reflect the minimal foreign-exchange content of a unit output from the corresponding domestic-output activity. The corresponding price of import activity in each case is unity — equal to its coefficient in the objective function. The ratio of the shadow price in each sector to the alternative import price (equal to unity) thus represents the relative foreign-exchange content of domestic production. The higher this ratio the lower the net saving of the foreign exchange afforded by import substitution. A ranking of the domestic sectors in ascending order of the value of their shadow prices thus affords us a way of determining the comparative advantage (in descending order) of the different sectors.

[32]Their applicability to different runs is shown in Table VI.

TABLE VI

RANKING OF SECTORS ACCORDING TO SHADOW PRICE

Optimal basis	Group	Case	Rate of growth	Sectors in increasing order of values of p^x
1	I	A,B	4.0-8.0	I, IV, III, II, V, VI, VIII, VII
2	II	A	5.0-8.0	I, III, IV, II, V, VI, VII, VIII
3	II	A	4.0-5.0	I, III, IV, II, V, VI, (VII, VIII)*
4	II	B	4.0	I, III, IV, II, (V, VI, VII, VIII)*
5	II	B	5.0-8.0	I, III, IV, II, V, VI, (VII, VIII)*
6	III	A	7.5-8.0	I, III, IV, II, V, VI, VII, VIII
7	III	A	5.5-7.0	I, III, IV, II, V, VI, (VII, VIII)*
8	III	A	4.5-5.0	I, III, IV, II, V, (VI, VII, VIII)*
9	III	B	7.0-8.0	I, III, IV, II, V, VI, VII, VIII
10	III	B	6.0	I, III, IV, II, V, (VI, VII, VIII)*

*These sectors have equal prices.

In Table VI the ranking of the eight sectors where an alternative import choice is permissible in ascending order of the values of dual variables (and, hence, in descending order of static comparative advantage) resulting from the different optimal bases is given. This ranking of the different sectors also reflects in decreasing order their comparative advantages, based on this relative price criterion.

The relative position in the ranking of Sectors I (agriculture), VII (machinery) and VIII (transport and communications equipment) does not change in any of the bases. There are some minor shifts in the ranking position of other sectors in some of the bases. The only significant difference between the ranking in the unconstrained group bases and others is that the machinery sector in the former has a higher relative price than the transport equipment sector. This is explained by the fact that the capital coefficient in transport equipment sector is higher than in the machinery sector and as our analysis of the dual problem, at the end of Section A above, shows the shadow prices in the savings-constrained and foreign-aid availability models have an additional cost element involving the capital coefficient.

The majority of the bases have the following ranking:

Rank		
1	Sector I	Agriculture
2	Sector III	Food-processing industries
3	Sector IV	Textile industries
4	Sector II	Mining
5	Sector V	Wood products
6	Sector VI	Chemicals
7	Sector VII	Machinery
8	Sector VIII	Transport equipment

The above ranking conforms to the commonly held view about the pattern of comparative advantage in an underdeveloped economy. However, it cannot be too strongly emphasized that this ranking is based on the current value of the structural parameters of the economy. In particular, the import coefficients used are those existing at the initial year. During the process of growth, import substitution will become a necessity in order to close the savings and foreign-exchange gaps and many of the presently fixed import coefficients will have to be lowered. It is quite likely that the first sectors to be affected by an import-substitution strategy would be those very sectors where comparative advantage at present is very low.

In addition, two more qualifications to the above results must be pointed out. First, the model does not take into account either external economies or economies of scale — both of which are known to be highly important factors in determining the pattern of comparative advantage in a developing country. Secondly, the length of planning horizon could also be a significant factor: *e.g.*, domestic production in the machinery sector may be profitable with a 20-year horizon but not with a 10-year horizon.

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Appendix A

TABLE A-1

TWELVE-SECTOR CURRENT INPUT-OUTPUT COEFFICIENTS (MATRIX A) FOR PAKISTAN: 1959/60

Consuming sectors → / Producing sectors ↓	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
I	.04620	.00067	.41693	.28078	.04996	.02687	.00179	—	—	.76130	—	.00096
II	—	—	.00240	.00638	.00065	.15002	.00290	.00107	—	.00052	.08132	—
III	.00231	—	.03249	.00072	—	.04089	—	—	—	—	—	.00076
IV	—	—	.00447	.06750	.00412	.02669	.00772	.02233	—	—	—	.00529
V	—	—	.01452	.01103	.20392	.04372	.00394	.00238	.02033	—	—	.00875
VI	.00252	.00863	.00931	.02903	.15654	.09527	.02080	.00480	.11467	—	.04699	.01918
VII	—	—	.00702	.01469	.03102	.01196	.29534	.06929	.10469	.00138	—	.00046
VIII	.00066	—	—	—	—	—	—	.11105	.00130	—	—	.00213
IX	.00466	—	—	—	—	—	—	—	—	—	—	—
X	—	—	—	—	—	—	—	—	.06608	.06487	—	—
XI	.00014	.01853	.01048	.01361	.00284	.00745	.00456	.00286	.00048	—	—	.00132
XII	.02209	.10362	.23361	.21353	.36679	.26211	.26414	.56225	.13033	.07308	.11858	.10238

Source: [5].

TABLE A-2

EIGHT-SECTOR CURRENT IMPORT COEFFICIENTS MATRIX (MATRIX M) FOR PAKISTAN: 1959/60

Consuming sectors → / Producing sectors ↓	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
I	.00004	.00067	.04520	.01388	.00802	.01339	.00079	—	—	—	—	—
II	—	—	—	—	—	.07192	.00056	—	—	.00024	.04392	—
III	—	—	—	—	—	.02562	—	—	—	—	—	—
IV	—	—	.00089	.02142	.00193	.00417	.00695	.01876	—	—	—	.00196
V	—	—	.00227	.00558	.04993	.00404	.00003	.00238	.01015	—	—	—
VI	.00220	.00695	.00640	.02328	.06246	.06873	.00411	.00428	.02710	—	.02415	.00984
VII	—	—	.00230	.00886	.00809	.00156	.29534	.02609	.09341	.00109	—	.00038
VIII	.00066	—	—	—	—	—	—	.09522	.00130	—	—	.00213

Source: [5].

TABLE A-3

THREE-SECTOR FIXED CAPITAL COEFFICIENTS MATRIX (MATRIX B) FOR PAKISTAN: 1962/63

Consuming sectors → / Producing sectors ↓	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
VII	0.210	1.070	0.250	0.260	0.300	0.490	0.490	0.400	0.100	0.240	2.950	0.150
VIII	—	0.450	0.150	0.100	0.050	0.100	0.150	0.050	0.050	—	0.150	0.400
IX	1.270	1.140	0.200	0.500	0.500	0.460	1.600	2.000	0.640	0.240	3.200	1.000

TABLE A-3a

INVENTORY COEFFICIENTS (N_{ii})

0.150	0.500	0.200	0.306	0.230	0.340	0.520	0.840	—	0.150	—	—

TABLE A-3b

SECTORAL CAPITAL COEFFICIENTS (B_i)

1.630	3.160	0.800	1.166	1.080	1.390	2.560	3.290	0.790	0.630	6.300	1.550

TABLE A-4

INITIAL-YEAR ESTIMATES OF DOMESTIC PRODUCTION AND IMPORTS AND THEIR DISTRIBUTION BY USES

Sectors	X_o	Z_o	$\frac{Z_o}{X_o+Z_o}$	C_o	E_o	J_o	J_o^m	w_o	$\frac{w_o}{Z_o}$	$\frac{R_o}{Z_o}$	$\frac{J_o^m}{Z_o}$
I	24066.7	510.4	2.08%	16611.9	1517.8	162.1	—	124.4	24.37%	15.63%	—
II	182.8	62.0	25.32	92.9	—	4.6	—	60.1	96.94	3.06	—
III	1464.2	288.7	19.72	1570.9	32.0	14.6	—	16.6	5.75	94.25	—
IV	3164.2	118.8	3.62	2505.0	414.5	48.4	—	105.0	88.38	11.62	—
V	555.6	90.0	13.94	226.5	10.1	6.4	—	84.8	94.22	5.78	—
VI	649.6	817.5	55.72	520.1	9.2	11.0	—	424.8	51.96	48.04	—
VII	261.9	1372.6	83.98	773.1	35.7	574.6	459.7	429.8	27.33	35.20	37.47%
VIII	376.0	543.2	59.09	311.1	6.6	405.4	324.3	79.6	23.10	25.64	44.20
IX	3504.6	—	—	775.2	—	2723.2	—	—	—	—	—
X	1722.1	—	—	1385.7	—	12.9	—	—	—	—	—
XI	292.3	—	—	201.6	—	—	—	—	—	—	—
XII	17048.7	—	—	7924.0	—	—	—	—	—	—	—

Key: X_o = domestic output, Z_o = total imports, C_o = consumption, E_o = exports, J_o = total investment goods, J_o^m = imported investment goods, w_o = inter-industrial imports, R_o = nonessential imports.

TABLE A-5

INCREMENTAL CONSUMPTION VECTORS, C_{10}—C_0, CORRESPONDING TO DIFFERENT RATES OF GROWTH OF OVERALL CONSUMPTION

(million rupees)

Annual growth rate of consumption → / Sectors ↓	.04	.045	.05	.055	.06	.065	.07	.075	.08
I	7,292.6	8,281.0	9,234.6	10,249.5	11,279.5	12,359.3	13,472.3	14,635.8	15,831.4
II	32.1	34.0	35.9	37.7	39.7	41.6	43.5	45.5	47.6
III	882.8	1,051.9	1,231.6	1,421.7	1,624.3	1,838.0	2,067.3	2,304.5	2,559.0
IV	1,407.8	1,677.3	1,963.9	2,267.0	2,590.2	2,930.9	3,296.6	3,674.8	4,080.6
V	127.3	151.7	177.6	205.0	234.2	265.0	298.1	332.3	369.0
VI	359.9	447.0	541.9	644.9	756.7	879.0	1,011.1	1,153.6	1,309.1
VII	606.1	767.7	952.4	1,153.5	1,375.3	1,616.6	1,888.7	2,181.7	2,510.3
VIII	289.3	379.4	481.2	596.4	726.4	872.9	1,040.3	1,223.2	1,434.5
IX	536.4	666.3	807.7	961.2	1,127.9	1,310.1	1,507.0	1,719.4	1,951.2
X	778.8	927.7	1,086.4	1,254.1	1,432.8	1,621.3	1,823.8	2,032.8	2,257.3
XI	113.3	135.7	158.1	182.4	208.4	235.9	265.3	295.7	328.4
XII	3,334.4	3,635.3	3,978.6	4,273.8	4,577.1	4,858.5	5,037.6	5,238.6	5,377.4

TABLE A-6

SECTORAL EXPENDITURE ELASTICITIES

Sector		Elasticity
I	Agriculture	0.8
II	Mining	0.3
III	Food processing	1.4
IV	Textiles	1.4
V	Woodwork and paper	1.4
VI	Chemicals	2.0
VII	Machinery	2.4
VIII	Transport equipment	3.0
IX	Construction	2.0
X	Cottage industries	1.4
XI	Electric, power and gas	1.4
XII	Services	1.0

TABLE A-7

EXPORT ESTIMATES FOR 1972/73

Sector	Estimate I	Estimate II
I	2,926.0	3,218.6
II	65.0	71.5
III	80.0	88.0
IV	1,155.0	1,270.5
V	242.0	266.2
VI	100.0	110.0
VII	100.0	110.0
VIII	11.6	12.8
Total	4,679.6	5,147.6

TABLE A-8

"Y" VECTORS CORRESPONDING TO DIFFERENT OVERALL RATES OF GROWTH OF CONSUMPTION

(million rupees)

Annual growth rate of total consumption → / Sector ↓	.04	.045	.05	.055	.06	.065	.07	.075	.08
I	9,007.8	9,996.2	10,949.2	11,964.7	12,994.7	14,074.5	15,187.0	16,351.0	17,546.6
II	154.5	156.5	158.4	160.2	162.2	164.1	166.0	168.0	170.1
III	1,204.5	1,374.0	1,553.7	1,743.8	1,946.4	2,160.1	2,389.4	2,626.6	2,881.1
IV	2,218.7	2,488.2	2,774.8	3,077.9	3,401.1	3,741.8	4,107.5	4,485.7	4,891.5
V	409.1	433.5	459.4	486.8	516.0	546.8	579.9	514.1	550.8
VI	1,257.2	1,344.3	1,439.2	1,542.2	1,654.0	1,776.3	1,908.4	2,050.9	2,206.4
VII	1,732.9	1,894.5	2,079.2	2,280.3	2,502.1	2,743.1	3,015.5	3,308.5	3,637.1
VIII	335.3	425.4	527.2	642.4	772.4	918.9	1,086.3	1,269.2	1,480.5
IX	—1,791.9	—1,662.0	—1,520.6	—1,367.1	—1,200.4	—1,018.2	— 821.3	— 608.9	—377.1
X	778.8	927.9	1,086.4	1,254.1	1,432.8	1,621.3	1,823.6	2,032.8	2,257.3
XI	113.3	135.0	158.1	182.4	208.4	235.9	265.3	295.7	328.4
XII	3,334.3	3,635.3	3,978.6	4,237.8	4,577.1	4,858.5	5,037.6	5,238.6	5,377.4

Appendix B

A NOTE ON APPENDIX B

The tables in this appendix are based on the optimal solutions of the different runs of our single-period programming model, obtained by changing different parameters and exogenous variables. The identification of different runs with reference to these parametric changes is given in Table II (p. 123).

Appendix Table B-1 provides, for each case the different macroeconomic aggregates for 1972/73, the terminal year of our planning period. The derivation of these aggregates is discussed and the notation described on page 125.

Appendix Table B-2 gives, for each case, the value of increases in domestic production for each sector, between 1962/63 and 1972/73.

Appendix Tables B-3 and B-4, presented together for each case, give, respectively, the values of total sectoral imports in the terminal year 1972/73 (Z_1, for example, represents total imports of agricultural products in 1972/73) and the non-essential imports of each sector in 1972/73.

All values in Appendix Tables B-1 through B-4 are in million rupees.

Whereas Appendix Tables B-2 through B-4 represent the primal solution of each run, Appendix Table B-5 represents the dual solution. As many of the primal solutions have the same dual solution the number of the latter is necessarily smaller than that of the former.

TABLE B-1

MACROECONOMIC AGGREGATES

(Group I — Case A)

Variable ↓ / Rate of growth of consumption →	.04	.045	.05	.055	.06	.065	.07	.075	.08
$\bar{Z}_{10}$	4,407.4	4,880.5	5,389.5	5,921.5	6,502.3	7,114.4	7,761.3	8,411.0	9,149.5
F_{10}	—272.3	200.0	709.9	1,241.9	1,822.4	2,434.8	3,081.7	3,731.4	4,469.9
$\bar{J}_{10}$	6,984.9	7,949.5	8,965.3	10,020.1	11,161.3	12,354.0	13,596.0	14,863.5	18,256.4
S_{10}	7,257.2	7,748.6	8,225.4	8,778.2	9,338.9	9,919.2	10,514.3	11,132.1	11,786.5
$\bar{C}_{10}$	48,595.8	50,989.5	53,484.9	56,082.2	58,807.5	61,664.1	64,586.4	67,672.9	70,890.8
Y_{10}	55,853.0	58,738.1	61,710.3	64,860.4	68,146.4	71,583.3	75,103.7	78,805.0	82,677.4
S_{10}/Y_{10}	12.94%	13.20%	13.39%	13.50%	13.70%	13.87%	14.00%	14.15%	14.26%
$\frac{S_{10}-S_0}{Y_{10}-Y_0}$	24.2%	23.3%	22.5%	22.0%	21.5%	21.1%	20.7%	20.4%	20.1%

TABLE B-1

MACROECONOMIC AGGREGATES

(Group II—Case A)

Variable ↓ / Rate of growth of consumption →	.04	.045	.05	.055	.06	.065	.07	.075	.08
$\bar{Z}_{10}$	4,832.6	5,240.0	5,690.2	6,175.6	6,711.6	7,274.2	7,814.9	8,463.7	8,505.7
$\bar{F}_{10}$	153.0	560.4	1,010.6	1,496.0	2,032.0	2,594.6	3,135.3	3,784.1	3,826.1
$\bar{J}_{10}$	6,317.1	7,322.9	8,397.0	9,570.3	10,749.8	12,025.8	13,297.0	14,717.5	15,023.9
S_{10}	6,164.1	6,762.5	7,386.4	8,074.3	8,717.0	9,431.2	10,161.8	10,933.4	11,737.8
$\bar{C}_{10}$	48,595.8	50,989.5	53,484.9	56,082.2	58,807.5	61.664.1	64,586.4	67,672.9	70,890.5
Y_{10}	54,759.9	57,752.0	60,871.3	64,156.5	67,524.5	71,095.3	74,748.2	78,606.3	82,628.3
S_{10}/Y_{10}	11.25%	11.71%	12.13%	12.50%	12.90%	13.27%	13.59%	13.91%	14.20%
$\frac{S_{10}-S_o}{Y_{10}-Y_o}$	20%	20%	20%	20%	20%	20%	20%	20%	20%

TABLE B-1

MACROECONOMIC AGGREGATES

(Group III—Case B)

Variable ↓ / Rate of growth of consumption →	.04	.05	.06	.07	.08
$\bar{Z}_{10}$	6617.6	7342.5	8183.0	9196.3	10379.2
F_{10}	1938.6	2662.9	3503.4	4516.7	5700.0
$\bar{J}_{10}$	4848.2	6657.2	8767.0	11302.9	14263.1
S_{10}	2909.6	3994.3	5263.6	6786.2	8563.1
$\bar{C}_{10}$	48595.8	53584.9	58807.5	64586.4	70890.8
Y_{10}	51505.4	57579.2	64071.1	71372.6	79453.9
$\frac{S_{10}}{Y_{10}}$	5.65%	6.94%	8.22%	9.51%	10.78%

TABLE B-1

MACROECONOMIC AGGREGATES

(Group IV—Case A)

Rate of growth of consumption → / Variable ↓	.04	.045	.05	.055	.06	.065	.07	.075	.08
$\bar{Z}_{10}$	6,540.8	6,848.3	7,173.3	7,511.1	7,877.0	8,260.0	8,636.7	9,066.6	9,516.2
F_{10}	1,861.2	2,168.7	2,493.7	2,831.5	3,197.4	3,580.4	3,957.1	4,387.0	4,836.6
$\bar{J}_{10}$	6,203.9	7,229.0	8,312.3	9,438.2	10,658.0	11,934.2	13,190.0	14,623.4	16,122.1
S_{10}	4,342.7	5,060.3	5,818.6	6,606.7	7,460.6	8,354.2	9,233.2	10,236.4	11,285.5
$\bar{C}_{10}$	48,595.8	50,989.5	53,484.9	56,082.2	58,807.5	61,664.1	64,586.4	67,672.9	70,890.8
Y_{10}	52,938.5	56,049.8	59,303.5	62,688.9	66,268.1	70,018.3	73,819.6	77,909.3	82,176.3
S_{10}/Y_{10}	8.20%	9.03%	9.81%	10.54%	11.26%	11.93%	12.51%	13.14%	13.73%
$\frac{S_{10}-S_0}{Y_{10}-Y_0}$	11.85%	13.51%	14.83%	15.86%	16.78%	17.53%	18.08%	18.79%	19.23%

TABLE B-2

VALUES OF INCREASES IN DOMESTIC PRODUCTION

(Group I — Case A)

Annual growth rate of total consumption → / Incremental domestic outputs ↓	.04	.045	.05	.055	.06	.065	.07	.075	.08
x_1	11677.4	13087.4	14480.8	15962.0	17485.5	19085.1	20750.6	22480.7	24288.0
x_2	249.9	272.8	297.1	322.6	350.4	379.8	411.0	442.7	478.4
x_3	1325.4	1513.6	1713.1	1924.0	2148.8	2385.8	2639.9	2902.7	3184.8
x_4	2396.5	2702.7	3028.5	3372.7	3740.2	4127.5	4542.6	4971.5	5432.5
x_5	620.6	684.3	752.8	824.0	901.2	982.0	1067.0	1031.0	1125.9
x_6	1355.7	1544.6	1747.1	1963.5	2197.9	2448.9	2715.6	2985.3	3293.1
x_7	1667.8	1886.5	2132.9	2399.5	2692.8	3010.0	3364.5	3739.6	4163.7
x_8	433.9	556.5	694.5	847.7	1020.6	1212.9	1429.4	1664.0	1933.8
x_9	2860.0	3630.0	4441.1	5290.4	6207.0	7172.3	8182.9	9230.0	10371.3
x_{10}	1060.4	1279.6	1512.0	1757.2	2019.4	2295.8	2590.7	2895.7	3224.3
x_{11}	197.2	230.1	265.3	302.2	341.8	383.7	428.4	474.3	524.3
x_{12}	6885.4	7736.5	8672.9	9552.5	10571.4	11569.8	12508.0	13452.9	14460.7

TABLE B-2

VALUES OF INCREASES IN DOMESTIC PRODUCTION

(Group II — Case A)

Rate of growth of consumption → / Incremental domestic outputs ↓	.04	.045	.05	.055	.06	.065	.07	.075	.08
x_1	11,648.4	13,061.5	14,457.8	15,942.6	17,469.5	19,072.9	20,739.6	22,476.7	24,287.8
x_2	242.9	267.2	292.8	319.0	347.4	377.5	408.4	441.9	478.4
x_3	1,323.9	1,512.4	1,712.0	1,923.1	2,148.0	2,385.3	2,639.4	2,902.5	3,184.8
x_4	2,390.9	2,697.2	3,023.0	3,368.1	3,736.4	4,124.6	4,540.1	4,970.5	5,432.5
x_5	603.7	670.3	741.2	814.2	893.1	975.8	1,061.0	1,029.0	1,125.9
x_6	1,299.2	1,497.7	1,709.3	1,931.0	2,171.1	2,428.5	2,692.5	2,978.6	3,293.1
x_7	1,079.5	1,587.2	2,083.5	2,357.3	2,658.4	2,983.8	3,272.5	3,730.9	4,163.7
x_8	0	0	36.4	291.6	562.7	863.1	1,169.7	1,548.6	1,933.8
x_9	2,453.4	3,265.2	4,114.6	5,014.5	5,979.8	6,998.7	8,028.5	9,172.7	10,371.3
x_{10}	1,031.0	1,253.1	1,488.3	1,737.2	2,002.9	2,283.3	2,579.5	2,891.6	3,224.3
x_{11}	191.7	225.7	261.8	299.3	339.5	381.9	426.6	473.7	524.3
x_{12}	6,351.8	7,221.7	8,177.8	9,134.1	10,226.9	11,306.6	12, 284.2	13,366.0	14,460.7

TABLE B-2

VALUES OF INCREASES IN DOMESTIC PRODUCTION

(Group III—Case B)

Rate of growth of consumption → / Incremental domestic outputs ↓	.04	.05	.06	.07	.08
x_1	11306.5	14321.0	17355.8	20647.5	24199.4
x_2	123.0	180.8	318.3	385.2	459.3
x_3	1300.2	1690.2	2142.5	2634.8	3180.5
x_4	1572.7	2983.1	3718.8	4522.9	5413.4
x_5	0	0	375.9	1007.6	1078.3
x_6	0	469.4	1930.4	2508.9	3132.7
x_7	0	0	0	1125.1	3771.8
x_8	0	0	0	0	0
x_9	1617.7	3073.7	4710.4	6739.1	9120.3
x_{10}	970.5	1413.0	1911.0	2486.1	3133.8
x_{11}	159.6	235.6	318.9	408.5	509.3
x_{12}	5054.6	6684.7	8604.2	10636.7	12690.2

TABLE B-2

VALUES OF INCREASES IN DOMESTIC PRODUCTION

(Group IV — Case A)

Rate of growth of consumption → / Incremental domestic outputs ↓	.04	.045	.05	.055	.06	.065	.07	.075	.08
x_1	9,116.3	10,725.0	12,339.4	14,053.7	15,835.2	17,709.9	19,637.0	21,693.6	23,847.7
x_2	244.5	267.8	292.5	318.6	346.9	376.8	407.5	441.0	477.5
x_3	1,317.9	1,506.7	1,706.8	1,918.4	2,143.9	2,381.8	2,636.5	2,900.4	3,183.5
x_4	2,394.2	2,700.5	3,026.5	3,371.0	3,738.7	4,126.2	4,541.0	4,970.8	5,432.1
x_5	607.2	672.3	741.9	814.3	892.8	975.0	1,059.4	1,027.1	1,123.7
x_6	1,293.6	1,487.3	1,695.8	1,917.2	2,157.8	2,415.6	2,678.8	2,966.2	3,282.4
x_7	1,636.7	1,857.8	2,106.8	2,376.3	2,672.7	2,993.3	3,276.3	3,730.0	4,158.4
x_8	429.8	552.8	691.1	844.6	1,018.0	1,210.7	1,394.2	1,662.8	1,933.1
x_9	2,255.5	3,072.4	3,935.7	4,840.6	5,817.5	6,847.7	7,878.7	9,044.2	10,267.4
x_{10}	1,016.7	1,239.2	1,475.4	1,724.6	1,991.2	2,272.3	2,568.6	2,882.3	3,216.8
x_{11}	195.5	228.5	263.8	300.8	340.7	382.8	427.0	473.8	524.0
x_{12}	6,692.5	7,558.4	8,511.6	9,408.8	10,447.1	11,466.2	12,370.9	13,396.6	14,427.5

TABLE B-3

VALUE OF TOTAL SECTORAL IMPORTS IN TERMINAL YEAR, 1972/73

(Group I — Case A)

Annual growth rate of total consumption → / Total imports ↓	.04	.045	.05	.055	.06	.065	.07	.075	.08
Z_1	242.6	258.7	275.8	293.8	313.2	333.6	355.5	377.0	401.5
Z_2	167.5	182.7	199.0	216.4	235.2	255.3	276.7	298.4	323.1
Z_3	51.3	56.2	61.4	66.9	72.9	79.3	86.2	93.1	101.0
Z_4	197.6	210.7	225.0	240.0	256.5	274.0	292.7	312.1	333.7
Z_5	167.7	181.9	197.0	212.8	229.9	248.0	266.9	280.4	301.9
Z_6	807.1	867.2	931.2	997.6	1069.8	1145.5	1224.4	1297.7	1386.5
Z_7	2156.5	2429.1	2721.6	3030.9	3366.2	3722.0	4102.0	4494.0	4931.0
Z_8	616.9	694.0	778.5	863.1	958.6	1056.7	1156.2	1258.3	1371.0

TABLE B-4

NONESSENTIAL IMPORTS, 1972/73

(Group I—Case A)

Annual growth rate of total consumption → / Nonessential imports ↓	.04	.045	.05	.055	.06	.065	.07	.075	0.8
R_1	0	0	0	0	0	0	0	0	0
R_2	0	0	0	0	0	0	0	0	0
R_3	0	0	0	0	0	0	0	0	0
R_4	0	0	0	0	0	0	0	0	0
R_5	0	0	0	0	0	0	0	0	0
R_6	0	0	0	0	0	0	0	0	0
R_7	0	0	0	0	0	0	0	0	0
R_8	0	0	0	0	0	0	0	0	0

TABLE B-3

VALUE OF TOTAL SECTORAL IMPORTS IN TERMINAL YEAR, 1972/73

(Group II—Case A)

Rate of growth of consumption → / Total Imports ↓	.04	.045	.05	.055	.06	.065	.07	.075	.08
Z_1	241.1	257.6	275.0	293.2	312.6	333.2	355.0	376.9	401.5
Z_2	162.8	178.9	196.1	213.9	233.1	253.8	274.9	297.9	323.1
Z_3	49.9	55.0	60.4	66.1	72.2	78.8	85.6	92.9	101.0
Z_4	183.9	196.8	211.0	228.2	246.8	266.6	286.6	309.6	333.7
Z_5	161.5	176.0	191.4	208.1	226.0	244.9	264.4	279.4	301.9
Z_6	781.3	844.2	910.8	980.3	1,055.6	1,134.6	1,214.4	1,294.1	1,386.5
Z_7	2,358.9	2,460.3	2,605.7	2,932.9	3,285.6	3,660.4	4,027.2	4,473.7	4,931.0
Z_8	893.1	1,071.3	1,239.9	1,252.9	1,279.6	1,301.9	1,306.9	1,339.2	1,371.0

TABLE B-4

NONESSENTIAL IMPORTS, 1972/73

(Group II — Case A)

Rate of growth of consumption → / Nonessential imports ↓	.04	.045	.05	.055	.06	.065	.07	.075	.08
R_1	0	0	0	0	0	0	0	0	0
R_2	0	0	0	0	0	0	0	0	0
R_3	0	0	0	0	0	0	0	0	0
R_4	0	0	0	0	0	0	0	0	0
R_5	0	0	0	0	0	0	0	0	0
R_6	0	0	0	0	0	0	0	0	0
R_7	504.5	233.8	0	0	0	0	0	0	0
R_8	361.8	468.5	557.0	470.7	337.5	296.1	191.5	97.7	1.0

TABLE B-3

VALUE OF TOTAL SECTORAL IMPORTS IN TERMINAL YEAR, 1972/73

(Group III — Case B)

Rate of growth of consumption → / Total imports ↓	.04	.05	.06	.07	.08
Z_1	205.5	249.2	302.6	349.9	397.7
Z_2	67.3	104.5	213.4	259.7	310.3
Z_3	16.6	28.6	66.1	80.9	96.9
Z_4	856.9	185.5	212.2	245.3	285.8
Z_5	522.4	658.3	557.3	244.9	281.4
Z_6	1625.9	1657.6	941.7	1132.3	1307.6
Z_7	2595.9	3385.6	4388.4	4858.5	5015.4
Z_8	727.0	1073.2	1501.4	2024.9	2684.1

TABLE B-4

NONESSENTIAL IMPORTS

(Group III — Case B)

Rate of growth of consumption → / Nonessential imports ↓	.04	.05	.06	.07	.08
R_1	0	0	0	0	0
R_2	0	0	0	0	0
R_3	0	0	0	0	0
R_4	707.1	0	0		0
R_5	409.5	520.0	372.5	0	0
R_6	1033.0	932.8	0	0	0
R_7	1411.5	1796.7	2304.4	1873.5	768.8
R_8	322.9	540.8	813.1	1163.0	1628.5

TABLE B-3

VALUE OF TOTAL SECTORAL IMPORTS IN TERMINAL YEAR, 1972/73

(Group IV—Case A)

Rate of growth of consumption → / Total imports ↓	.04	.045	.05	.055	.06	.065	.07	.075	.08
Z_1	2,588.1	2,422.1	2,236.9	2,041.4	1,824.2	1,593.0	1,372.2	1,097.8	804.6
Z_2	162.9	178.4	195.2	212.9	232.2	252.9	274.0	297.0	322.3
Z_3	49.7	54.7	60.0	65.7	71.9	78.5	85.2	92.6	100.7
Z_4	196.6	209.8	224.1	239.3	255.9	273.4	291.0	311.8	333.5
Z_5	160.7	175.1	191.1	207.6	225.4	244.1	263.2	278.3	300.6
Z_6	777.9	840.1	906.7	975.7	1,050.9	1,129.7	1,208.7	1,288.8	1,381.4
Z_7	2,006.1	2,290.3	2,595.9	2,918.8	3,269.3	3,641.2	4,001.8	4,447.8	4,905.2
Z_8	598.9	677.4	763.4	849.6	946.9	1,047.0	1,140.5	1,252.8	1,367.9

TABLE B-4

NONESSENTIAL IMPORTS, 1972/73

(Group IV—Case A)

Rate of growth of consumption → / Nonessential imports ↓	.04	.045	.05	.055	.06	.065	.07	.075	.08
R_1	2,346.9	2,164.8	1,962.3	1,748.7	1,512.3	1,260.2	1,017.7	721.2	403.4
R_2	0	0	0	0	0	0	0	0	0
R_3	0	0	0	0	0	0	0	0	0
R_4	0	0	0	0	0	0	0	0	0
R_5	0	0	0	0	0	0	0	0	0
R_6	0	0	0	0	0	0	0	0	0
R_7	0	0	0	0	0	0	0	0	0
R_8	0	0	0	0	0	0	0	0	0

TABLE B-5

VALUES OF DUAL VARIABLES IN DIFFERENT OPTIMAL BASES

Dual variables ↓ / Optimal bases →	1	2	3	4	5	6	7	8	9	10
p_1^x	.0910	.1794	.1946	.1996	.2266	.0968	.0973	.0972	.1184	.1221
p_2^x	.3078	.3770	.3874	.3874	.4041	.2035	.1735	.1936	.2356	.1588
p_3^x	.2180	.2801	.2899	.2899	.3084	.1512	.1324	.1449	.1763	.1656
p_4^x	.2175	.2874	.2987	.2987	.3258	.1551	.1398	.1493	.1817	.1747
p_5^x	.3823	.4167	.4217	.4217	.4252	.2250	.1826	.2107	.2565	.2273
p_6^x	.4179	.4311	.4324	.4324	.4296	.2328	.1846	.2162	.2630	.2253
p_7^x	.5442	.5676	.5707	.5707	.4296	.3064	.1846	.2852	.3471	.2273
p_8^x	.4600	.6340	.5707	.5707	.4296	.3423	.1846	.2852	.3471	.2273
p_9^x	.2518	.2588	.2595	.2595	.2578	.1398	.1109	.1299	.1577	.1377
p_{10}^x	.1355	.2409	.2589	.2589	.2960	.1301	.1272	.1295	.1576	.1594
p_{11}^x	.6305	.8317	.8656	.8656	.9260	.4487	.3975	.4325	.5265	.4957
p_{12}^x	.1506	.2174	.2276	.2276	.2489	.1174	.1070	.1139	.1385	.1338

(*Contd.*)

TABLE B-5 (*Contd.*)

Dual variables ↓ / Optimal bases →	1	2	3	4	5	6	7	8	9	10
p_1^z	.9090	.4550	.3761	.3761	.2030	.2455	.0873	.1880	.2288	.1052
p_2^z	.6922	.2570	.1833	.1833	.0255	.1388	.0111	.0916	.1115	.0685
p_3^z	.7820	.3540	.2807	.2807	.1212	.1911	.0522	.1403	.1708	.0618
p_4^z	.7825	.3466	.2719	.2719	.1038	.1871	.0447	.1359	.1654	.0526
p_5^z	.6177	.2173	.1490	.1490	.0045	.1173	.0020	.0744	.0906	.0000
p_6^z	.5821	.2029	.1382	.1382	.0000	.1095	.0000	.0690	.0841	.0020
p_7^z	.4558	.0664	.0000	.0000	.0000	.0359	.0000	.0000	.0000	.0000
p_8^z	.5400	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
p_s, p_f^*		.3650	.4287	.4287	.5704	.6577	.8159	.7148	.6529	.7727

*These are the dual variables corresponding to the savings constraint (16) in bases 2-5 and to the foreign-aid constraint (18) in bases 6-10.

The Possibilities of The East Pakistan Economy During the Fourth Five Year Plan

Azizur Rahman Khan

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The Possibilities of The East Pakistan Economy During the Fourth Five Year Plan

Azizur Rahman Khan

1. INTRODUCTION

1.1 The Objective

The purpose of the present set of exercises is to study the possibilities of the East Pakistan economy during the fourth five-year plan period (1970-75) with the help of an explicit model. The model we employ is a multisectoral one of the simple consistency type. It is a *multisectoral* or *detailed* model for planning in the sense that it distinguishes as many as twenty-nine producing sectors of the economy of East Pakistan and explicitly takes into account all intersectoral deliveries of current and capital goods. The definite advantages of a multisectoral model over its alternative, a highly aggregated model, need hardly be pointed out. Since sectors with widely varying resource-requirements can easily have widely divergent rates of growth, the use of fixed overall incremental capital and foreign-exchange coefficients can hardly be a reliable method of estimating the size of a development programme. Moreover, it is not enough to know the total size of a development programme. From an operational standpoint it is essential to know in some details the pattern of distribution of resources among various types of activities.

Ours is a simple consistency model, not a usually more attractive optimizing model. In an optimizing model of this size it is necessary not only to specify all the structural constraints but also a large number of "realistic" cons-

traints to guard partly against the tendency of such linear models to select extreme points and partly against the overemphasis on a single objective. This not only requires a great deal of additional practical knowledge and anticipation but also renders the size of the programme so large as to make its computation much more difficult. On the other hand, a consistency model has very important virtues. Determining the feasibility of a plan is itself an important achievement. In addition, it is possible to generate a set of alternative feasible plans by varying the targets and policies to quantify important trade-off ratios between sets of resources and objectives. These are useful guides in formulating a more desirable plan and hence, to a certain extent, substitute for a fully optimizing model.

Our model is essentially a terminal-year exercise: it attempts to project the possible state of affairs in the terminal year of the Fourth Plan (1974/75) which are consistent with certain targets and objectives as well as other historically determined conditions. It also estimates the cost in terms of scarce resources, *e.g.*, investment and foreign exchange, which must be incurred over the plan period to reach the stipulated state of affairs in 1974/75. It is not, however, a fully intertemporal model because it does not explicitly specify the state of affairs in each of the intervening periods. A fully intertemporal model would be several times the size of a terminal-year model and hence would entail much greater computational burden. It would, however, be worthwhile to undertake this additional computational burden if no other problems were involved. But the use of an intertemporal model requires detailed information about investment-output lags and their distribution. No simple assumption about some average time lag would do. It is well known, however, that the knowledge about time lags is almost completely nonexistent. Nor is it advisable to try to "guess" such a large number of lags, one for each type of fixed asset for each sector. The results would usually be sensitive to the assumed values of lags.

Although our model is of the terminal-year variety, we do say something about the time-path of investment during the plan period and about the immediate post-terminal growth. This is incorporated in the investment demand function which specifies a given pattern of growth in investment and some average time lag between investment and output.

The model finds out the cost in terms of scarce resources of alternative growth targets, given certain export possibilities and the possibilities of import substitution both with respect to West Pakistan and the rest of the world. It also distributes these resources over the twenty-nine producing sectors as well as finds out the rates of expansion of these sectors. The model also quantifies the gaps between the supplies and the requirements of resources.

The two resources we single out are investment and foreign exchange.

Undoubtedly, these are the two most important resources whose shortages constrain the development of most underdeveloped countries, including both the regions of Pakistan. This, however, is not to suggest that there are no other scarce factors. Although the supply of unskilled labour is nearly perfectly elastic, the supply of skilled labour is not. It would be highly desirable to make the demand for skilled labour endogenous. Unfortunately, the state of statistical information does not allow us to do so.

The model provides quantitative information about the gaps between the requirements and the supplies of the two resources, *viz.*, the savings-investment gap and the foreign-exchange (or export-import) gap. By varying the target growth rate, export target and the import-substitution possibilities, we can reduce or enlarge these gaps and get some ideas about the important trade-off ratios.

1.2 Sector Classification

We want projections on a reasonably detailed basis so that they can be useful in deciding the broad outline of the plan. We, however, have to keep the details limited in order to be able to derive most of the information about intersectoral relations from existing sources and solve the system repeatedly using the computational resources available within the country. The sector classification in Table I is used, keeping these considerations in mind.

TABLE I

SECTORS IN THE MODEL

1. Rice-growing and processing
2. Jute-growing and baling
3. Tea
4. All other major and minor crops, livestock, forestry and fishery
5. Sugar
6. Edible oils
7. Cigarettes and tobacco products
8. Miscellaneous food and drinks
9. Cotton textiles
10. Jute textiles
11. Other textiles
12. Paper and printing
13. Leather and rubber products
14. Fertilizer
15. Chemicals
16. Cement
17. Basic metals
18. Metal products
19. Machineries

20. Transport equipment
21. Construction
22. Miscellaneous manufactures
23. Coal and petroleum
24. Electricity and gas
25. Transport
26. Trade
27. Housing
28. Government
29. Miscellaneous services

Each of the first three sectors includes growing, harvesting and processing of a principal crop. The fourth sector, called all other agriculture for short, is a rather heterogeneous sector of residual category: it includes the growing and processing of non-rice-tea food crops and cotton, growing of sugarcane, fruits and vegetables, livestock products, forestry, fishery, oilseeds and tobacco, including its minor processing. It is assumed that agricultural activities of sectors 1 to 4 include such ancillary activities as trading and transporting crops to rural processing units (farmers themselves in many cases) and to rural consumers. On the amounts sold in the urban markets and the large-scale manufacturers and the amount exported, however, trade and transport margins have been charged.

The next four sectors are food-processing industries. Sectors 9 to 17 and 22 and 23 produce manufactured consumption and intermediate goods. Titles explain the contents of these sectors reasonably well. It should be emphasized that all manufacturing sectors (and the processing of crops) include large-scale and small-scale activities. Any projection work using this kind of sector-aggregation scheme will require an *a priori* decision regarding the incremental importance of each part of each sector. Since ours is a consistency model, we have to make the projection of such shares outside the model.

Mining and quarrying activities have been vertically integrated with the manufacturing sectors to which they deliver. This procedure is preferable to aggregating together very different mining activities. Since mining and quarrying are trivial in East Pakistan this has no significant effect.

Five of our sectors, 18 to 22, supply fixed capital. One of them, construction, supplies building and construction capital while the other four capital-supplying sectors provide plant, machinery, transport equipment, office equipment, furnitures and fixtures. Of these the quantity of fixed capital supplied by metal products (18) and miscellaneous manufactures (22) is very small. They are predominantly consumption-goods sectors.

The contents of the remaining sectors — transport, trade, and the services — are sufficiently explained by their titles.

We have not made any detailed discussion of the justification of the procedures outlined above. This has, however, been provided by Khan and MacEwan [15] in details.

1.3 Prices

All the exercises are done at 1964/65 market (*i.e.*, purchasers') prices. The reason for using the 1964/65 prices is simply that 1964/65 seems to be the last year at whose prices most of the information is available. An additional advantage is that 1964/65 is the base year of the current five-year plan. The results can of course be transformed into any other year's price as long as we know the sectoral price indices for that year.

The significance of the use of purchasers' price in an intersectoral model is that each industry is assumed to pay the trade and transport costs on all its sales of output, and the value of these services together form the trade and transport input into that industry. The reason we use the purchasers' price is that our basic sources of data on intersectoral purchases all use such prices.

The foreign-trade entries must also be made at purchasers' prices. Exports abroad and imports from abroad are stated in Central Statistical Office's *Foreign Trade Statistics* respectively at *f.o.b.* and *c.i.f.* prices. For our purpose, it is satisfactory to treat the *f.o.b.* price as the relevant purchasers' price of exports. The purchasers' price of imports is, however, higher than the *c.i.f.* price by the amount of import duty and trade and transportation costs incurred in taking the imported goods to its various users within the region from the port of entry. Imports from West Pakistan must also be similarly treated. We shall see later that the sectoral balance equations for transport and trade have to be especially adjusted to take into account the regional transport and trade required for the marketing of the imported goods.

2. THE MODEL

2.1 Notations

In the following algebraic notations the subscripts i, j denote the producing sectors (i , j = 1, 2, . . . , 29). In case of double subscripts, the first refers to the supplying sector and the second to the using sector. Unsuperscripted variables denote changes over the Fourth Plan, *i.e.*, between 1969/70 and 1974/75. Superscript T denotes value in 1974/75, 0 denotes value in 1969/70 and, in general, t denotes value in year t (t = 1 refers to 1970/71, t = 2 to 1971/72, . . . , t=5=T to 1974/75). We denote for sector i

X_i = gross value of production
X_{ij} = current input supplied to sector j
B_{ij} = fixed capital input supplied to sector j for new capacity creation

W_{ij} = working capital supplied to sector j
M_i = endogenous foreign import
M_i' = endogenous import from West Pakistan
C_i = personal consumption
G_i = public consumption (*i.e.*, expenditure on public administration and defence)
E_i = foreign export
E_i' = export to West Pakistan
R_i = replacement demand for fixed capital
$\bar{M}_i$ = exogenous foreign import for final consumption
$\bar{M}_i'$ = exogenous import from West Pakistan for final consumption
V_j = gross value added at market price (*i.e.*, gross value added at factor cost plus indirect taxes)

2.2 Sectoral Balance Between Supply and Demand

The first set of equations of the model refers to the balance between availability and use of the products of each sector

$$(a)\ X_i + M_i + M_i' = \sum_j X_{ij} + \sum_j B_{ij} + \sum_j W_{ij} + C_i + G_i + E_i + E_i' + R_i - \bar{M}_i - \bar{M}_i'$$

The left-hand side elements are components of supply while the right-hand side elements are sources of demand. Only for a few sectors will all the elements be non-zero. For the non-tradable sectors (services, electricity, for example), all export and import components will be zero. Fixed-capital deliveries and replacement demand will exist only for the five fixed-capital supplying sectors (18 through 22). Personal consumption of non-consumption-goods supplying sectors (*e.g.*, basic metal, construction) will of course be zero. Public consumption consists only of one sector's services, government (*i.e.*, public administration and defence).

Exogenous imports refer to those use-specific complementary demands for imports which are required for final consumption. They are related to the latter through fixed coefficients. Since final consumption in the model is an exogenous target, the demand for such imports may also be shown as exogenous.

2.3 Current Input Demand Function

Following the standard Leontief type of input-output assumption we make the intersectoral current input deliveries proportional to the output levels of the using sectors

$$(b)\ X_{ij} = a_{ij} X_j.$$

Since our variables denote *changes* and not *total* levels we need not assume simple proportionality between total current input of each type and total output of the using sector. We merely assume fixed *incremental* current input-output coefficients.

The value of current inputs is defined as the actual amounts used up in the production process. We have not included rent as current input to producing sectors and have no sector producing rental services of non-residential buildings. Instead, we have adopted the more usual, and preferable, alternative of treating all non-residential buildings as capital in the relevant producing sectors. The only parts of "depreciation" which we have included as current inputs are purchases of spare parts and repair and maintenance of houses. Other "depreciation" charges are treated as replacement. Alternatives could conceivably be desirable but empirically would be more difficult.

2.4 Fixed Investment Demand Function and Stock-Flow Conversion Factor

The next step consists of expressing the deliveries of fixed-capital inputs as linear functions of the output levels of the receiving sectors. We can express the assumption of fixed capital-output ratios as follows

$$\int_{t=-\theta}^{5-\theta} B_{ij}^t \, dt = b_{ij} X_j$$

where $\int_{t=-\theta}^{5-\theta} B_{ij}^t \, dt$ is total fixed capital input of the i-*th* type in the j-*th* sector during the five years from $t = -\theta$ to $t = 5 - \theta$, b_{ij} is the incremental coefficient of the i-*th* type of fixed capital into the j-*th* sector and θ is the average investment output lag.

Our balance equations, however, contain changes in investment in year T over year 0, *i.e.*, $B_{ij} = B_{ij}^T - B_{ij}^0$. We know B_{ij}^0 as given base-year magnitude. Hence, all we have to do is to express the terminal-year investment, B_{ij}^T, as proportion of total investment between $t = -\theta$ and $t = 5-\theta$. This we do by

assuming

$$B_{ij}^{T} = h_1 \int_{t=-\theta}^{5-\theta} B_{ij}^{t}\, dt$$

i.e., the terminal-year investment in fixed capital of type i in sector j is a given proportion h_1 of total fixed capital of type i required to build up an additional X_j amount of output capacity in sector j with an average time lag of θ years.

What is the rationale behind the assumption of this kind of "stock-flow conversion factor"? Usually its value is determined by assuming some kind of smooth growth in investment over time. Let us assume that investment of each type increases exponentially over the plan period

$$B_{ij}^{t} = e^{rt}$$

where e^{rt} is the investment index in time t, with the annual exponential growth rate of r. We have

$$\int_{t=-\theta}^{5-\theta} B_{ij}^{t}dt = \int_{t=-\theta}^{5-\theta} e^{rt}dt = \frac{1}{r}\left[e^{r(5-\theta)} - e^{-\theta r}\right]$$

We, therefore, have

$$h_1 = \frac{e^{5r}}{\frac{1}{r}\left[e^{r(5-\theta)} - e^{-\theta r}\right]} = \frac{re^{\theta r}}{1-e^{-5r}}.$$

We now have an expression for B_{ij}:

(c) $B_{ij} = B_{ij}^{T} - B_{ij}^{0} = h_1 b_{ij} X_j - B_{ij}^{0}$.

The assumption of some kind of stock-flow conversion factor is inevitable in the comparative static models of planning and growth. Variants of such assumption have been used by Manne [19 ; 20], Sandee [24] and others. One advantage of the stock-flow conversion factor is its relative insensitivity to r and θ. Table II gives the values of h_1 for alternative values of θ and r.

TABLE II

STOCK-FLOW CONVERSION FACTORS FOR ALTERNATIVE θ AND r

	θ	r	h_1
1.5	years	.07	.263
1.5	years	.08	.274
1.5	years	.10	.296
1.25	years	.07	.259
1.25	years	.08	.268
0	years	.07	.237
0	years	.08	.243
0	years	.10	.254

We use the value of .296 which would result from the assumption that the gestation lag is on the average a year and a half and that investment will grow exponentially at 10 per cent per year[1]. However, it should be noted that by using the value of .296 we need not commit ourselves to any single value of r or θ. A large number of alternative combinations of r and θ would give the same value for h_1. In fact, the stock-flow factor can be given a more general interpretation than is implied by the assumption of some kind of smooth growth in investment[2].

[1]It has been pointed out to me that in the formulation of the five-year plans, annual investments are discrete variables whereas in the above demonstration we derived value of the stock-flow conversion factor by specifying investment as continuous. Note that the specification of investment as discrete does no harm to the assumption of stock-flow factor. It then becomes, with a time lag of θ years, and annual compound growth rate g :

$$h_1 = \frac{(1+g)^5 B_{ij}^{0}}{\sum_{t=1-\theta}^{5-\theta} (1+g)^t B_{ij}^{0}} = \frac{(1+g)^5}{\sum_{t=1-\theta}^{5-\theta} (1+g)^t}$$

For $\theta = 1.5$ and g = 10 per cent the value of h_1 turns out to be .277, or a value of $h_1 = .296$ would imply just over 10 per cent annual compound rate of growth. In the main text we use the continuous case for the convenience of computation. It should, however, be noted that the discrete case presents no problem; the growth rate (g) that is implicit is simply slightly larger, other things being equal.

[2]The assumption of smooth growth in investment is rather restrictive. It assumes most of the indivisibilities away and forces the assumption that one can build capacity bit by bit as demand grows. In a mature economy in which each new project is small in comparison to the total capacity of the sector this may be a justified assumption. But in an economy like East Pakistan's it may sometimes turn out to be unrealistic.

In discussing the numerical results of the model below we have often talked about a value of $\theta = 1.5$ years. Our gestation lag is an *average* — a year and a half's average lag means the application of capital inputs can start something like three years before output becomes forthcoming. This does not, therefore, seem in general to be too short a time lag. In fact, for certain sectors like agriculture and small-scale industries this may turn out to be too long a lag.

In fact, we need not assume any given time lag for all the sectors — we can rationalize our use of a fixed h_1 by assuming that the sectors with shorter (longer) lag will have relatively more (less) rapid acceleration of investment (*i.e.*, higher (lower) r) to compensate.

2.5 Demand for Additional Working Capital

The treatment of working capital is similar to that of fixed capital except that in this case the time lag is insignificant for all practical purposes. Unlike fixed capital, the stock of working capital can be built up in the same time period in which the expansion of capacity takes place[3]. The stock-flow conversion factor, h_2, would, therefore, be given by

$$h_2 = \frac{e^{5r}}{\int_{t=0}^{5} e^{rt}dt} = \frac{r}{1 - e^{-5r}} .$$

We, therefore, have

$$\text{(d)}\quad W_{ij} = W_{ij}^{T} - W_{ij}^{0} = h_2 w_{ij} X_j - W_{ij}^{0}.$$

We have chosen $h_2 = .254$ which implies an r of 10 per cent.

2.6 Regional and Foreign Imports

In the situation of acute shortage of foreign exchange, as characterizes Pakistan, all imports are complementary in the *ex-post* sense. *Ex-ante*, however, some imports can be treated as competitive in the sense that additional domestic capacity can be created if planned in time.

One can identify two broad classes of complementarities arising out of two different sets of circumstances. One class of complementarities derives

[3]This frequently is not recognized by the users of such conversion factors. *See*, Manne and Rudra [20] for an example of the use of the same stock-flow conversion factor for fixed and working capital even with an explicit time lag.

from the fact that a particular kind of import classified under a domestic producing sector either is technologically impossible to produce domestically or its potential cost of production is known to be very much more than for the aggregate domestic sector. Such imports will be identified and their destinations will be known. Frequently, such products would be use-specific and the pattern of their distribution among users would be dissimilar to the pattern of the distribution of the products of the aggregate sector under which they have been classified. Examples are: *a*) most of the superior-cotton imports into East Pakistan which cannot be produced domestically due to technological considerations and is used up entirely by the cotton-textiles sector while domestic all other agriculture, the sector under which cotton is classified, delivers also to other sectors; *b*) books and magazines which are published abroad and cannot be printed domestically — products used up for final consumption purposes. We give to this type of imports the title of use-specific complementary imports.

A second kind of complementarity derives from the consideration that although there are no technological or other considerations militating against the substitution by domestic production of any single kind of the imported goods classifiable under any given aggregate sector, it would be quite impossible to substitute all such imported goods by domestic production within the next five or ten years. Machinery import is an example. It would be quite possible to substitute almost entirely by domestic production the import of any single kind of machines, say, sewing machines for example, over the fourth-plan period. But it would be impossible to substitute entirely the import of all kinds of machineries. It would be arbitrary and misleading to select a few of these machines as complementary. All we know is that the import substitute of the sector as a whole cannnot be driven faster than a given rate. We give to this class of imports the name of the non-use-specific complementarity.

Note that *ex-ante* there will exist some degree of freedom with respect to such complementary imports. This kind of complementarity is simply a limitation on the rate of expansion of domestic production of the corresponding sector. It appears that such limits on self-sufficiency can better be expressed as minimum import ratio rather than as maximum absolute production. The latter is necessarily arbitrary whereas the former may be based on a ranking of the subsectors according to the ease with which they can be replaced by domestic production, making a decision on a border line upto which import replacement should be driven during the given plan period and looking into the base-year share of the total use of the remaining subsectors.

The essential distinction between the two types of complementary imports is that in the former case we know who the users of these imports will be while in the latter case we do not know who the users will be. All we know in the second case is that the domestic use of a particular sector's products must consist

of a certain minimum proportion of imports — a proportion which can to a limited extent be varied *ex-ante*.

We express the use-specific complementary imports ($_uM_i$) as proportions of the activity levels of the using sectors,

$$_uM_i = \sum_j q_{ij}X_j + q_{ic}C$$

where the last term is what we call exogenous import (since consumption is an exogenous target) and is treated along with other exogenous elements of the model. The non-use-specific complementary imports ($_cM_i$) are expressed as given proportions of the sectoral domestic outputs,

$$_cM_i = p_iX_i .$$

Thus, our total *endogenous* imports from abroad and from West Pakistan can each be expressed as

$$(e)\ M_i = \sum_j m_{ij} X$$

where $m_{ij} = q_{ij}$ for all $i \neq j$ and $m_{ii} = q_{ii} + p_i$; and

$$(f)\ M_i' = \sum_j m_{ij}' X_j$$

where $m_{ij}' = q_{ij}'$ for all $i \neq j$ and $m_{ii}' = q_{ii}' + p_i'$.

Note that for our kind of a model it would be of particular interest to observe how *ex-ante* variations in the p_i's affect the foreign-exchange gap and the investment cost of the plan.

2.7 The Final Form of the Balance Equations

Substituting (b), (c), (d), (e) and (f) into (a) we get the 29 supply and demand balance equations for our sectors:

$$(1\text{—}29)\ X_i + \sum_j (m_{ij} + m_{ij}' - a_{ij} - h_1b_{ij} - h_2w_{ij})\, X_j = C_i + G_i + E_i + E_i' + R_i - \overline{M}_i - \overline{M}_i' - B_i^0 - W_i^0$$

where $B_i^0 = \sum_j B_{ij}^0$ and $W_i^0 = \sum_j W_{ij}^0$.

The balance equations for trade and transport sectors have to be specially adjusted to take into account the inputs from these sectors to imports (*see* subsection 1.3 above). For these sectors we have

$$X_i = \sum_j X_{ij} + \sum_j T_{ij} + \sum_j T_{ij}' + C_i$$

where T_{ij} = trade (transport) input into j-*th* type of foreign import,

T_{ij}' = trade (transport) input into j-*th* type of regional import.

None of the other components of demand and supply exists because these services are non-tradable and not used as fixed or working capital.

We assume that trade (transport) input required per unit of foreign (regional) import of j-*th* type is fixed

$$T_{ij} = t_{ij}\, M_j = t_{ij} \sum_i m_{ji}X_i \text{ and}$$

$$T_{ij}' = t_{ij}'M_j' = t_{ij}' \sum_i m_{ji}'X_i,$$

whence we have for these sectors the following form of the balance equations:

$$X_i - \sum_j a_{ij}\, X_j - \sum_j t_{ij} \sum_i m_{ji}X_i - \sum_j t_{ij}' \sum_i m_{ji}'X_i = C_i$$

2.8 The "Elements on the Right"

The solution of the 29 equations system can be obtained once we are able to specify the components on the right-hand side of the equations. The details of their estimation are stated in the next section. Here we briefly indicate the procedure. Total consumption, C , is set as a target and the consumption of individual sector's products is related to total consumption through the Engel functions

$$C_i = c_iC$$

where c_i is the marginal consumption coefficient for sector i. Although the above relations are linear and homogeneous we actually base them on linear approximations of more general forms of Engel functions. Public consumption expenditure, which consists only of public administration and defence, is set as a target. Similarly, exports are what may reasonably be considered as feasible targets. Replacement demand depends on the historical pattern of investment and certain assumptions related to the mortality pattern of fixed assets. "Exogenous imports" are estimated as fixed proportions of target consumption. Base-year investments are "historical" data although we have to project them because these historical events are yet to take place.

2.9 Macro-Economic Accounts

Once the system is solved we shall be able to derive not only the required sectoral expansions, the required investment in each sector by type of assets, and the required foreign-exchange allocation for each user and on each category of goods, but also a complete set of macro-economic accounts.

Increase in value added in sector j is a linear function of the increase in output of sector j

$$V_j = v_j X_j$$

where $v_j = (1 - \sum_i a_{ij})$. Increase in gross regional product (GRP) is given by the equation

$$Y = \sum_j V_j = \sum_j v_j X_j$$

Note that the GRP and the sectoral values added are at market prices, *i.e.*, they include indirect taxes. We do not separate indirect taxes because we do not concern ourselves with the financial problems of the plan formulation. This could certainly be incorporated into our system but would require a great deal of additional information about sectoral saving rates and the saving rates of various groups of primary factors. We simply do not have any such information. It, therefore, seems appropriate to leave the entire financial aspect of the plan out of the present framework to be analyzed with the help of a separate (perhaps more aggregated) model and to concentrate in the present model on the real aspects of plan formulation.

Thus, our model simply specifies the required rate of real investment and foreign-exchange requirement and states that once these requirements are met the plan targets can be achieved. It does not get involved in the fiscal problem of how the required savings can be generated and how the gap between exports and required foreign exchange can be financed.

Investment for new capacity in the terminal year of the plan is given by

$$I_T = h_1 \sum_j \sum_i b_{ij} X_j + h_2 \sum_j \sum_i w_{ij} X_j.$$

Fixed investment for new capacity to be completed during the five years upto θ years before July 1, 1975 is given by

$$\sum_j \sum_i b_{ij} X$$

while actual fixed investment for new capacity during the fourth-plan period is given by

$$\frac{h_1}{h_2} \sum_j \sum_i b_{ij} X_j.$$

Investment in working capital (for which $\theta = 0$) during the Fourth Plan

is given by

$$\sum_j \sum_i w_{ij} X_j.$$

Note that the fixed investment for new capacity during the last θ years of the Fourth Plan will contribute to output increase in the post-terminal years so that there would be a discrepancy between investment required for the achievement of the fourth-plan targets and the actual investment taking place during the fourth-plan period.

The former (called 'lagged investment') is given by

$$\sum_j \sum_i b_{ij} X_j + \sum_j \sum_i w_{ij} X_j + \sum_{t=1}^{5} \sum_i R_i^t$$

while the latter (called 'actual investment') is given by

$$\frac{h_1}{h_2} \sum_j \sum_i b_{ij} X_j + \sum_j \sum_i w_{ij} X_j + \sum_{t=1}^{5} \sum_i R_i^t.$$

The latter is greater than the former by

$$\left(\frac{h_1}{h_2} - 1\right) \sum_j \sum_i b_{ij} X_j .$$

Both the investment-savings gap and the foreign-exchange gap will be determined endogenously. Since our model is at purchasers' prices showing the imported goods not at their foreign-exchange costs but at their market prices, a few manipulations will have to be made to determine these gaps. Let us write

$$M_i = N_i + Q_i + T_i \quad \text{and}$$

$$M_i' = N_i' + T_i'$$

where

$N_i (N_i')$ = foreign (regional) import at *c.i.f.* value,

Q_i = import duty and indirect taxes on imports, and

$T_i (T_i')$ = trade and transport input on imports.

Our balance equation then becomes

$$X_i = \sum_j X_{ij} + C_i + G_i + E_i - (N_i + Q_i + T_i) + E_i' - (N_i' + T_i') + B_i + W_i + D_i$$

We also have

$$X_j = \sum_i X_{ij} + V_j .$$

But $\sum_i X_i = \sum_j X_j$ whence we have

$$Y = C + G + (E - N - Q - T) + (E' - N' - T') + B + W + D$$

where $C = \sum_i C_i$, $G = \sum_i G_i$ *etc.*

We, therefore, have

$$(B + W + D) - (Y - C - G + Q + T + T') = (E - N) + (E' - N')$$

The expression on the left is the investment-saving gap (note that Q, T and T' are components of saving because they are parts of GRP at market price which are not spent on consumption or as current inputs for the domestic production of goods and services) and the expression on the right is "foreign-exchange" gap. Total "foreign-exchange gap" consists of the sum of import surplus with rest of the world and import surplus with West Pakistan.

Note that in our model, Q_i and $T_i(T_i')$ have been expressed as fixed coefficients of $M_i(M_i')$ so that $N_i(N_i')$ can also be expressed as fixed proportion of $M_i(M_i')$.

$$N_i = n_i M_i \text{ and}$$

$$N' = n_i' M_i'$$

where n_i = foreign-exchange coefficient of import at purchasers' price and

n_i' = ratio of *c.i.f.* price to purchasers' price of regional imports.

3. ON THE DATA FOR THE EMPIRICAL IMPLEMENTATION OF THE MODEL

3.1 Data Requirement

The empirical implementation of the model requires a great deal of statistical information related to the structural and behaviourial interrelationship within the economy and to the exogenous variables. We have chiefly depended on the work of the Quantitative Planning Section of the Pakistan Institute of Development Economics (PIDE) supplemented by the work done at the Planning and Development Department of the Government of East Pakistan. Below we list the major types of data used in the model and briefly discuss the methodology of obtaining each of them.

3.2 Incremental Current Input-Output Coefficients

The basis of our estimates of the current input coefficients is the 1962/63 matrix developed at the PIDE. Its methodology has been described in details by Khan and MacEwan [15]. The procedure adopted in obtaining the incremental coefficients may briefly be described in the following steps:

a) The first step was to bring the Khan-MacEwan table into line with our sector classification by making minor aggregation and disaggregation of a few sectors.

b) The original Khan-MacEwan table is at 1962/63 purchasers' prices. Since our exercise is at 1964/65 prices we had to transform the coefficients into that year's prices.

c) The original Khan-MacEwan table provides for each sector separate input coefficients column for large- and medium-scale, small-scale and cottage production. It can be observed that over time large-scale processes are coming to dominate over small-scale. It was assumed that in each manufacturing sector the elasticity of small-scale production with respect to aggregate small and large production will be 0.5, *i.e.*, the incremental share of small-scale will be half its average share. The incremental coefficients for each sector were based on this assumption.

Of course, the assumption of a uniform elasticity of small-scale production of 0.5 is rather weak. However, the general order of magnitude is probably correct particularly for the big sectors. Moreover, it should be pointed out that for many sectors small-scale production was sufficiently negligible or non-existent in the 1962/63 table so that it could be ignored in the increment.

d) Some of the sectors in 1962/63 were so different from what their increments in later years have been in terms of product composition and input structure that it would be unrepresentative to use their 1962/63 coefficients for future projection purposes. Information, therefore, was collected about the input structure of the recently completed "representative" projects in these sectors from EPIDC sources. This information was used to adjust the input coefficients of the relevant sectors. Prominent among these sectors are basic metals, machineries and, to some extent, fertilizer and cement.

In 1962/63 there was no production of coal and petroleum products in East Pakistan. Some capacity has since been created within the region in petroleum, but information about its input structure was not available. In order to include a coal and petroleum product sector in the incremental table of East Pakistan, the West Pakistan coefficients have been used with important adjustments on the basis of international data.

3.3 Incremental Fixed Capital Coefficients

We used the following four major sources of statistical information in estimating the incremental fixed capital coefficients.

a) Khan and MacEwan [16] have made a comprehensive set of estimates on the basis of a sector classification which is only marginally different from ours. For large-scale manufacturing industries they estimate the average coefficients

for 1962/63 after adjusting the book values of assets shown in the census of manufacturing for the discrepancy for each asset between actual deterioration pattern and depreciation practices adopted by enterprises and for the rising prices of different assets over time.

The limitation of these estimates is primarily due to the fact that they are average coefficients at a historical point of time and hence needs adjustment in order to be useful for future projections. Such adjustments should be based on considerations such as the changing pattern of products and techniques, increase in efficiency arising out of learning by doing and so on.

b) Robert Repetto of the East Pakistan Planning Department has estimated sets of capital coefficients on the basis of the information obtained from the IDBP and PICIC-sanctioned projects[4]. While the main weakness of the Khan-MacEwan estimates is that they are *averages* for a given year, the main problem about the Repetto estimates seems to be that they are based on the projects yet to be completed and not on the projects just completed.

c) For a number of sectors we have been able to get information on the values of capital assets and capacity output for projects which are going on or have just been completed. This information has been of particular value for sectors for which our base-year output composition appears to be unrepresentative of the expected incremental output.

d) Finally, we have some international estimates for comparison. Two of the estimates of this kind that we have used are the capacity expansion planning factors of the National Planning Association of the United States [22] and Alan Manne and Tom Weisskopf's estimates for India [21].

The procedure we have followed in selecting a set of capital coefficients for large-scale manufacturing sectors can be described as follows:

a) For a number of sectors we have simply used the Khan-MacEwan estimates either because they are very similar to the Repetto and/or the other country data or because we have no evidence or *a priori* reason to expect that for them the incremental coefficients would be any different from average. These sectors are sugar (adjusted for capacity utilization), edible oils, cigarettes, miscellaneous food and drinks, jute textiles, leather and rubber, metal products and miscellaneous manufactures. For coal and petroleum we have used Khan and MacEwan's West Pakistan estimate for the same reason as mentioned in connection with this sector's current input coefficient estimates.

b) It was thought that for basic metal, machinery, fertilizer, cement and electricity, the composition of incremental output would be very different from

[4]These estimates are still unpublished.

the average output in 1962/63. We, therefore, have used the coefficients directly estimated from the reports about EPIDC and EPWAPDA projects. For similar reasons we have used Repetto's estimates for chemicals and somewhat arbitrarily made an upward adjustment in Khan-MacEwan estimate for transport equipment. In all these cases the estimated incremental coefficients are higher (and frequently very significantly so) than the average 1962/63 coefficients except for electricity and fertilizer for which they are lower. This is generally in line with the expectation based on international data that the capital cost of creating domestic capacity for capital goods and heavy industries is relatively high. Khan-MacEwan estimates for them are probably understatements in view of the peculiar product composition of these sectors in 1962/63.

c) For textiles and paper the Khan-MacEwan estimates appear too high. This probably is due to the relatively inefficient use of capital by these sectors in 1962/63 which we hope will be overcome in future. We have made downward adjustment in them on the basis of an arbitrary compromise between the evidence found in Repetto, Weisskopf and National Planning Association.

d) The disaggregation of total capital coefficient into supplying sectors has been done according to the procedure adopted by Khan and MacEwan.

3.4 Incremental Working Capital Coefficients

Every productive enterprise requires inventories of raw materials and finished and semi-finished products for well-known reasons. Besides, there exists the pipeline stock of the products which have left the factory gate but have not yet reached the user. It would be quite appropriate to allocate the pipeline stocks either to the trade sector or to the respective using sectors. But we do neither and instead allocate the pipeline stock to the respective producing sectors. In a consistency model this procedure should present no difficulty while in an optimizing model this could conceivably distort the relative capital costs of output expansion in various sectors.

Total raw materials and products inventory coefficients have been estimated by fitting linear regressions to the data obtained from all the available censuses of manufacturing industries. The total raw material inventory coefficient has been split into supplying sectors by assuming that raw materials are bought in the same proportion in which they are used, *i.e.*, such split is in the same proportion as the coefficients of current input from the relevant supplying sectors.

We do not have any information about raw material and product inventories for small-scale sectors and we have used for them the coefficients for corresponding large-scale sectors. Although it seems plausible that the small-scale activities require less fixed capital than large-scale, it is by no means plausible that they also require less working capital.

Pipeline stocks are estimated on the basis of assumed lags between production (importation) and final use. Generally, we use two months' lag except for a few commodities for which a different procedure is adopted for special reasons.

Raw material inventories for non-manufacturing sectors have generally been estimated according to the same procedure outlined by MacEwan [18] with certain exceptions.

3.5 Import Coefficients

The meaning of our import coefficients has been explained in detail in the previous section. Our first step is to identify and quantify the use-specific imports from abroad and from West Pakistan. This we do for the year 1962/63 and assume that in general such imports are used up by the large-scale industries. Allocation to small-scale industries has been made only when there is a balance after satisfying total requirements by large-scale manufacturing. We think it reasonable to assume that the incremental coefficients would be the same as average. Thus for the aggregate using sector we have estimated the incremental coefficients by taking a weighted average of the large- and the small-scale coefficients, weights being proportional to the incremental shares of each technique. It should be emphasized that for want of information we have failed to specify many of the use-specific imports. We have only been able to identify the big and obvious ones while many smaller ones remain unidentified. They, therefore, get lumped with the non-use-specific imports.

We have already indicated that the non-use-specific import coefficients should be best regarded as constraints on the rate of import replacement by domestic production. We have also stated that they are obvious candidates as variables in a sensitivity analysis. We use two sets of such coefficients: one pertaining to what we call the "moderate (or low) import-substitution case" and the other to "rapid import-substitution case".

The sectors for which it is particularly important to specify these constraints are the investment goods and related industries (basic metals, metal products, machineries and transport equipment) because our imports are heavily concentrated in them. For the moderate import-substitution case we set the import coefficients of these sectors at the level at which we think the perspective plan would want them to be during the fourth-plan period. For the capital-goods sectors the Perspective-Plan projects an import elasticity with respect to output of 0.6 for the fourth-plan period for Pakistan as a whole (*i.e.*, annual growth rate of 10 per cent for production and 6 per cent for imports). We apply this to the benchmark ratio of imports to obtain incremental ratios. For the rapid import-substitution case we generally use an elasticity of imports 2/3 as high as the above case.

For other non-use-specific imports we have set the coefficients after reducing arbitrarily the coefficients in the base-years. In most such cases our incremental proportions are between a 1/2 and 2/3 of the base-year average coefficients.

For certain vertically integrated sectors (basic metals, petroleum and rubber) all the self inputs have to be imported because they are use-specific complementary imports.

Denote for such a sector,

M = total import

M' = import of final product (non-use-specific)

M'' = import of raw material (use-specific for the sector itself).

We have

$M'' = aX = mX$ (a is Leontief input-coefficient)

$M' = b(M' + X)$, (*i.e.*, b is the ratio of product import to total supply of the finished product of the sector)

$$= \frac{b}{(1-b)} X,$$

so that

$$M = M' + M'' = \left[m + \frac{b}{(1-b)}\right] X.$$

3.6 Marginal Consumption Proportions

Beginning of these estimates was made by *a*) fitting Engel curves of appropriate types separately to urban and rural household consumption data shown in the *Quarterly Survey of Current Economic Conditions* [6], *b*) making linear approximations to these functions for the projected "appropriate" expenditure level to obtain marginal coefficients, and *c*) taking the weighted average of the urban and rural marginal consumption proportions. The details of each step have been discussed by Khan in [17].

Adjustments in these preliminary estimates have been made for the following considerations:

a) The forms of our Engel curves are not additive, *i.e.*, the sum of all the marginal consumption coefficients estimated from them for the projected level of total expenditure does not add up to one. We, therefore, have to make some upward adjustment in them.

b) For a number of rather unimportant sectors we do not have separate information of expenditure elasticities from the *Quarterly Survey* data. For these sectors we, therefore, have applied other available expenditure elasticity estimates based on Pakistani or Asian data to their base-year consumption proportions.

c) Finally, we have compared the estimates with international data related to countries of similar income levels and made further adjustments where our proportions appeared out of line.

3.7 Replacement

Replacement has been estimated for the products of only three sectors, machinery, transport equipment and construction. The deliveries to fixed investment of the other two capital-supplying sectors are very small and hence the replacement demand for their products would be negligible. We have assumed that such demands are taken care of as part of their current input demand for repair and maintenance.

The first step in estimating replacement is to prepare a series of fixed investment in each of these assets over as many years as we have information for[5]. Next we have applied a set of physical deterioration assumption to this series[6] to obtain replacement requirements in 1969/70 and 1974/75.

It can easily be recognized that the procedure is indeed very tentative, but the results we get look reasonable when compared with other country data. Replacement as percentage of gross investment in 1969/70 would be as follows:

Machinery	24 per cent
Transport equipment	37 per cent
Construction	20 per cent

These are very close to the estimates used by Manne and Rudra [20]. The incremental ratios would be somewhat lower as would be expected in a situation of accelerating investment.

[5]Direct estimates from CSO surveys are available for most years from mid-fifties to mid-sixties. Some of these have been published in *Consistency Committee's Report* [8] while others are unpublished and can be obtained from CSO sources. For more recent years, estimates are available at the East Pakistan Planning Department. We obtained estimates of some very early years by assuming certain growth rates. We extrapolated the series for the projection of investment in early fourth-plan years. Note that these estimates have been converted into 1964/65 prices.

[6]The main features of these deterioration assumptions are: *i*) 25-per-cent loss of productive capacity during first half of the assets' life; *ii*) 65-per-cent loss of capacity during next half of the assets' life; *iii*) 10 per cent of capacity remaining at the time of retirement. Life for buildings has been assumed to be 40 years, for machineries 12 to 16 years and for transport equipment 5 to 10 years. For details, *see* Khan and MacEwan [16].

3.8 Agriculture

It is well known that the incremental technology of rice will be remarkably different from its average technique. It is, however, rather difficult to foresee accurately what the actual incremental pattern would be. One inevitably has to make a number of simplifying assumptions. The procedure we have followed is described below.

We have assumed that *a*) new seed under irrigation, *b*) improved local variety under irrigation, and *c*) improved local variety without irrigation will each form a third of the incremental output of rice. We have estimated the coefficients of modern input (irrigation, which consists of pump and tubewell, fertilizer, pesticide, fuel and improved seed) for each of these techniques on the basis of the information in the self-sufficiency plan of the East Pakistan Government [12] and some unpublished background information and have obtained weighted average. To these we have added the traditional inputs (based on the price-corrected 1962/63 input-output table) with some reduction in inputs from all other agriculture (animal service, cowdung, *etc.*) to reflect the fact that such inputs are perhaps proportional to acreage (rather than output) so that there would be a decline in such inputs per unit of output as output per acre increases. Inputs into processing have been adjusted to reflect the rising share of milling against home-pounding.

For the other agricultural sectors we have somewhat arbitrarily increased the coefficients of modern inputs and reduced the coefficients of all other agricultural inputs for considerations similar to those discussed under rice.

3.9 Exports

For exports we have two sets of projections, a moderate projection and an ambitious projection. The first one is the basic projection while the second one is obtained simply by raising it by something between a quarter and a third (with some obvious exceptions to account for known limitations).

The moderate projection is primarily based on trend extrapolation with the exception that exports to West Pakistan have been estimated after a reasonably careful analysis of the possible expansion in demand and creation of regional capacity there.

It is easily recognized that export projections are very uncertain and subject to wide variation. The task is, however, rendered manageable by the fact that East Pakistan's exports are extremely undiversified.

The moderate projections amount to more than 20-per-cent increase in exports abroad and about 25-per-cent increase in exports to West Pakistan over the five-year period. These are just under the trend rates of growth, a situation

arising out of the fact that the big items are unlikely to be able to maintain the trend rate of growth in future. New items will probably expand fast but from a very small base.

3.10 Benchmark Estimates

It has been necessary for the implementation of the model to estimate certain benchmark investment, consumption and production figures as well as macro-economic aggregates for 1969/70. Investment estimates enter the balance equations, while consumption and income estimates are necessary to set target and measure growth for the Fourth Plan. We have used the following benchmark estimates of the macro-economic variables (in million rupees at 1964/65 prices):

Gross regional product (GRP)			=	26,405
Fixed investment for new capacity	=	2,125		
Fixed investment for replacement	=	651		
Investment in working capital	=	424		
Total gross investment			=	3,200
Consumption (of which public consumption	=	972)	=	23,800

The above figures imply an import surplus with West Pakistan and the rest of the world of about 600 million.

Gross regional product has been estimated by projecting sectoral outputs to 1969/70. Information for the agricultural sectors has mainly been derived from Raisuddin's benchmark study [23], for industrial sector from the Annual Plan document [2] upto the year 1968/69 and then by extrapolating to the next year on the basis of the information about on-going projects and/or trends, and for the services on the basis of the trends shown by the respective components of national accounts. This, together with our sectoral value-added coefficients, gives an estimate of 26,405 million at 1964/65 prices.

We have made an alternative estimate by using the annual-plan GRP estimate for 1968/69 as the basis and assuming for the following year a 6-per-cent rate of growth. These estimates are at 1959/60 prices. The comparison of the current and constant price GRP estimates from the CSO sources shows that the GRP deflator for 1964/65, with 1959/60 as base, was about 1.11. Using this we get an estimate of 1969/70 GRP of 25,403 million at 1964/65 prices. This is 96 per cent of our estimate. The annual-plan estimates, however, do not include certain central government services and defence. If these are included our estimates would be less than 2 per cent higher than the alternative estimate. The

closeness of our estimate to the alternative estimate convinces us about its reasonableness.

Fixed investment estimates are those made by the Planning Department of the Government of East Pakistan. They indicate a 10-per-cent increase over their 1968/69 planned figures. They have been changed to 1964/65 prices.

The method of estimating replacement has been discussed above.

The demand for working capital has been estimated by applying our coefficients to the increase in sectoral outputs in 1969/70 over the previous year.

Import surplus has been 370 million in 1965/66 and 500 million in 1966/67 approximately. We have arbitrarily assumed that it will become about 600 million.

We have obtained consumption as residual. This gives us an average saving rate of about 10 per cent in 1969/70 which is consistent with other available estimates.

4. ALTERNATIVE NUMERICAL FORMULATIONS OF EAST PAKISTAN'S FOURTH FIVE-YEAR PLAN

4.1 Introduction: the Alternatives Explored

In this section we explore the possibilities of the East Pakistan economy during the fourth-five-year-plan (FFYP) period by generating a number of alternative blueprints or 'plans' through a combination of the model outlined in Section 2 and the numerical data described in Section 3. A plan in the present context means a particular way of using up the degrees of freedom in the model. Conceivably such degrees of freedom exist with respect to almost every component of 'final demand' as well as with respect to a number of structural relations. We, however, have assumed that such degrees of freedom primarily exist only with respect to the following targets and policies:

a) the target rate of growth in aggregate consumption,

b) the rates of import-substitution in non-use-specific 'complementary' goods, and

c) the target (or feasible limits to) exports.

The target growth has been specified in terms of increase in aggregate consumption over the fourth-plan period. Growth in income is endogenously determined by the model and is higher than the growth in consumption since the income-elasticity of savings is considerably greater (though not the same) for each of the alternatives explored. We have considered three different rates of

growth in consumption — a 'moderate' one of 6 per cent per year, a 'high' one of 7 per cent and a 'very high' one of 7.5 per cent[7].

As discussed in Section 3, degrees of freedom with respect to imports exist only for the non-use-specific ones. These are mainly capital goods and related commodities. For these we have assumed a moderate rate of import substitution which is quantified to be the same as our interpretation of the perspective-plan target of import replacement for these sectors for the period under consideration. We also have a second case of more rapid import substitution in which case import proportions for these sectors are generally assumed to be lower—about two-thirds as compared with the first case (with some exceptions to deal with certain special features). It is perhaps useful to emphasize that the rapid import-substitution case is almost certainly the limit of feasible import replacement in these sectors during the fourth-plan period. To give an example of how intense an effort has to be made in these directions, the incremental share of regional production in the total use of machineries will have to be nearly half by 1974/75.

For exports again we have used two different projections of increases over the Fourth Plan—a 'normal' one and an 'ambitious' one. The latter is a quarter to a third higher than the former depending on the sector. The details about these projections have been stated in Section 3. The moderate projection is the one we think is the outside limit of what is perhaps realistic. It reveals a rate of growth as high as the trend in the recent past. It is perhaps well known that driving the traditional exports at the trend rate is going to be difficult. Thus new exports, whose base is small, will have to be increased very fast. We, therefore, do not stipulate that the ambitious projection is feasible, without a radically different system of export incentives. Given such incentives the limits are imposed by the state of world demand and by the supply of such scarce factors as skilled manpower needed in marketing efforts. Our exercise simply spells out the implications for feasibility if such obstacles can somehow be overcome.

The six basic numerical solutions to the model we have obtained refer to the following cases:

1. Moderate import substitution, moderate rate of growth

[7]The actual procedure we have adopted in setting the consumption target may be described as follows: public consumption increased over the Third Plan by about 42 per cent. We consider this rather high a rate to be repeated in future taking into account the sharp acceleration in recent past. Corresponding to our three growth rates in aggregate consumption we have three rates of growth in public consumption over the FFYP—37 per cent, 40 per cent and 42 per cent.

We have applied to benchmark consumption estimate, the target rate of growth (say, 7.5 per cent per year or 43.56 per cent over 5 years) to obtain target increase in consumption over FFYP. We have subtracted from it the increase in public consumption to obtain target increase in personal consumption. Finally, we have multiplied vector of consumption proportion by this target increase to obtain the vector of target increase in personal consumption.

2. Moderate import substitution, high rate of growth
3. Moderate import substitution, very high rate of growth
4. Rapid import substitution, moderate rate of growth
5. Rapid import substitution, high rate of growth
6. Rapid import substitution, very high rate of growth.

In all the above cases the moderate export projection is assumed. However, a separate solution is obtained for additional exports (*i.e.*, the amount by which the 'ambitious' export vector is greater than the 'moderate' export vector). Since additional exports simply change the 'final demand' vector by the same amount, this solution is additive to the basic cases, *i.e.*, we can obtain for each of the above six cases a corresponding case for ambitious exports by adding the solution for additional exports to the basic case[8].

4.2 What Consists of a Solution?

Each numerical solution (*i.e.*, plan) is feasible both in the macro and micro sense. At the macro-economic level each numerical solution shows the growth in gross regional product (GRP) and its costs in terms of required investment, import and saving. It also shows the numerical measurements of the gaps between the demand for and the supply of each of the two important resources, capital and foreign exchange. At the micro level we obtain a set of equilibrium increase in the outputs of the twenty-nine producing sectors, equilibrium in the present context meaning the balance in the terminal year between the supply of and the (intersectoral current and capital as well as 'final') demand for the products of each sector. Investments and foreign-exchange requirements for each sector by type of assets are also shown.

We have stated in Section 2 that due to our explicit recognition of an investment-output lag there will be a discrepancy between fixed investment required for the achievement of the FFYP target and fixed investment actually taking place during the FFYP period. Likewise total investment required for the achievement of the FFYP target will be different from total investment actually taking place during FFYP. We call the former amount the 'lagged' investment and the latter amount the 'actual' investment. The fixed investment component of lagged investment will have to be completed by approximately January 1, 1974. Under our assumptions the actual investment will of course be greater than the lagged investment.

Gross investment has been shown separately as fixed investment, investment in working capital and investment for the replacement of the deteriorated

[8]Apart from the above cases we have also worked out a few other variants of the model. These have not been reported here. For an account of these, *see* Khan [14].

capacity installed in the past. Investment in fixed and working capital can together be called investment for the creation of new capacity — this is the investment that would have to be undertaken if there were no need to replace deteriorated past capacity.

Thus, we have several measurements of incremental capital-income ratio. Gross capital-income ratio with time lag is the ratio of gross lagged investment to increase in income. Capital-income ratio for new capacity with time lag is the ratio of lagged 'new' investment (*i.e.*, gross investment less replacement) to increase in output. Finally, we have the unlagged capital-income ratio which measures the ratio of actual investment to increment in output. Analytically the lagged measures are the relevant ones. The unlagged ones are of little analytical interest except perhaps that they are comparable to the Planning Commission's (implicit) capital-income ratios.

As discussed in Section 2, the foreign-exchange gap is the excess of imports at foreign-exchange cost (and not at purchasers' price) over exports. Similarly, the import surplus with West Pakistan is the excess of regional imports at *c.i.f.* (and not at purchasers') price over regional exports at *c.i.f.* price.

4.3 A Description of the Basic Solutions

The detailed solutions to the six basic cases have been shown in the Appendix Tables 11 to 16. Let us repeat that the results are in values *at 1964/65 prices*. The transformation of the investment costs into current or base-year prices will require the application of the price indices for investment goods to the values of the various types of investment goods required. We do not attempt such transformation but it seems that the overall price index for investment for 1969/70, with 1964/65 as base, may be something like 115 (assuming the trend being maintained between now and June 1970).

An interesting exercise would be the measurement of sectoral elasticities. It would be seen that elasticities of sectoral outputs with respect to aggregate income, consumption or any other component of final demand would vary from sector to sector. Such elasticities with respect to aggregate income would of course depend on the relative sizes of the components of incremental income and would be sensitive to such factors as whether the incremental income derives mainly from, say, consumption or export because the commodity composition would differ widely between such components of final demand. Sectoral elasticities with respect to individual components of final demand could be estimated by systematic variation in such components. By comparing our solutions for the different rates of consumption growth we can measure sectoral elasticities with respect to consumption. It would be seen that such elasticities are extremely high for capital and related sectors like construction, machineries, basic metals and cement — sectors which directly deliver insignificant

or no quantity at all to consumption. This illustrates the powerful leverage of intersectoral demand mainly on capital inputs.

It can be noticed that for each solution more than a half of fixed investment is taken up by a few "economic overheads" and services sectors — electricity, transport, housing and miscellaneous services. This is much greater than the share of these sectors in incremental output. The explanation of course lies in the fact that these sectors are particularly capital costly. Another feature of the solutions is the relatively high share of working capital in aggregate investment. It turns out to be about 12 per cent of aggregate gross investment (compare the unlagged, *i.e.*, "actual" investment costs). This is to be compared with the Third Five-Year Plan's provision of less than 4 per cent of aggregate investment as working capital accumulation. As has been pointed out frequently[9], the Planning Commission estimates are certainly serious underestimates of working capital requirements. It is not enough to estimate fixed capital requirements accurately. We must obtain reasonable estimates of working capital needs as well because additional savings will have to be generated to match such demand.

4.4 A Comparison of the Alternative Plans

4.4.1 Introduction: It seems useful to compare the six basic solutions in their major aspects. Such a comparison will reveal the sensitivity of the major elements of resource costs to changes in the rates of growth, rates of import substitution, levels of exports, *etc.*, and thereby make the task of the ultimate choice of a plan easier.

4.4.2 Size of the Plan: Table III summarizes the broad features of the six basic solutions. The solutions indicate six alternative sizes of the FFYP in terms of actual investment to be undertaken during the plan period[10]. This size ranges from 23.7 thousand million rupees (moderate import substitution and moderate rate of growth) to 31.8 thousand million rupees (rapid import substitution and very high rate of growth) at *1964/65 prices*. At the base-year (1969/70) prices these may be about 15 per cent higher.

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[9] *See*, for example, Khan [13].

[10] We use *actual* instead of 'lagged' investment as the measure of plan size. This is for comparability of our measures with those of the Planning Commission.

TABLE III

BASIC SOLUTIONS

(*Values in million rupees*)

	Moderate import substitution			Rapid import substitution		
	Moderate growth	High growth	Very high growth	Moderate growth	High growth	Very high growth
Growth rate in gross regional product (GRP)	6.5%	7.8%	8.4%	6.7%	8.0%	8.7%
Total 'lagged' fixed investment for new capacity	14,650.0	17,830.7	19,466.5	15,328.5	18,752.0	20,512.0
Total investment in working capital	2,733.3	3,382.4	3,714.9	2,918.0	3,633.4	3,999.9
Total replacement demand for fixed capital	3,937.0	3,937.0	3,937.0	3,937.0	3,937.0	3,937.0
Total lagged investment cost for FFYP targets	21,320.3	25,150.1	27,118.4	22,183.5	26,322.4	28,448.9
Gross capital-income ratio with time lag	2.165	2.092	2.063	2.186	2.117	2.091
Capital income-ratio for new capacity (*i.e.*, net of replacement) with lag	1.765	1.764	1.764	1.798	1.801	1.802
Total fixed investment to be actually undertaken during FFYP period	17,072.4	20,779.1	22,685.4	17,863.0	21,852.8	23,903.9
Total investment to be actually undertaken over FFYP period	23,742.7	28,098.5	30,337.3	24,718.0	29,423.2	31,840.8
Unlagged gross capital-income ratio	2.411	2.337	2.308	2.436	2.367	2.340
Fixed investment in 1974/75	4,336.4	5,227.9	5,762.1	4,537.2	5,550.6	6,071.6
Investment in working capital in 1974/75	694.3	859.1	943.6	741.2	922.9	1,016.0
Replacement in 1974/75	889.0	889.0	889.0	889.0	889.0	889.0
Total gross investment in 1974/75	5,919.7	7,026.0	7,594.7	6,167.4	7,362.5	7,976.6
Increase in foreign-exchange gap	410.0	661.6	790.7	372.0	612.5	735.6
Increase in import surplus with West Pakistan	131.3	209.7	249.8	145.1	228.4	270.8
Increase in total capital inflow	541.3	871.3	1,040.5	517.1	840.9	1,006.4
Total capital inflow as percentage of gross investment in 1974/75	19.3%	20.9%	21.6%	18.1%	19.6%	20.1%
Marginal rate of capital inflow	5.5%	7.3%	7.9%	5.1%	6.8%	7.4%
Marginal rate of regional saving	18.3%	20.3%	21.1%	20.7%	22.9%	23.8%

TABLE IV-A

REDUCTION OF FOREIGN-EXCHANGE GAP BY MORE RAPID IMPORT SUBSTITUTION

	Moderate growth	High growth	Very high growth
Foreign-exchange gap of 1974/75 reduced	38.0	49.1	55.1
Total capital inflow of 1974/75 reduced	24.2	30.4	34.1
Additional lagged investment cost during FFYP	863.2	1172.3	1330.5
Additional income generated during FFYP	301.8	406.7	461.4
Capital cost of unit reduction in foreign-exchange gap in 1974/75	22.716	23.876	24.147
Capital-income ratio for additional income generated	2.860	2.882	2.884
Marginal saving rate changes } from	18.3%	20.3%	21.1%
Marginal saving rate changes } to	20.7%	22.9%	23.8%
Capital-income ratio for new capacity in moderate import-substitution case	1.765	1.764	1.764

TABLE IV-B

REDUCTION OF FOREIGN-EXCHANGE GAP BY MORE RAPID EXPORT EXPANSION

(Additional export expansion of 89.3 million abroad and 25.8 million to West Pakistan in 1974/75)

Additional foreign-exchange requirement in 1974/75	=	24.0
Additional import surplus with West Pakistan in 1974/75	=	5.3
Total additional capital inflow in 1974/75		29.3
Net reduction in foreign-exchange gap	=	65.3
Net reduction in capital inflow	=	85.8
Additional investment cost (lagged)	=	343.0
Additional income generated	=	170.3
Capital cost over FFYP of unit reduction in capital inflow	=	3.998
Capital-income ratio for additional income generation	=	2.014

The plan size of the Third Five-Year Plan (TFYP) is, however, at 1964/65 prices and hence comparable with our estimates. The proposed size of East Pakistan's Third Plan was 27 thousand million rupees so that our smallest fourth-plan size is considerably smaller (by about 12 per cent) than the proposed Third Plan while our biggest fourth-plan size is only about 18 per cent higher than the proposed Third Plan. Does it, therefore, indicate that we are aiming for a rather small and unambitious Fourth Plan?

As we take into account the actual performance during the third-plan period, the proposed fourth-plan sizes do not appear particularly unambitious. It seems unlikely that actual investment during the Third Plan will exceed 18 to 20 thousand million rupees at *current* prices[11]. At constant 1964/65 prices they would be smaller, perhaps between 16 and 18 thousand million rupees[12]. Thus, the proposed FFYP sizes would be at least 32 to 77 per cent higher than the actuals during the Third Plan. This means that the biggest ones among the six alternatives would indeed be anything but unambitious and would require quite rapid acceleration in effort.

When one compares our plans with what was originally provided in the Perspective Plan one must of course admit that ours are rather small in comparison. At 1964/65 prices gross investment in 1970, according to the Perspective Plan, is to be 19,180 million rupees for Pakistan as a whole, *i.e.*, at least 9,590 million rupees for East Pakistan[13]. Even our biggest plan gives nearly 17 per cent less investment in 1974/75. But surely the original perspective-plan provisions for 1975 should look overambitious under the changed circumstances of significant shortfall for the Third Plan.

4.4.3 Alternative Rates of Growth and Capital Costs: It has already been stated that for each solution the elasticity of savings (consumption) is greater (less) than one so that the rate of growth in gross regional product (GRP) is greater than the rate of growth in consumption. Moreover, an examination of Table III will show that such elasticity is greater (smaller) the higher the rate of growth in consumption or income. Thus with moderate rate of import substitution a 6-per-cent growth in consumption gives an endogenously determined growth in GRP of 6.5 per cent (elasticity of consumption of 0.92) while a 7.5-per-cent growth in consumption gives a growth in GRP of 8.4 per cent (elasticity of consumption of 0.89).

For the same rate of growth in consumption the elasticity of savings (consumption) is greater (smaller) as the rate of import substitution becomes more

[11]See, *Annual Plan for East Pakistan, 1968-69* [2] for actual investment during 1964/65 through 1967/68 and proposed investment during 1968/69. We assume some rise in 1969/70 over 1968/69.

[12]It should also be pointed out that Plan "investment" includes some non-investment "development expenditure". *See*, the last section.

[13]*See* [9, p. 19].

rapid. Thus, for 7.5-per-cent growth in consumption the moderate import-substitution case gives an 8.4-per-cent growth in GRP (elasticity of consumption of 0.89) while the rapid import-substitution case gives an 8.7-per-cent growth in GRP (elasticity of consumption of 0.86). The explanation of this phenomenon simply lies in the fact that to satisfy a given final demand a greater proportion of the feasible output requirements will have to be produced regionally if import substitution is being driven faster.

It can be seen from Table III that the capital cost of the plan increases only in proportion to the rate of growth in GRP. This is shown by the constancy of the lagged capital-income ratio for new capacity for the same rate of import substitution. In fact, the lagged gross capital-income ratio declines slightly as the rate of growth goes up, the rate of import substitution remaining unchanged. This somewhat peculiar result derives from the particular way we specify the replacement demand for capital. This is done, as detailed in Section 3, by applying certain mortality assumption to the 'past' series of investment leading upto 1973/74. The variations in the growth in investment between 1969/70 and 1973/74 will of course influence the demand for replacement. We have used the same estimate of replacement for all the cases and its actual estimation has been based on the assumption of a somewhat moderate acceleration in investment during 1969/70 through 1973/74. Thus, we probably have understated the replacement demand for the higher growth cases relative to that for the lower growth cases.

While the value of the lagged gross capital-income ratio varies between 2.1 and 2.2 the unlagged capital-income ratio ranges between 2.3 and 2.4. We have already stated that the unlagged capital-income ratio has little analytical meaning but is probably the relevant one for purposes of comparison with the Planning Commission's implicit estimates. Our unlagged overall capital-income ratios for the East Pakistan economy during the Fourth Plan are startlingly similar to the Planning Commission's implicit assumption of such coefficient for the Third Plan[14].

It can be noted that for the rapid import-substitution cases the capital-income ratios are higher than for the corresponding moderate import-substitution cases. This is a feature that we discuss in somewhat greater details later in this section.

4.4.4 Foreign-Exchange Gap and Capital Inflow: Traditionally, East Pakistan has been a highly self-reliant economy. It earned more than half the foreign exchange for Pakistan but used up between a quarter and a third of imports into Pakistan during the sixties. Except in 1963/64 and 1964/65 it has always had a surplus in its trade with rest of the world. In its trade with West

[14]*See*, Khan [13] for an estimate of the third-plan overall capital coefficient for East Pakistan on the basis of the information in Planning Commission [9].

Pakistan, however, it has always shown a deficit which in recent years has reached the level of 500 million rupees. Total capital inflow into East Pakistan in recent years has remained less than 20 per cent of investment and it has almost entirely been in terms of goods and services from West Pakistan and not in terms of 'precious' foreign exchange.

East Pakistan's imports from West Pakistan have mainly consisted of food and other consumer goods. These are the areas in which the region is likely to concentrate heavily its industrialization effort so that the *incremental* share of regional imports of these goods must decline. Acceleration of the development effort in East Pakistan on the other hand will mean a sharp increase in demand for capital goods and related products. In spite of considerable effort at the import substitution of these goods, the incremental share of their imports will remain high by the end of the Fourth Plan. West Pakistan supplies only a very small proportion of these goods and is itself a net importer of these goods in huge quantities. It is, therefore, certain that the acceleration of East Pakistan's development effort during the Fourth Plan will mean a much sharper increase in its foreign-exchange gap as compared to its trade gap with West Pakistan.

As can be seen from Table III East Pakistan's foreign-exchange gap will increase rather sharply — even for moderate import substitution it will go up by 410 million rupees for 6.5-per-cent growth in GRP and by 791 million rupees for 8.4-per-cent growth in GRP. Foreign-exchange gap will increase more than proportionately as income and investment increase.

Trade gap with West Pakistan will also increase and will go up more than proportionately as income and investment go up, but its increase will be more modest — for moderate import-substitution cases it will vary between 131 million and 250 million rupees.

There are two reasons why the capital inflow increases more than proportionately with increases in GRP and investment. First, we have already noticed that the capital goods and the related sectors are highly income elastic. These are also the sectors in which most of the imports are concentrated. Thus, imports increase more than proportionately as GRP increases. Secondly, our exports are exogenously fixed and do not vary with the rate of growth in GRP— probably a not-too-unrealistic assumption.

We do not know the base-year capital inflow into East Pakistan, but assuming that it would be about 600 million rupees (as compared to 370 million rupees in 1965/66 and 504 million rupees in 1966/67) we find that the required capital inflow in 1974/75 will be around 20 per cent of gross investment. This again indicates a lower dependence on foreign resources than has been the characteristic level for Pakistan *as a whole* in the past. This is also within the limits

set in the original Perspective Plan which intended the nation as a whole to have a capital inflow of about 21 per cent of gross investment in 1975[15].

The crucial factor, however, is the rise in East Pakistan's foreign-exchange gap from perhaps almost nothing in the base year to something between 400 and 800 million rupees in 1974/75 depending on the target growth and the intensity of import-substitution effort.

Note, however, that our estimate of the required capital inflow is entirely a measure of the non-competitive import requirement and not a measure of the required addition to domestic savings. The implementation of the required investment programme will necessitate, in addition to the specified quantities of capital inflow, the fulfilment of the savings target which is endogenously given by the model.

One final point needs to be emphasized to forestall the possibility of the misrepresentation of the above analysis. The fact that East Pakistan will have an increasing trade gap (*i.e.*, import surplus) with West Pakistan *does not mean that there will necessarily be a net resource transfer from West to East.* In fact, both the regions will almost certainly remain net importers of foreign capital. One can perhaps talk about the regional shares of foreign assistance but such measurements, to be useful, must be based not only on detailed information about the triangular pattern of trade but also on the correction for the difference between the value of the interregionally traded goods and their value in the international market.

4.4.5 Reducing the Foreign-Exchange Gap: There are two kinds of policies through which attempts can be made to reduce the foreign-exchange gap, import substitution and export expansion. In this subsection we analyse the consequences of each of these alternatives.

Table IV-A quantifies the implications of more rapid import substitution. The meanings of more rapid import substitution and its quantitative measurements have been discussed above in sufficient details. We have argued above that the rapid import-substitution cases probably indicate the limits to feasible import substitution during the FFYP.

By driving the rate of import substitution to its limits we reduce the foreign-exchange gap rather modestly (by 38 million in the moderate-growth case, 49 million in the high-growth case, and 55 million in the very high-growth case). Although the more rapid import substitution means significant reduction in the marginal *share* of imports in the capital goods and related sectors, a part of this is offset by the higher demand for these goods for the required expansion in the regional capacity of these goods. Thus, the overall saving

[15] *See*, [9, p. 19].

in foreign exchange is rather small even though the effort in each of these sectors is rather high. Capital inflow is reduced by even less due to the increase in use-specific complementary regional imports induced by the higher output levels of the using sectors.

Additional income generated is 302 million for the moderate-growth case, 407 million for the high-growth case, and 461 million for the very high-growth case. Additional investment cost is, however, significantly higher than average and has a tendency to increase more than proportionately with additional income generated. It is 863 million, 1172 million and 1331 million respectively. Thus, the capital-income ratio for the additional income generated in the process of more rapid import substitution is very high, 2.9 approximately[16], as compared to the average capital-income ratio for *new capacity* (*i.e.*, net of replacement) of about 1.8 in the three moderate import-substitution cases. The capital cost of reducing foreign-exchange gap is also very high—to reduce the gap in 1974/75 by one rupee, an additional investment of 23 to 24 rupees has to be undertaken during the plan period[17].

An additional dimension of the cost involved in reducing the foreign-exchange gap through greater import substitution is the added burden on fiscal policy of diverting to savings the entire additional income generated. Marginal saving rates will have to be between 2.4 and 2.7 percentage points higher.

Thus, we find that the policy of further reducing the foreign-exchange gap by greater import substitution is very expensive in terms of capital. This, however, is what one expects. Further import substitution is possible only in the sectors in which we have significant non-use-specific imports. Such imports are concentrated in the capital goods and related industries. These sectors are much more capital using than the average.

Table IV-B indicates the consequences of reducing the foreign-exchange gap through export promotion *if* exports can be increased across the board by a stipulated amount. The detailed results of additional export expansion of 89.3 million abroad and 25.8 million to West Pakistan have been shown in Appendix Table 17. As discussed earlier this solution is additive to our basic solutions, *i.e.*, we can add it to any of the three moderate import-substitution cases to obtain the corresponding solution for the ambitious export case.

It can be noted from Table IV-B that although exports abroad go up by 89 million, net improvement in foreign-exchange gap amounts to only 65 million. The rest is used up in importing goods required for the production of additional

[16]To be exact for each subsequently higher rate of growth this ratio goes up slightly. *See*, Table IV-A.

[17]Actually the fixed new investment component of it will have to be completed θ years before the end of the FFYP.

outputs directly and indirectly demanded by additional exports. Similarly, net reduction in total capital inflow amounts to only 86 million although total exports abroad and to West Pakistan together increase by 115 million.

Additional income generated is 170 million at an investment cost of 343 million. Thus, the capital-income ratio for the additional income generated by export expansion is just over 2 which is higher than the average capital-income ratio for new capacity for the three moderate import-substitution cases but significantly lower than that for additional income generated by more rapid import substitution. Capital cost of reducing the foreign-exchange gap by one unit is way below such costs involved in the policy of import substitution.

We must, however, emphasize strongly that we do not stipulate that the additional exports would be actually achieved. There are at least two kinds of limitations that our model is unable to take into account. First, the state of world demand will certainly indicate an upper limit for those traditional exports in which our share is big. Secondly, in exporting other goods a number of scarce resources would be required for the marketing effort. Skilled sales representatives is an example. In the short period of five years the supply of such resources may be quite inelastic.

We should finally point out that the costs of export promotion would be sensitive to the composition of exports. We have assumed that exports can be further accelerated almost across the board (with the qualification that for certain traditional exports the prospects are more limited). It may easily be that the feasible exports are more expensive.

4.4.6 Regional Savings in the Alternative Plans: In the base year the average regional saving rate in East Pakistan will probably be around 10 per cent. In view of this the saving targets of the alternative plans may seem to be rather high.

The marginal saving rates are rather sensitive to the rates of growth. For moderate import substitution it ranges from 18.3 per cent for moderate growth to 20.3 per cent for high growth and to 21.1 per cent for very high growth. These rates are also sensitive to the rate of import substitution. For rapid import-substitution cases they are higher, 20.7 per cent, 22.9 per cent, and 23.8 per cent respectively. Thus, the income elasticity of savings ranges from 1.83 (moderate import-substitution, moderate-growth case) to 2.38 (rapid import substitution, very high growth).

Although the alternative plans indicate a rapid expansion in the foreign-exchange gap and capital inflow, the marginal rate of "foreign savings" (*i.e.*, the increase in capital inflow expressed as the ratio of incremental income)

remains small in comparison to the incremental saving rate particularly in the rapid import-substitution cases.

For an economy like East Pakistan the savings targets are certainly ambitious. The size of the capitalist sector is small so that most of the burden will be upon the public sector. It is going to prove an extremely difficult task for the fiscal policy of the government to generate a marginal rate of saving more than twice as high as the average rate. This may be an important consideration in favour of preferring the moderate import-substitution alternatives which have significantly lower marginal saving rates than the rapid import-substitution alternatives.

4.5 Implications for Additional Employment

It remains for us to estimate for the alternative solutions the additional employment that will be generated. This we do by applying the labour-requirement coefficients for a past period to the sectoral additions to value added.

Labour inputs (in man-years) per unit of value added have been calculated for the manufacturing industries on the basis of *1962/63 Census of Manufacturing Industries* [5] and *1963/64 Survey of Small Industries* [4]. Such coefficients for the services sectors have been estimated by combining the information on the occupational distribution in the 1961 Census [11] and the components of national income reported in the National Income Commission's *Report* [7].

We do not try to estimate such coefficients for the agricultural sectors. This is because agriculture is at the moment the residual employment category and believed to contain a large amount of underemployment. An increase in agricultural employment at present will almost certainly increase the extent of underemployment during most of the year.

Appendix Table 18 shows the employment implications of the two very high-growth cases. It can be seen that for moderate import-substitution employment will increase by about 2.4 million and for rapid import substitution by 2.5 million[18]. Projections for additions to total labour supply have not been done in the light of the latest information on birth and death rates. Estimates done by Bose [1] several years ago indicate an increase in labour supply over the FFYP of about 3.2 million. On the basis of the latest population projections, this estimate appears to be an understatement if anything. Thus, the nonagricultural employment creation under the most ambitious of our plans would absorb no more than 75 to 78 per cent of the additional labour force under most favourable assumptions.

[18]There will probably be another few thousand additional employment in the processing of agricultural goods.

Once we allow for the facts that *a*) the projected increase in labour supply is almost certainly an understatement and that *b*) the use of the labour-coefficients of nearly a decade ago leads to an overestimate in employment since some increase in labour productivity would be inevitable particularly in the services sectors, it would appear that the additional nonagricultural employment during the FFYP would be a much smaller proportion of the increased labour supply — perhaps between a half and two-thirds.

The shares of manufacturing and construction will each be roughly a quarter of the additional employment. It may be noted that half of the additional employment will be in services, *i.e.*, in trade, transport, government and miscellaneous services. Particularly large is the share of miscellaneous services, a quarter of total additional employment. This makes us wonder how effective this employment would be. Almost certainly the labour-coefficient for this sector includes a significant degree of underemployment. This is also supported by the evidence of very low labour productivity indicated by the labour-coefficient of this sector.

It may, however, be noted that even after the corrections for the possible overestimates in employment creation the two plans would indicate very large percentage increase in nonagricultural labour force — certainly well over 50 per cent. This would also mean a much higher marginal share of nonagricultural employment than average (the average share according to 1961 Census was only 15 per cent). While between the 1951 and 1961 Censuses the share of nonagricultural employment actually declined, the two plans under review will result in an increase in such share. But not only the prospect of absolute transfer of labour from agriculture to nonagriculture will remain an illusion, there will actually be an absolute increase in agricultural labour force and underemployment.

4.6 Some Concluding Remarks

In the above we have derived a number of alternative plans. Each of the plans indicates a given size in terms of actual total investment to be undertaken during the FFYP. It should be emphasized that our "plan size" in terms of total gross investment is not quite comparable to the plan size as indicated in the plan documents prepared by the Planning Commission. There are two main discrepancies: *a*) plan documents are presumably formulated in the prices of the plan base-years[19] while our estimates are in the prices of the base-year of the previous plan; and *b*) the Planning Commission's definition of plan cost includes certain non-investment development expenditures.

[19] The plan documnet is actually prepared long before the base-year of the Plan is over. Thus, in using the base-year prices there is always a problem of price prediction. How this is done in practice has remained a minor mystery surrounding the planning process in the country.

Thus, in order to compare our results with the forthcoming FFYP document of the Planning Commission, one must make adjustments for the above factors. To make these accurately, one would be required to undertake great pains. *Very roughly*, a price index for investment for the year 1969/70 of about 115 is indicated (with that for our base, 1964/65 = 100) if trends since 1964/65 are maintained in near future. It is also very difficult to estimate the volume of non-investment development expenditure, but 5 per cent of the value of investment may indicate the order of magnitude.

Thus, in order to convert our plan sizes into the value units of the Planning Commission's forthcoming FFYP size, an upward adjustment of *roughly* 20 per cent will have to be made. This means that for the very high-growth cases the fourth-plan sizes in terms of the Planning Commission's value units would be approximately 36.4 thousand million (moderate import-substitution case) and 38.2 thousand million (rapid import-substitution case).

In the present exercise we have worked out a number of alternative feasible plans although we have not discussed anything about the criteria of selecting a plan from the alternative blueprints. Such choice must ultimately depend upon the political process. But a number of considerations clearly rule out all but the most ambitious of the alternatives explored.

It is true that the very high-growth alternatives present a highly optimistic picture in terms of growth of regional product. Even with the 3-per-cent rate of growth of population, that is being currently forecast, these alternatives would provide over 5 per cent annual growth in income per head—a highly favourable performance compared to almost any developing country today. But from another important standpoint even this rate of growth is hardly enough. East Pakistan is one of the poorest economies of the world with one of the highest population densities and one of the smallest nonagricultural sectors in terms of shares of employment and output. Consequently, underemployment and unemployment in agriculture, actual and potential, are staggering. It is highly desirable that most, if not all, of the additions to labour force be absorbed in nonagricultural employment. As we have shown above, even these very high-growth alternatives are unlikely to absorb more than two-thirds of the additional labour force in nonagricultural employment during the FFYP.

Another consideration is the likely size of the national plan and the notion of what is an appropriate share of East Pakistan. In spite of the frequently mentioned "unfavourable aid climate", the size of Pakistan's Fourth Plan should be greater than the *planned* size of the preceding plan to avoid demoralization and to demonstrate self-reliance. Even a modest increase of about 15 per cent in *real terms* over the Third Plan would indicate a fourth-plan size of over 70 thousand million in current prices. In the past, a national concensus was reached that a higher growth rate in East Pakistan relative to that in

West should be maintained until the living standards in the two regions were equalised. Accordingly, in formulating the third-plan allocation East's share was proposed to be more than half. Unfortunately, preliminary estimates suggest that East's actual share is unlikely to be anything like its planned share which only underlines the need to pursue this objective even more vigorously in near future. If the capital-income ratio is lower in East Pakistan than in West (as the Planning Commission's estimates underlying the Third Plan seem to indicate) then it is an additional argument for (not an argument against) the concentration of investment in the East because the objective of national efficiency will then be fully consistent with the objective of interregional equity. Thus, given a national plan of over 70 thousand million rupees at current prices, a share of 36 to 38 thousand million rupees for East Pakistan would appear to be the minimum desirable. These are the sizes of the very high-growth alternatives.

One of the startlingly optimistic results of the present set of exercises is the low capital cost of generating income in East Pakistan. Although nothing in East Pakistan's past performance contradicts this optimism, it is important to recognise that the low capital-income ratio derives largely from the fact that the incremental share of agriculture (though much smaller than the average share) would remain large in incremental GRP. Although our incremental capital and modern input coefficients for agriculture have been estimated to be much higher than average coefficients to reflect the increasing costs at the margin, the direct and indirect capital requirements remain lower for these sectors than for the rest of the economy.

The low capital-income ratio for the economy, therefore, is crucially dependent on the success of the agricultural programme. The model admittedly does not take into account all possible constraints in this sector. Extension has been treated as part of public administration. The burden on it may turn out to be too great. There are institutional factors obstructing the rate of adoption of new techniques. Large-scale efforts will be needed to remove these through the provision of credit and cooperative arrangements. It may not be feasible to drive such programmes at the required rates. The consequence will be a smaller relative expansion in agriculture and a less favourable capital-income ratio for the economy of the region.

The present exercises have not incorporated the flood-control programme partly because technical details were not available and partly because no decisions were known to have been made by the planning authorities about the magnitude and the phasing of such a programme. It may turn out that some amount of flood-control work will become inevitable during the Fourth Plan. This will raise the plan cost. However, a preliminary exercise reported in [14] indicates that the direct capital cost of such a programme is unlikely to be very large. A more important problem is to finance the consumption of the additional labour force employed in flood-control work either by producing more

consumption goods (which will require additional investment) or by redistributing the present consumption bundle through taxation and other means (which will require no additional investment but will increase the required marginal saving rate thereby putting additional strain on fiscal mechanism).

The exercises also assume that self-sufficiency in rice will be achieved by the end of the Third Plan. If this does not prove true, then either additional agricultural investment will have to be undertaken during the Fourth Plan or additional foreign exchange will have to be provided for the import of rice. The detailed implications of such a possibility have been worked out in [14].

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Appendix Tables

TABLE 1

INCREMENTAL CURRENT INPUT COEFFICIENTS MATRIX

	1	2	3	4	5	6	7
1	.02238	0	0	.09162	0	0	0
2	0	.01319	0	0	0	0	0
3	0	0	.01736	0	0	0	0
4	.07130	.05087	.02275	.02370	.54828	.36503	.26485
5	0	0	0	0	0	0	0
6	0	0	0	0	0	.10383	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	.00282	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	.00033	0	0	0	.00149	.00674	.01035
13	0	0	0	0	0	0	0
14	.10883	.00190	.00559	.00228	0	0	0
15	.03585	.00070	.00267	.00080	.00281	.00080	.00878
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	.00909
18	0	0	0	0	0	.01595	0
19	.00450	.00179	.00052	.00096	0	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	.00009	0	0	0	0	0	.00102
23	.00848	0	0	0	0	.00425	.00295
24	.00093	0	0	0	.01161	.00373	.00070
25	.03000	.03044	.02448	.03492	.06618	.02134	.02375
26	.04000	.08782	.09489	.07025	.05221	.08678	.13071
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	.00040	.00143	.01085	.00014	.01317	.00283	.00191

(*continued*)

TABLE 1—*Contd.*

INCREMENTAL CURRENT INPUT COEFFICIENTS MATRIX

	8	9	10	11	12	13	14
1	0	0	0	0	0	0	0
2	0	0	.34519	0	0	0	0
3	0	0	0	0	0	0	0
4	.23983	.28329	0	.00069	.09500	.32276	.01121
5	.08654	0	0	0	0	0	0
6	.03042	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	.00738	0	0	0	0	.00767	0
9	0	.10963	0	.19851	0	.00638	0
10	.03621	.00135	0	.01315	0	0	.05342
11	0	.02581	0	.31098	0	.00230	0
12	.03036	.00202	.00207	.00133	.21062	0	0
13	0	0	0	.00026	0	.11225	0
14	0	0	0	0	0	0	0
15	.02542	.01338	.00953	.03385	.09545	.09448	.01737
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	.02660	0	0	0	.00642	.01200	0
19	0	.00241	.00848	.00272	.00158	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	.00491	.03362	.00047	0	.00880	.05429	.02545
23	.00798	.01138	.00794	.04987	.05083	.01312	.04584
24	.00422	.02987	.01933	.00242	.12050	.00968	.10393
25	.01591	.02567	.02082	.00738	.04215	.03593	.04809
26	.07029	.09119	.06922	.07451	.10411	.14305	.10758
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	.00210	.01250	.00874	.00406	.01089	.01098	.02991

(*continued*)

TABLE 1—*Contd.*

INCREMENTAL CURRENT INPUT COEFFICIENTS MATRIX

	15	16	17	18	19	20	21
1	0	0	0	0	0	0	.02266
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	.02849	0	0	.00626	0	.00307	.06980
5	.00117	0	0	0	0	0	0
6	.02273	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	.00792	0	0	0
10	0	.10909	0	0	0	.00493	0
11	0	0	0	0	0	0	0
12	.01709	0	.00248	.00156	0	0	0
13	0	0	0	.01133	0	.04371	0
14	0	0	0	0	0	0	0
15	.11582	0	.00261	.03054	.01309	.00777	.02163
16	0	0	0	0	0	0	.05000
17	0	0	.42689	.39302	.20000	.03421	.06320
18	.00191	0	.01533	.02660	.00851	.00798	.03811
19	.00284	.01087	.00250	.00546	.05580	.08912	.01298
20	0	0	0	0	0	.18882	0
21	0	0	0	0	0	0	0
22	.04655	.08400	.00123	.00121	.02028	.00656	.13004
23	.01289	.09716	.02020	.01223	.04623	.00821	.00281
24	.00323	.10135	.01170	.00540	.00661	.00913	0
25	.01929	.16033	.05199	.03251	.04365	.04302	0
26	.12452	.05151	.09273	.09458	.13823	.14421	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	.00954	.01648	.01515	.00913	.01438	.00553	.00074

(*continued*)

TABLE 1—*Concld.*

INCREMENTAL CURRENT INPUT COEFFICIENTS MATRIX

	22	23	24	25	26	27	28	29
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	.11356	0	0	.00601	0	0	.00267	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	.00317	0	0	0	0	0	0	0
9	.02320	0	0	0	0	0	0	0
10	0	0	0	.00441	0	0	0	0
11	.02137	0	0	0	0	0	.00017	0
12	.00273	0	.00403	.00209	.00049	0	.00661	.00448
13	0	0	0	.00575	0	0	0	0
14	0	0	0	0	0	0	0	0
15	.04319	.01048	0	0	0	0	.00243	.00079
16	0	0	0	0	0	0	0	0
17	.01078	0	0	0	0	0	0	0
18	.02385	.05482	0	.00525	.00232	0	.00087	.00010
19	.02527	0	.01626	0	0	0	.00031	.00097
20	0	0	0	.00670	0	0	0	0
21	0	0	0	0	0	.29392	0	0
22	.04615	0	0	.00311	.00108	0	.00153	.00159
23	.01108	.30000	.16658	.03471	0	0	.01052	0
24	.00701	.01011	.05588	.00209	.00188	0	.02403	.00246
25	.05761	.07844	0	0	0	0	.08784	0
26	.11822	.10269	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	.00532	0	0	.00184	.00503	.00724	.02381	.00130

TABLE 2

INCREMENTAL FIXED CAPITAL COEFFICIENTS MATRIX

	1	2	3	4	5	6	7	8
18	.001	.002	.012	0	.010	.001	.003	.005
19	.242	.143	.345	.068	.596	.133	.121	.245
20	0	0	.006	0	.020	.002	.006	.009
21	.124	.230	.204	.080	.162	.073	.117	.179
22	.002	.002	.013	0	.010	.002	.003	.005

(*contd.*)

	9	10	11	12	13	14	15	16
18	.002	.005	.001	.034	.004	.005	.009	.009
19	.381	.928	.174	.863	.201	1.719	.282	2.129
20	.005	.006	.002	.067	.009	.009	.019	.018
21	.158	.399	.065	.380	.119	.201	.367	.358
22	.003	.006	.001	.035	.005	.005	.010	.009

(*contd.*)

	17	18	19	20	21	22	23	24
18	.027	.004	.014	.023	0	.007	.014	0
19	1.285	.243	.889	.392	.037	.399	.862	3.498
20	.054	.007	.027	.043	.075	.013	.018	0
21	.873	.207	.705	.765	.038	.298	.309	2.332
22	.027	.005	.014	.024	0	.007	.014	0

(*contd.*)

	25	26	27	28	29
18	.003	.020	0	.014	.013
19	.039	.199	0	.159	.198
20	.949	.043	0	.034	.042
21	1.206	1.137	6.000	.907	1.132
22	.002	.023	.0	.020	.030

TABLE 3

INCREMENTAL WORKING CAPITAL COEFFICIENTS

	1	2	3	4	5	6	7
1	.12500	0	0	.02164	0	0	0
2	0	.21549	0	0	0	0	0
3	0	0	.20460	0	0	0	0
4	.00143	0	0	.15271	.02700	.12210	.12889
5	0	0	0	0	.45200	0	0
6	0	0	0	0	0	.23365	0
7	0	0	0	0	0	0	.20000
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	.00028	0	0	0	0	0	0
11	0	0	0	0	0	0	0
12	0	0	0	0	0	.00165	.00530
13	0	0	0	0	0	0	0
14	.01088	.00217	.00130	.00016	0	0	0
15	.00359	.00080	.00062	.00006	0	0	.00400
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	.00711
18	0	0	0	0	0	.00495	0
19	.00045	.00211	.00014	.00022	0	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	0	0	0	0	0	.00051
23	.00085	0	0	0	0	.00165	.00158
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0

(*continued*)

TABLE 3—*Contd.*

INCREMENTAL WORKING CAPITAL COEFFICIENTS

	8	9	10	11	12	13	14
1	0	0	0	0	0	0	0
2	0	0	.11040	0	0	0	0
3	0	0	0	0	0	0	0
4	.03552	.08791	0	0	.04891	.05460	.00878
5	.01258	0	0	0	0	0	0
6	.00444	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	.32874	0	0	0	0	.00105	0
9	0	.29527	0	.05120	0	.00105	0
10	.00518	0	.26500	.00320	0	0	.04631
11	0	.00745	0	.32460	0	0	0
12	.00444	0	.00120	0	.22300	0	0
13	0	0	0	0	0	.25590	0
14	0	0	0	0	0	0	.22300
15	0	.00447	.00360	.00960	.04618	.01575	.01306
16	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0
18	0	0	0	0	.00315	.00210	0
19	0	0	.00240	0	.00082	0	0
20	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0
22	0	.01043	0	0	.00467	.00945	.02033
23	0	.00298	.00240	.01280	.02871	.00210	.03817
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0

(*continued*)

TABLE 3—*Contd.*

INCREMENTAL WORKING CAPITAL COEFFICIENTS

	15	16	17	18	19	20	21
1	0	0	0	0	0	0	.00567
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	.01188	.01123	0	.00330	0	0	.01745
5	0	0	0	0	0	0	0
6	.00972	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	.00660	0	0	0
10	0	.05014	0	0	0	.00292	0
11	0	0	0	0	0	0	0
12	.00756	0	.00199	0	0	0	0
13	0	0	0	.00660	0	.03212	0
14	0	0	0	0	0	0	0
15	.31168	0	.00199	.01980	.00996	.00584	.00541
16	0	.22000	0	0	0	0	.01250
17	0	0	.51509	.26070	.13695	.02628	.01580
18	0	0	.00597	.28950	.00747	.00584	.00953
19	.00108	.00452	.00199	.00330	.32182	.06716	.00325
20	0	0	0	0	0	.44016	0
21	0	0	0	0	0	0	0
22	.02052	.03545	0	0	.01494	.00584	.03251
23	.00540	.04283	.00796	.00660	.03735	.00730	.00070
24	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0

(*continued*)

TABLE 3—*Concld.*

INCREMENTAL WORKING CAPITAL COEFFICIENTS

	22	23	24	25	26	27	28	29
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
4	.02271	0	0	0	0	0	.00040	0
5	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
8	.00063	0	0	0	0	0	0	0
9	.00464	0	0	0	0	0	0	0
10	0	0	0	.00103	0	0	0	0
11	.00427	0	0	0	0	0	0	0
12	.00055	0	.00150	.00037	0	0	.00116	.00078
13	0	0	0	.00030	0	0	0	0
14	0	0	0	0	0	0	0	0
15	.00864	.00157	0	0	0	0	.00029	.00009
16	0	0	0	0	0	0	0	0
17	.00216	0	0	0	0	0	0	0
18	.00477	.00822	0	.00066	.00029	0	.00011	0
19	.00505	0	.00574	0	0	0	.00005	.00015
20	0	0	0	.00232	0	0	0	0
21	0	0	0	0	0	0	0	0
22	.23123	0	0	.00052	.00018	0	.00025	.00026
23	.00222	.17000	.06630	.00694	0	0	.00210	0
24	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0

TABLE 4

FOREIGN IMPORT COEFFICIENTS MATRIX

Supplying sector	Using sector	Moderate import substitution	Rapid import substitution
04	04	.02500	.02500
04	09	.04000	.04000
04	22	.02240	.02240
06	06	.03500	.03500
09	09	.02874	.02874
11	11	.06000	.06000
12	12	.12000	.12000
13	13	.10000	.10000
13	25	.00300	.00300
14	14	.15000	.15000
15	15	.42900	.28743
16	16	.66700	.66700
17	17	1.20000	1.00000
18	18	.10900	.07000
19	19	1.50000	1.00000
20	20	.66700	.44689
22	22	.10000	.10000
23	23	2.30000	1.30000

TABLE 5

REGIONAL IMPORT COEFFICIENTS MATRIX

Supplying sector	Using sector	
04	04	.03000
04	07	.14240
04	09	.18384
06	06	.02500
07	07	.10000
08	08	.02000
09	09	.11100
13	13	.10000
15	15	.06500
16	16	.33300
19	19	.05000
20	20	.05000
22	22	.10000

TABLE 6

Sectors	MCP*	(*c.i.f. Price/Purch. Price Ratio*)	
		Foreign import	Regional import
1	.230	.667	.605
2	—	—	—
3	.008	—	—
4	.210	.715	.690
5	.020	—	—
6	.026	.485	.835
7	.039	.222	.860
8	.030	.370	.695
9	.051	.602	.915
10	—	—	—
11	.023	.303	.914
12	.012	.516	.875
13	.016	.400	.860
14	—	.878	—
15	.036	.550	.874
16	—	.541	.833
17	—	.568	.865
18	.011	.513	.863
19	.016	.523	.905
20	.002	.529	.885
21	—	—	—
22	.028	.400	.885
23	.009	.483	—
24	.005	—	—
25	.037	—	—
26	—	—	—
27	.080	—	—
28	—	—	—
29	.111	—	—

*Marginal consumption proportion.

TABLE 7

The following are the transport and trade coefficients $\sum_i t_{ij}\, m_{ij}$ for all the import "using" sectors for inputs of transport and trade on foreign and regional imports together

Sector	Transport	Trade
4	.00140	.01290
6	.00775	.09683
7	.00626	.05176
8	.00060	.00550
9	.00894	.06761
11	.00060	.00852
12	.00252	.00804
13	.00760	.05070
14	.01530	.00300
15	.00988 (.00705)	.09484 (.06581)
16	.03762 (.07638)	.01782 (.03618)
17	.07800 (.06500)	.32400 (.27000)
18	.00436 (.00280)	.01177 (.00756)
19	.07725 (.05225)	.07750 (.05250)
20	.03093 (.02147)	.06153 (.04238)
22	.00545	.04253
23	.18400 (.10400)	.37260 (.21060)
25	.00047	.00529

Note: The figures in parentheses refer to the changed coefficients for the rapid import-substitution cases.

TABLE 8

BASE-YEAR INVESTMENT
(1964/65 Prices)

(million rupees)

Sector	Fixed capital for new capacity	Working capital	Replacement
1		84.1	
2		20.5	
3		0.9	
4		45.1	
5		30.5	
6		14.4	
7		11.0	
8		1.0	
9		37.0	
10		33.2	
11		20.4	
12		1.0	
13		5.8	
14		25.1	
15		14.9	
16		2.1	
17		30.4	
18	27.5	7.6	
19	632.0	6.6	200.0
20	270.0	9.6	158.0
21	1173.0	—	293.0
22	22.5	13.2	
23		9.2	
24			
25			
26			
27			
28			
29			

TABLE 9

INCREASES OVER THE FOURTH PLAN IN EXPORT REPLACEMENT, *ETC.*

(million rupees)

Sector	Normal projection		Replacement	Exogenous import		Trade & transport input on exogenous import*
	Foreign exports	Regional exports		Foreign	Regional	
1. Rice growing and processing						
2. Jute growing and baling	42.5	7.4				
3. Tea		68.5		0.8		
4. All other crops, fishery *etc.*	15.0	5.0		7.0	6.2	
5. Sugar						
6. Edible oils						
7. Cigarettes and tobacco products						
8. Misc. food and drinks	10.0					
9. Cotton textiles	5.0	5.0				
10. Jute textiles	260.0	52.0				
11. Other textiles	5.0	6.0		1.5	2.3	
12. Paper and printing		30.0		2.3	0.8	
13. Leather aud rubber produots	25.0	5.0		1.5		
14. Fertilizer						
15. Chemicals		10.0				
16. Cement						
17. Basic metals						
18. Metal produots						
19. Machineries			73.0			
20. Transport equipment			60.0			
21. Construction			105.0			
22. Misc. manufactures	15.0	15.0				
23. Coal and petroleum						
24. Electricity and gas						
25. Transport						0.6 (0.7) (.08)
26. Trade						5.0 (6.0) (6.5)
27. Housing						
28. Government						
29. Miscellaneous services						
TOTAL:	377.5	203.9	238.0	13.1	9.3	5.6

*Medium growth, high growth and very high growth, respectively.

TABLE 10

CONSUMPTION VECTORS: INCREASES OVER FFYP

(million rupees)

Supplying sector	Moderate growth	High growth	Very high growth
1	1768.7	2114.1	2290.6
2	—	—	—
3	61.5	73.5	79.7
4	1614.9	1930.3	2091.5
5	153.8	183.8	199.2
6	199.9	239.0	258.9
7	299.9	358.5	388.4
8	230.7	275.8	298.8
9	392.2	468.8	507.9
10	—	—	—
11	176.9	211.4	229.1
12	92.3	110.3	119.5
13	123.0	147.1	159.3
14	—	—	—
15	276.8	330.9	358.5
16	—	—	—
17	—	—	—
18	84.6	101.1	109.6
19	123.0	147.1	159.3
20	30.8	36.8	39.8
21	—	—	—
22	215.3	257.4	278.9
23	69.2	82.7	89.6
24	38.4	46.0	49.8
25	284.5	340.1	368.5
26	—	—	—
27	615.2	735.3	796.7
28	359.8*	388.9*	408.4*
29	838.2	1001.8	1085.7

*Public consumption expenditure.

TABLE 11

MODERATE IMPORT SUBSTITUTION, MODERATE GROWTH

(million rupees)

Sector	Change in GVP	Change in value added	'Lagged' fixed investment for new capacity	Investment in working capital
1. Rice growing and processing	2071.2	1396.2	764.3	295.1
2. Jute growing and baling	169.6	137.7	63.9	37.4
3. Tea	137.9	113.2	80.0	28.5
4. All other major and minor crops, livestock, forestry and fishery	2363.4	1832.4	349.8	413.1
5. Sugar	166.3	50.6	132.7	79.7
6. Edible oils	226.9	88.2	47.9	82.6
7. Cigarettes and tobacco products	275.4	150.3	68.9	95.7
8. Miscellaneous food and drinks	261.1	107.5	115.7	102.1
9. Cotton textiles	461.4	165.1	253.3	188.5
10. Jute textiles	344.9	175.3	463.5	132.8
11. Other textiles	283.0	85.0	68.8	113.6
12. Paper and printing	179.9	45.6	248.1	63.9
13. Leather and rubber products	150.7	26.4	50.9	51.5
14. Fertilizer	194.6	108.4	377.3	68.0
15. Chemicals	386.5	229.6	265.5	142.2
16. Cement	50.0	18.5	126.2	18.2
17. Basic metals	170.8	61.0	387.0	91.4
18. Metal products	193.2	70.0	90.0	115.2
19. Machineries	360.6	163.4	594.6	190.6
20. Transport equipment	74.3	30.0	92.7	44.1
21. Construction	1866.5	1097.6	280.0	191.9
22. Miscellaneous manufactures	523.3	255.1	378.9	150.1
23. Coal and petroleum	79.8	35.4	97.1	14.3
24. Electricity and gas	148.3	112.3	864.6	10.9
25. Transport	709.3	658.3	1559.8	8.6
26. Trade	1020.2	1009.2	1450.7	0.5
27. Housing	615.2	429.9	3691.2	—
28. Government	359.8	301.9	408.0	1.6
29. Miscellaneous services	903.6	893.0	1278.6	1.2
TOTAL:		9847.1	14650.0	2733.3

TABLE 12

MODERATE IMPORT SUBSTITUTION, HIGH GROWTH

(million rupees)

Sector	Change in GVP	Change in value added	'Lagged' fixed investment for new capacity	Investment in working capital
1. Rice growing and processing	2502.8	1687.1	923.5	356.6
2. Jute growing and baling	174.0	141.3	65.6	38.4
3. Tea	150.6	123.6	87.3	31.1
4. All other major and minor crops, livestock, forestry and fishery	2857.2	2215.3	422.9	499.4
5. Sugar	205.3	62.5	163.8	98.3
6. Edible oils	274.6	106.7	57.9	100.0
7. Cigarettes and tobacco products	331.2	180.8	82.8	115.1
8. Miscellaneous food and drinks	310.4	127.8	137.5	121.3
9. Cotton textiles	559.0	200.1	306.9	228.4
10. Jute textiles	355.7	180.8	478.1	136.9
11. Other textiles	342.4	102.8	83.2	137.4
12. Paper and printing	208.4	52.9	287.4	74.1
13. Leather and rubber products	177.9	31.2	60.1	60.8
14. Fertilizer	239.8	133.6	465.0	83.8
15. Chemicals	470.1	279.2	323.0	172.9
16. Cement	66.8	24.7	168.5	24.3
17. Basic metals	234.3	83.7	530.9	125.3
18. Metal products	251.5	91.1	117.2	150.0
19. Machineries	496.0	224.8	817.9	262.1
20. Transport equipment	127.7	51.6	159.2	75.8
21. Construction	2482.6	1459.8	372.4	255.3
22. Miscellaneous manufactures	662.2	322.8	479.4	190.0
23. Coal and petroleum	98.5	43.7	119.9	17.7
24. Electricity and gas	178.0	134.8	1037.7	13.1
25. Transport	865.0	802.8	1902.1	10.5
26. Trade	1264.2	1250.5	1797.7	0.6
27. Housing	735.3	513.9	4411.8	—
28. Government	388.9	326.4	441.0	1.7
29. Miscellaneous services	1081.3	1068.7	1530.0	1.4
TOTAL:		12025.0	17830.7	3382.4

TABLE 13

MODERATE IMPORT SUBSTITUTION, VERY HIGH GROWTH

(million rupees)

Sector	Change in GVP	Change in value added	'Lagged' fixed investment for new capacity	Investment in working capital
1. Rice growing and processing	2723.4	1835.8	1004.9	388.0
2. Jute growing and baling	176.2	143.0	66.4	38.9
3. Tea	157.2	129.0	91.2	32.5
4. All other major and minor crops, livestock, forestry and fishery	3109.7	2411.0	460.2	543.5
5. Sugar	225.3	68.5	179.8	107.9
6. Edible oils	298.8	116.1	63.0	108.8
7. Cigarettes and tobacco products	359.7	196.4	89.9	125.0
8. Miscellaneous food and drinks	335.5	138.2	148.6	131.1
9. Cotton textiles	609.0	217.9	334.3	248.8
10. Jute textiles	361.2	183.6	485.5	139.1
11. Other textiles	372.9	112.0	90.6	149.7
12. Paper and printing	223.1	56.6	307.7	79.3
13. Leather and rubber products	191.6	33.6	64.8	65.5
14. Fertilizer	262.8	146.4	509.6	91.9
15. Chemicals	512.8	304.6	352.3	188.6
16. Cement	75.5	27.9	190.5	27.5
17. Basic metals	266.9	95.3	604.8	142.8
18. Metal products	281.4	101.9	131.1	167.8
19. Machineries	565.5	256.3	932.5	298.9
20. Transport equipment	155.2	62.7	193.5	92.1
21. Construction	2799.4	1646.1	419.9	287.8
22. Miscellaneous manufactures	733.4	357.5	531.0	210.4
23. Coal and petroleum	108.1	47.9	131.6	19.4
24. Electricity and gas	193.3	146.4	1126.9	14.2
25. Transport	945.0	877.0	2078.1	11.5
26. Trade	1389.2	1374.2	1975.4	0.7
27. Housing	796.7	556.8	4780.2	—
28. Government	408.4	342.7	463.1	1.8
29. Miscellaneous services	1172.5	1158.8	1659.1	1.4
TOTAL:		13144.2	19466.5	3714.9

TABLE 14

RAPID IMPORT SUBSTITUTION, MODERATE GROWTH

(million rupees)

Sector	Change in GVP	Change in value added	'Lagged' fixed investment for new capacity	Investment in working capital
1. Rice growing and processing	2074.8	1398.6	765.6	295.6
2. Jute growing and baling	169.9	137.9	64.1	37.5
3. Tea	137.9	113.2	80.0	28.5
4. All other major and minor crops, livestock, forestry and fishery	2375.9	1842.1	351.6	415.3
5. Sugar	166.4	50.6	132.8	79.7
6. Edible oils	228.4	88.8	48.2	83.1
7. Cigarettes and tobacco products	275.4	150.3	68.9	95.7
8. Miscellaneous food and drinks	261.2	107.6	115.7	102.1
9. Cotton textiles	462.3	165.4	253.8	188.9
10. Jute textiles	345.5	175.6	464.4	133.0
11. Other textiles	283.7	85.2	68.9	113.9
12. Paper and printing	181.5	46.0	250.3	64.5
13. Leather and rubber products	152.2	26.7	51.4	52.1
14. Fertilizer	195.0	108.7	378.1	68.2
15. Chemicals	440.2	261.4	302.4	161.9
16. Cement	52.5	19.4	132.5	19.1
17. Basic metals	229.7	82.0	520.5	122.9
18. Metal products	213.3	77.3	99.4	127.2
19. Machineries	507.0	229.8	836.0	267.9
20. Transport equipment	97.1	39.2	121.1	57.6
21. Construction	1957.6	1151.1	293.6	201.3
22. Miscellaneous manufactures	543.1	264.8	393.2	155.8
23. Coal and petroleum	127.2	56.4	154.8	22.9
24. Electricity and gas	152.0	115.1	886.2	11.2
25. Transport	727.4	675.1	1599.6	8.8
26. Trade	1062.9	1051.4	1511.4	0.5
27. Housing	615.2	429.9	3691.2	—
28. Government	359.8	301.9	408.0	1.6
29. Miscellaneous services	908.0	897.4	1284.8	1.2
TOTAL:		10148.9	15328.5	2918.0

TABLE 15

RAPID IMPORT SUBSTITUTION, HIGH GROWTH

(million rupees)

Sector	Change in GVP	Change in value added	'Lagged' fixed investment for new capacity	Investment in working capital
1. Rice growing and processing	2507.7	1690.4	925.3	357.3
2. Jute growing and baling	174.3	141.5	65.7	38.4
3. Tea	150.6	123.6	87.3	31.1
4. All other major and minor crops, livestock, forestry and fishery	2874.0	2228.3	425.4	502.3
5. Sugar	205.4	62.5	163.9	98.4
6. Edible oils	276.4	107.4	58.3	100.6
7. Cigarettes and tobacco products	331.2	180.8	82.8	115.1
8. Miscellaneous food and drinks	310.5	127.9	137.6	121.4
9. Cotton textiles	560.2	200.5	307.5	228.8
10. Jute textiles	356.5	181.2	479.1	137.3
11. Other textiles	343.4	103.1	83.4	137.8
12. Paper and printing	210.5	53.4	290.3	74.8
13. Leather and rubber products	180.1	31.5	60.9	61.6
14. Fertilizer	240.3	133.9	465.9	84.0
15. Chemicals	536.3	318.5	368.4	197.3
16. Cement	70.2	25.9	177.1	25.6
17. Basic metals	314.9	112.5	713.6	168.5
18. Metal products	278.1	100.7	129.6	165.9
19. Machineries	696.5	315.7	1148.5	368.1
20. Transport equipment	163.7	66.1	204.1	97.1
21. Construction	2606.9	1532.9	391.0	268.0
22. Miscellaneous manufactures	688.9	335.8	498.8	197.6
23. Coal and petroleum	157.9	70.0	192.2	28.4
24. Electricity and gas	183.0	138.6	1066.9	13.5
25. Transport	889.4	825.4	1955.8	10.8
26. Trade	1323.1	1308.8	1881.4	0.6
27. Housing	735.3	513.9	4411.8	—
28. Government	388.9	326.4	441.0	1.7
29. Miscellaneous services	1087.2	1074.5	1538.4	1.4
TOTAL:		12431.7	18752.0	3633.4

TABLE 16

RAPID IMPORT SUBSTITUTION, VERY HIGH GROWTH

(million rupees)

Sector	Change in GVP	Change in value added	'Lagged' fixed investment for new capacity	Investment in working capital
1. Rice growing and processing	2728.9	1839.5	1007.0	388.8
2. Jute growing and baling	176.6	143.4	66.6	39.0
3. Tea	157.2	129.0	91.2	32.5
4. All other major and minor crops, livestock, forestry and fishery	3128.7	2425.8	463.0	546.9
5. Sugar	225.4	68.6	179.9	108.0
6. Edible oils	300.9	117.0	63.5	109.5
7. Cigarettes and tobacco products	359.7	196.4	89.9	125.0
8. Miscellaneous food and drinks	335.7	138.3	148.7	131.2
9. Cotton textiles	610.3	218.4	335.1	249.3
10. Jute textiles	362.2	184.1	486.8	139.4
11. Other textiles	374.0	112.3	90.9	150.1
12. Paper and printing	225.4	57.2	310.8	80.1
13. Leather and rubber products	194.2	34.0	65.6	66.4
14. Fertilizer	263.5	146.8	510.9	92.1
15. Chemicals	585.4	347.7	402.2	215.3
16. Cement	79.3	29.3	200.1	28.9
17. Basic metals	358.6	128.1	812.6	191.8
18. Metal products	311.4	112.8	145.1	185.7
19. Machineries	793.6	359.7	1308.6	419.4
20. Transport equipment	197.9	79.9	246.8	117.4
21. Construction	2940.7	1729.2	441.1	302.4
22. Miscellaneous manufactures	763.7	372.3	552.9	219.1
23. Coal and petroleum	173.6	77.0	211.3	31.2
24. Electricity and gas	198.9	150.6	1159.6	14.6
25. Transport	972.7	902.7	2139.0	11.8
26. Trade	1456.3	1440.6	2070.9	0.7
27. Housing	796.7	556.8	4780.2	—
28. Government	408.4	342.7	463.1	1.8
29. Miscellaneous services	1179.2	1165.4	1668.6	1.5
TOTAL:		13605.6	20512.0	3999.9

TABLE 17

ADDITIONAL EXPORT OF 115 MILLION

(million rupees)

Sector	Additional GVP	Additional value added	Additional lagged fixed investment	Additional investment in working capital
1. Rice growing and processing	2.9	2.0	1.1	0.4
2. Jute growing and baling	40.1	32.6	15.1	8.8
3. Tea	—	—	—	—
4. All other major and minor crops, livestock, forestry and fishery	19.9	15.4	2.9	3.5
5. Sugar	0.4	0.1	0.3	0.2
6. Edible oils	0.3	0.1	0.1	0.1
7. Cigarettes and tobacco products	—	—	—	—
8. Miscellaneous food and drinks	3.7	1.5	1.6	1.4
9. Cotton textiles	4.2	1.5	2.3	1.7
10. Jute textiles	56.2	28.6	75.5	21.6
11. Other textiles	0.7	0.2	0.2	0.3
12. Paper and printing	12.3	3.1	17.0	4.4
13. Leather and rubber products	10.0	1.8	3.4	3.4
14. Fertilizer	0.4	0.2	0.8	0.1
15. Chemicals	6.6	3.9	4.5	2.4
16. Cement	1.0	0.4	2.5	0.4
17. Basic metals	5.0	1.8	11.3	2.7
18. Metal products	3.2	1.2	1.5	1.9
19. Machineries	16.9	7.7	27.9	8.9
20. Transport equipment	3.2	1.3	4.0	1.9
21. Construction	35.4	20.8	5.3	3.6
22. Miscellaneous manufactures	15.9	7.8	11.5	4.6
23. Coal and petroleum	1.4	0.6	1.7	0.3
24. Electricity and gas	3.6	2.7	21.0	0.3
25. Transport	9.3	8.6	20.5	0.1
26. Trade	25.1	24.8	35.7	0
27. Housing	—	—	—	—
28. Government	—	—	—	—
29. Miscellaneous services	1.6	1.6	2.3	0
TOTAL:		170.3	270.0	73.0

TABLE 18

INCREASE IN EMPLOYMENT IN THE VERY HIGH-GROWTH CASES

(thousand)

Sectors	Moderate import substitution	Rapid import substitution
5	9.88	9.90
6	28.90	29.12
7	5.13	5.13
8	36.51	36.54
9	72.97	73.14
10	44.23	44.35
11	35.83	35.92
12	14.25	14.40
13	10.02	10.14
14	10.98	11.01
15	55.04	62.83
16	2.79	2.93
17	22.45	30.18
18	33.34	36.91
19	45.11	63.31
20	17.25	21.98
21	576.14	605.22
22	174.78	182.02
23	1.63	2.63
24	16.19	16.66
25	122.78	126.38
26	385.88	404.52
27	—	—
28	91.23	91.23
29	616.83	620.34
	2430.14	2536.79