Problems of Interregional and Intersectoral Allocation: The Case of Pakistan

by

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THE REGIONAL PROBLEM

Many countries have "regional problems". Income and political power are allocated unequally among regions with no significant change over time, and these inequities are a source of political tension. The regional problem in Pakistan is especially severe because the peculiar geographic nature of Pakistan makes the issue so visible[1].

Economic planners in Pakistan and other poor countries are often assigned the task of designing programmes to bring about income parity among regions. In doing so, planners confront several analytic and technical problems. The principal difficulty is how to allocate resources so as to best conform to political preferences of policy-makers. In this context it is desirable to discover and exploit the comparative advantages of the regions. Regional comparative advantages, in turn, are dependent upon the regional distribution of resources and upon political preferences as to the regional allocation of welfare.

In this essay, a multisectoral regional linear-programming planning model is used to investigate various aspects of Pakistan's "regional problem". First, the model will serve to illustrate the dependence of the average productivity of a region upon the structure of demand in that region. Usually, one conceives of productivity as being a function primarily of supply conditions. When trade

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[1]Pakistan is unique in its regional division into two wings sharing population on a 55:45 basis and separated from each other by 1,000 miles of foreign territory (for trade purposes the relevant distance is 3,000 miles which separates the major ports of the two regions).

limitations exist, however, the composition of supply and hence the average productivity is also dependent upon the structure of demand.

Second, the model will aid in an examination of the dependence of regional comparative advantage upon political preferences regarding the regional allocation of welfare. The decision to favour the development of one region necessarily implies a shift of resources to that region and away from the other region. The change in resource availabilities in the two regions affects relative prices and hence affects comparative advantage in each region.

Third, the model will be used to isolate the economic factors which are most important in determining relative regional advantages. It will be seen that regional differences in the ability to generate resources, which can be transferred between the regions, do not seriously affect regional comparative advantages. However, regional comparative advantages can be affected either by changes in national resource availabilities — *e.g.*, the increase of capital availability relative to foreign-exchange availability — or by regional differences in the ability to generate nontransferable resources.

Before a full discussion of these aspects of regional planning can be undertaken, it is first necessary to lay out the model. In Section II, therefore, following a brief discussion of the assumptions and principles of design behind the model, the basic equations are laid out. Section III discusses the analytic results obtained from various solutions to the problem embodied in the model. In Section IV, the general conclusions are summarized.

II. THE REGIONAL PLANNING MODEL[2]

The planning problem for Pakistan examined here may be stated as follows: find a resource-allocation programme — among sectors and between regions — for the period 1964/65 to 1974/75. The programme should lead to the economy's being on the highest feasible consumption path by the latter date. The programme is constrained by the shortages of investment funds and foreign-exchange earning possibility and by limited agricultural growth possibilities[3].

Before laying out the equations which define the linear-programming problem, it will be useful to state some of the features of the model.

1. The model is regional. Production processes and demand in the two regions of Pakistan are considered separately, while tied together by tariff-free trade, a common supply of certain resources, and a common central plan-

[2]For a more complete description of the model and its uses, *see* MacEwan [3]. There the reader will also find the complete set of parameter values and exogenous variable values.

[3]Labour is assumed to be in surplus. Skilled labour is taken into account only indirectly: export limitations, noncompetitive import requirements, and agricultural growth limitations are, at least in part, based on consideration of skilled labour shortage; *see* MacEwan [3].

ning authority. (All parameter values have been estimated separately for the two regions.)

2. The model is multisectoral or an input-output type model. That is, explicit account is taken of the deliveries of goods and services between producing sectors as well as to final demand categories[4]. The technical coefficients embody an attempt to estimate important technical change. A list of sectors is given below in Table I.

TABLE I

SECTOR CLASSIFICATION[a]

1.	*Rice* growing and processing	19.	*Cement*, concrete, and bricks
2.	*Wheat* growing and processing	20.	*Basic metals*
3.	*Jute* growing and baling	21.	*Metal products*
4.	*Cotton* growing and ginning	22.	*Machinery*
5.	*Tea* growing and processing	23.	*Transport equipment*
6.	*All other agriculture* Forestry and fishery	24.	*Wood, cork, and furniture*
		25.	*Construction of* residential *houses*
7.	*Sugar refining*	26.	*Construction of* nonresidential *buildings*
8.	*Edible oils*		
9.	*Tobacco* products	27.	All *other construction*
10.	*Other food* and drinks	28.	*Miscellaneous manufacture*
11.	*Cotton textiles*	29.	*Coal and petroleum products*
12.	*Jute textiles*	30.	*Electricity and gas*
13.	*Other textiles*	31.	*Transport*
14.	*Paper* and printing	32.	*Trade*
15.	*Leather* and leather products	33.	Ownership of dwellings (*housing*)
16.	*Rubber* and rubber products	34.	*Government*[b]
17.	*Fertilizer*	35.	*Services, n.e.s.*
18.	*Other chemicals*		

[a]Italicized portion of name will usually be used.
[b]*i.e.*, public administration and defence.

3. Special attention has been given to technical change in the agricultural sectors, especially in foodgrains. The large foodgrain-production programme being undertaken in Pakistan should substantially reduce the cost of producing rice and wheat. The cost of rice and wheat will be shown to have a substantial effect upon regional issues[5].

[4]The general input-output framework is Leontief's dynamic model.

[5]The impact of the foodgrain-production programme upon regional issues and upon industrial priorities has been more thoroughly investigated in MacEwan [3, especially Chapter VI, "Agricultural Change and Industrial Planning"].

4. The model is comparative static. That is, variables are defined as changes which take place between 1964/65, the base year of Pakistan's Third Five Year Plan, and 1974/75, the terminal year of Pakistan's Fourth Five Year Plan. The solution of the model problem, therefore, yields a comparison of 1974/75 with 1964/65, but it does not reveal anything about the time pattern of change between those years.

5. The explicit choice variables of the linear-programming problem are plan-period increments to: the level of consumption in each region, the quantity of capital flowing between the regions, and the source of supply of each commodity — *i.e.*, production in East Pakistan, production in West Pakistan, or importing from abroad[6].

In algebraic terms the skeleton structure of the problem may be stated as follows:

Maximize: $W = \delta^e \omega^e C^e + \delta^w \omega^w C^w$ .....(1)

subject to:

a. Supply and Demand Balances

For Goods and Services, for each region:

$$x_i + m_i + r_i^1 \geqslant c_i + \sum_j x_{ij} + \sum_j h_{ij} + rep_i + w_i + e_i + r_i^2 + gov \quad (2)$$

For Foreign Exchange, for each region:

$$\sum_i p_i e_i + \sum_i p_i' r_i^2 + f = \sum_i q_i m_i + \sum_i q' r_i^1 \quad \text{.....(3)}$$

For Capital, for each region:

$$S + f + \sum_i tar_i = \sum_i \sum_j h_{ij} + \sum_i w_i + \sum_i rep + \Sigma gov_i \quad \text{.....(4)}$$

Overall Supply of Funds, for the nation:

$$f^e + f^w = F \quad \text{.....} \quad (5)$$

b. Export Limits, for each region:

$$p_i e_i \leqslant \bar{e}_i \quad \text{.....} \quad (6)$$

$$\sum_i p_i e_i \leqslant \bar{E} \quad \text{.....} \quad (7)$$

[6]It should be evident that the problem can be viewed as a three-country trade problem and is analogous to many customs-union type problems.

where

$$\overline{E} < \Sigma \bar{e}_i \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (8)$$

c. Savings Limits, for each region:

$$S = \sum_{i=1}^{6} s_1 v_i + \sum_{i=7}^{35} s_2 v_i \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (9)$$

$$v_i = \nu_i x_i \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (10)$$

where

$$\nu_i = 1 - \sum_j a_{ji} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (11)$$

d. Availability of Foreign Funds, for the nation:

$$F = \overline{F} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (12)$$

e. Agricultural Growth Limits, for each region:

$$x_i \leqslant x_i^* \left\{ (1.05)^{10} - 1 \right\} \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (13)$$

for i, a nonfoodgrain agricultural sector.

The variables and parameters specified separately for each region are defined as follows:

Endogenous Variables in Increments over 1964/65

C^e, C^w = per capita consumption in East Pakistan and West Pakistan, respectively

x_i = regional gross output of sector i

m_i = imports to the region from abroad of goods classified under sector i

r_i^1 = imports to the region from the other region of goods classified under sector i

c_i = regional consumption of the products of sector i

x_{ij} = current deliveries to sector j of goods classified under sector i

h_{ij} = net fixed capital deliveries to sector j of goods classified under sector i

rep_i = deliveries of goods classified under sector i for replacement investment

w_i = working capital deliveries of goods classified under sector i

e_i = exports of goods of sector i from the region to abroad

r^2 = exports of goods of sector i from the region to the other region

gov_i = government public administration and defence expenditure on the products of the *i*-th sector (zero except for i=34)

f = net regional inflow of funds

S = aggregate regional savings

tar_i = total tariff earned on imports of goods classified under sector i

F = net inflow of funds to the nation from abroad

v_i = value added in sector i

Predetermined Base-Year Variables and Exogenous Variables

$\bar{e}_i$ = upper limit on the increment to foreign exchange earned from the increment to exports abroad of type i

$\bar{E}_i$ = upper limit on the increment to foreign exchange earned from total increment to exports abroad

$\bar{F}$ = exogenously specified increment over the Plan to net inflow of funds to other nations from abroad

x_i^* = peak output attained up to 1964/65 in nonfoodgrain agricultural sectors

Parameters

δ^e, δ^w = weights, representing the political valuation of increments to consumption in East Pakistan and West Pakistan, respectively

ω^e, ω^w = population shares of East Pakistan and West Pakistan

p_i = *f.o.b.* price of foreign exports of type i

p_i' = *f.o.b.* price of regional exports of type i

q_i = *c.i.f.* price of foreign imports of type i

q_i' = *c.i.f.* price of regional imports of type i

v_i = ratio of value added to output in sector i

s_1, s_2 = marginal savings rates for agricultural and nonagricultural sectors, respectively

The welfare function consists of the maximization of the weighted sum of 1964/65 to 1974/75 increments to regional per capita consumption. The weights are population shares (ω^e,ω^w) and political valuations (δ^e, δ^w). When political valuations are taken as unity for both regions, *i.e.*, $\delta^e = \delta^w = 1$, this is equivalent to maximization of the increment to total national consumption. Because of the manner in which the economy is constrained to continue growing, maximization of this welfare function puts the economy on the highest feasible consumption growth-path. The structure of consumption is determined by a linear relationship between consumption of each type in a region and aggregate consumption in the region.

The supply and demand balance for goods and services states that demand for each commodity in each region cannot exceed supply in each region. The supply variables (all in increments) — production (x_i), foreign import (m_i), and regional import (r_i^1) — are explicit choice variables[7]. Consumption demand (c_i), as stated in the previous paragraph, is linearly related to aggregate consumption in the region. Intermediate deliveries on current account (x_{ij}) are proportionally related to output. Net fixed capital deliveries (h_{ij}) and working-capital deliveries (w_i) are linearly related to output increments in the receiving sectors by using the "stock-flow conversion factor" technique[8]. Replacement (rep_i) and government consumption expenditure (gov_i) are determined exogenously. Foreign exports (e_i) and regional exports (r_i^2) are explicit choice variables, the latter being regional imports of the other region.

The supply and demand balances for foreign exchange and for capital are accounting identities. It should be noted that tariffs are included as a source of capital, and government consumption expenditures are included as a demand for capital. These terms are included because, from the point of view of the central planner trying to determine how to raise a surplus and decide how to allocate it, these terms need to enter into the "savings-investment" relationship.

The overall supply of funds specifies that foreign funds (F) which are exogenously specified ($\bar{F}$) can be allocated in any manner between the regions. In

[7]Some imports, foreign and regional, are taken as noncompetitive and proportionally related to output increment in certain sectors.

[8]The "stock-flow conversion factor" technique is explained by Manne [4 ; 5]. Briefly, an assumption is made as to the growth rate for the plan period. Further, it is assumed that the growth rate is constant over the period. These assumptions make it possible to determine the ratio between investment in the terminal year and the stock of investment accumulated over the plan period. This ratio is the "stock-flow conversion factor". Output in the terminal period is related to the stock and, using the conversion factor, output is directly related to the flow of investment. The "stock-flow conversion factor" technique is one way of dealing with the so-called "terminal conditions" problem in planning models. It is this technique, referred to above, which puts the economy on the highest consumption path and provides for future growth. Working capital is treated in the same manner as fixed capital. Working-capital deliveries, however, go not only to producing sectors but also to final demand categories.

particular, the region can have capital outflows as well as capital inflows, *i.e.*, f^c and f^w can take on negative values[9].

The export limits or foreign-exchange earning limits are specified so as to allow some choice in the specification of an export programme. It is assumed that the limits to exporting are primarily marketing problems, and to a certain degree marketing "effort and ability" may be shifted among sectors.

The savings limit specifies saving in each sector as proportional to value added in that sector — at base-year prices. Separate savings rates are specified for agriculture and nonagriculture, but no distinction is made between profits and wage income. Saving includes all forms of savings out of domestic income, whether "voluntary" or "forced" by one or another form of fiscal or monetary policy (including taxation).

The agricultural growth limits are based upon the reasoning that there are "institutional" limits — the structure of human capital and the social relations of peasant agriculture, for example — which inhibit the expansion of agricultural output. Although ideally such limits should be specified by rising costs, for nonfoodgrain agricultural sectors an absolute upper limit has been placed on the average growth rate of output over the ten-year planning period, namely, 5 per cent per annum based on projections for the Third Five Year Plan. While these limits play an important role in some cases, they represent a relatively optimistic appraisal of the situation. In foodgrain sectors rising cost-functions have been used, but for purposes of this essay it is sufficient to note that overall costs of foodgrain production should be substantially reduced, as compared to the base year, by the new foodgrain programme.

The first step in investigating the regional problem is to obtain a solution based upon a "best guess" at the values of behavioural and structural parameters and upon the assumption of political neutrality with regard to the regional origin of increments to national per capita consumption (*i.e.*, the δ's in equation (1) both have the value of unity). This original solution will be referred to as the basic solution. Table II presents the most important aggregate parameters upon which the basic solution is obtained. These include the δ's, the savings rates, the export growth rates, and the increment to foreign-funds inflow.

A single solution to the model yields the value of the increment to per capita consumption in each region, an incremental production-trade programme for each region, and the value of the interregional flow of resources. Thus, associated with any regional consumption programme, there is a production-trade programme, *i.e.*, comparative advantage programme. It is by varying

[9]The non-negativity constraints of linear programming provide no obstacle in this respect. Extra variables, the negatives of f^c and f^w, can be included.

TABLE II

KEY PARAMETERS OF THE BASIC SOLUTION

Parameters	East Pakistan	West Pakistan
Political valuation of consumption increments (δ)	1.0	1.0
Marginal savings rate		
Agricultural sectors (s_1)	0.14	0.14
Nonagricultural sectors (s_2)	0.24	0.24
Export growth rate	7.5%	7.5%
Increment to foreign-funds inflow ($\bar{F}$)	0[a]	

[a]All Pakistan.

the principal assumptions about the economy and about political preferences that alternative solutions may be obtained and compared.

III. ECONOMIC AND POLITICAL DETERMINANTS OF REGIONAL ALLOCATION

Disparity and Regional Productivity

The basic solution serves two functions in addition to providing a "best guess" at an overall resource-allocation plan. First, it serves as a reference point. By comparing alternative solutions to the model with the basic solution, an analysis of interregional and intersectoral allocation can be developed. Second, a direct examination of the basic solution reveals information about the relationship between regional productivity and the structure of demand. This latter issue is dealt with first.

In Table III the main macrovariables of the basic solution are presented: per capita consumption, per capita income, population, the incremental aggregate savings ratio, the incremental gross and net capital-output ratios, and the average annual rate of growth. In the table the values of the macrovariables are also shown for the base year, the terminal year, and for the situation envisioned in the Plan document [7]. (The terminal-year variables are simply the base-year values plus the increments obtained in the basic solution.)

It can be noted from the data in Table III that on an aggregate level the basic solution is roughly in accord with the projections contained in Pakistan's

TABLE III

MACROVARIABLES OF THE BASIC SOLUTION

	Per capita private consumption	Per capita income	Population	Incremental gross aggregate domestic savings rate[a]	Incremental capital-income ratio net—gross	Average annual rate of growth of GNP
	(*rupees*)	(*rupees*)	(*millions*)			
Basic solution increment						
East Pakistan	144.9	197.3	21.5	22.3	2.17—2.66	7.5
West Pakistan	146.4	203.5	15.9	22.3	2.54—3.63	6.0
All Pakistan	144.4[b]	198.6	37.4	22.3	2.35—3.13	6.7
Base year 1964/65						
East Pakistan	309.5	377.1	60.5	14.8	— —	—
West Pakistan	423.1	547.9	51.7	16.9	— —	—
All Pakistan	361.8	455.8	112.2	16.0	— —	—
Terminal year 1974/75						
East Pakistan	454.0	574.2	82.0	18.7	— —	—
West Pakistan	569.5	751.4	67.6	19.3	— —	—
All Pakistan	506.2	654.4	149.6	18.9	— —	—
Plan assumption for 1975						
East Pakistan	*n.a.*	565.9[c]	81.1	*n.a.*	*n.a.*—*n.a.*	7.7[d]
West Pakistan	*n.a.*	662.1[c]	66.3	*n.a.*	*n.a.*—*n.a.*	6.2[d]
All Pakistan	*n.a.*	609.3[c]	147.4	23.5[d]	*n.a.*—2.90	7.0

Sources: Plan assumptions for 1975 are from [7]
Population estimates for the model computations are from [6]
All other entries can be derived from [6 ; 7] and Table I.

[a]These are average rates for the base and the terminal years. Savings include government savings.

[b]That the increment to national per capita consumption is less than either of the regional increments is due to the faster rate of population growth in East Pakistan.

[c]The Plan document [7] gives per capita income figures inconsistent with its aggregate GNP and population estimates. The estimate given here is based on the aggregate GNP data and population with the same regional breakdown as given by the Plan per capita figures.

[d]Arithmetic average of third- and fourth-plan rates.

Third Five Year Plan[10]. With regard to reduction of disparity between East and West Pakistan, the basic solution and the Plan are also in general agreement. The disparity ratios of the two programmes are shown in Table IV.

TABLE IV

DISPARITY RATIOS FROM THE PLAN AND BASIC SOLUTIONS[a]

	1964/65	1974/75
Plan: in terms of per capita income	1.34	1.17
Basic solution: in terms of per capita income	1.45	1.31
Basic solution: in terms of per capita private consumption	1.37	1.25

[a]The disparity ratio is defined as the ratio of the West Pakistan value to the East Pakistan value.

Although the Plan and the basic solution begin with different estimates of base-year disparity, both prescribe large reductions of disparity over the plan period. However, while the disparity reduction of the Plan is a matter of policy, no politically based restrictions on regional distribution have been employed in the basic solution. The disparity reduction of the basic solution is an optimal economic programme where national per capita consumption is the welfare criterion.

This result — that it is economically optimal to move toward parity between East Pakistan and West Pakistan — requires some explanation[11]. It might be expected that the economically more advanced region (in this case, West Pakistan) would be more efficient in its use of scarce resources and, hence, that increased disparity would result from purely economic considerations[12].

When trade opportunities are limited, the productivity of a region cannot be defined independently of what must be provided for final demand in that region. Because East Pakistan is the poorer of the two regions, it has a larger share of agricultural goods in its marginal consumption bundle. These agricultural goods, especially rice, are relatively cheap to provide when the rate of growth is not high, *i.e.*, when the limits on agricultural production are not reached. Thus, until a level of consumption is reached which requires East Pakistan to import agricultural products — and, therefore, undertake costly

[10]A sector-by-sector description of the basic solution can be found in MacEwan [3].
[11]Somewhat different results have been obtained by Khan [2] and Stern [8].
[12]*See*, for example, Hirschman [1].

import substitution in nonagricultural sectors—supplying additional consumption is "cheaper" in East Pakistan than in West Pakistan. This is due, in large part, to the very low cost of increasing rice production which is expected to result from the use of new seed varieties.

When East Pakistan needs to import agricultural goods in order to expand consumption further, it cannot do so simply by expanding low-cost exports. Because of trade limitations the East must engage in costly import substitution, and at that point provision of consumption in the West becomes "cheaper". It is trade limitations which prevent either region from expanding consumption simply by concentrating production in the highest productivity sectors, exporting goods from these sectors, and importing higher-cost items.

East Pakistan's *ex-post* production advantage can be seen from the capital-income ratios in Table III. The incremental net capital-income ratio in East Pakistan is 2.16 and in West Pakistan it is 2.54. The higher productivity of capital in East Pakistan is explained primarily by the very high capital costs of agricultural expansion in the West. While costs of agricultural expansion in the East have been taken as much higher than average costs of agricultural production, costs in the West are still a good deal more[13]. The point is that the productivity of either region can only be derived in terms of what must be provided for consumption.

Alternative Regional Allocation Programmes

The optimality of disparity reduction, as stated above, holds under the condition of political neutrality, *i.e.*, increments to national per capita consumption are weighted equally regardless of region. By varying the relative political valuations of regional consumption (the δ's in the welfare function), alternative political situations can be simulated, and a regional incremental consumption frontier can be generated.

In addition to the basic solution, five solutions have been obtained, each with different relative valuation of increments to national per capita consumption originating in the East and in the West. With δ^w as unity, the values of δ^e in the six solutions are 2.00, 1.22, 1.00 (the basic solution), 0.79, 0.68, and 0.60. The segment of the incremental regional consumption frontier which these solutions imply is shown in Figure 1, and values of increments to per capita consumption obtained are shown in Table V.

The segment of the regional consumption frontier in Figure 1 is obtained by linear interpolation between the six points obtained by the solutions. The

[13]Whether East Pakistan really does have an overall production advantage maybe subject to some question; in particular if skilled-labour requirements and supplies were taken into account, the situation might be significantly modified.

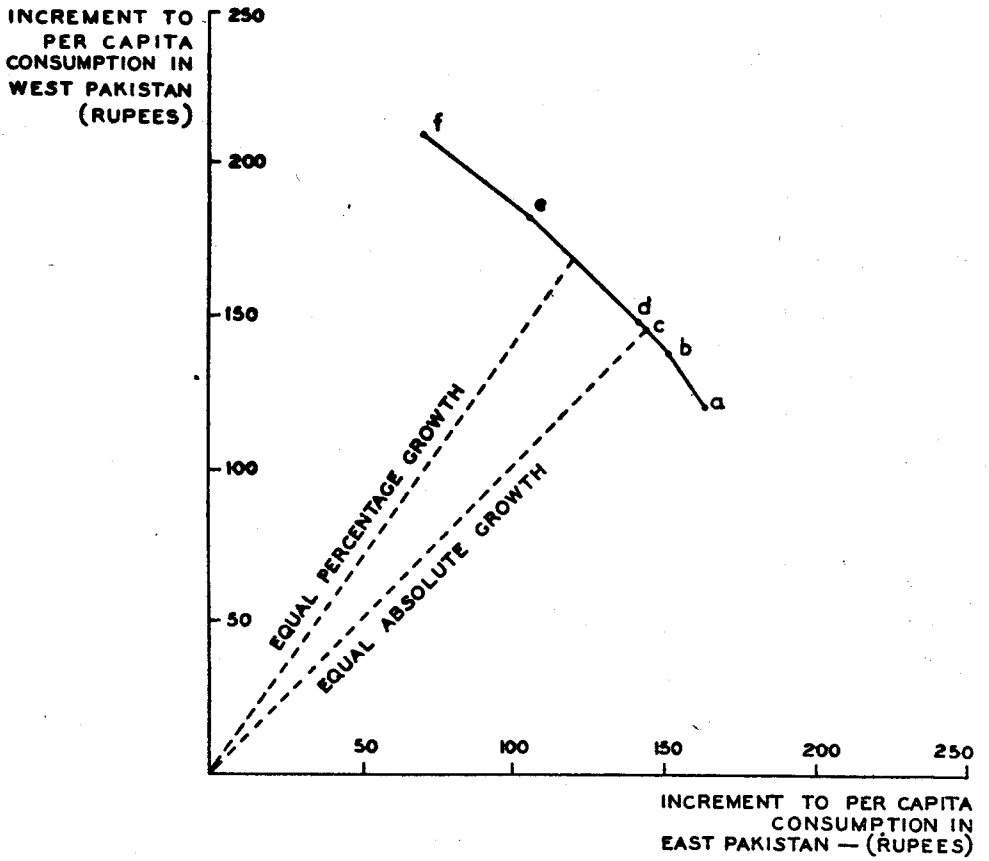

Figure 1. The Incremental Regional Consumption Frontier

TABLE V

INCREMENT TO PER CAPITA CONSUMPTION UNDER ALTERNATIVE RELATIVE VALUATIONS OF CONSUMPTION IN THE TWO REGIONS

	Valuation of increments to national per capita consumption originating in		Increment to per capita consumption		
	East (δ^e)	West (δ^w)	East Pakistan	West Pakistan	All Pakistan
			(..... *rupees* .....)		
(a)	2.00	1.00	162.3	120.3	142.3
(b)	1.22	1.00	150.4	138.3	143.9
(c)	1.00	1.00	144.9	146.6	144.4
(d)	0.79	1.00	143.8	147.2	144.3
(e)	0.68	1.00	105.9	181.5	139.0
(f)	0.60	1.00	70.4	208.3	131.6

slope of the frontier is the quantity of per capita consumption which must be given up in the West in order to expand consumption in the East by one unit, *i.e.*, the marginal rate of transformation of per capita consumption in the West for per capita consumption in the East. It is an interesting result that the marginal rate of transformation is close to unity over a wide range. Consequently, in terms of national per capita consumption, no great loss would result from placing strong emphasis upon the development of one of the regions[14].

Movement along the consumption frontier involves a transfer of resources from one region to the other. There are two ways the resource transfer can take place. First, there can be a direct transfer of resources by a change in the net flow of capital between the regions. The capital serves to finance investment in and imports to the receiving region. Second, a transfer of foreign exchange between the regions can be affected by adjustment of trade patterns. That is, the region which is favoured runs a regional trade surplus in order to finance a foreign-trade deficit. The other region, accordingly, must run a

[14]A similar result was obtained by Khan [2].

foreign-trade surplus and a regional-trade deficit. The foreign-trade-surplus region is forced to produce commodities which it would otherwise import and to regionally import commodities which it would otherwise produce. That is, one region saves foreign exchange which is then used by the other region.

Both processes of resource transfer are exhibited in the movement between the solution points on the consumption frontier in Figure 1. In Table VI, the regional, foreign, and total-trade deficits of each region are shown. In moving from the basic solution, solution (c), toward a greater emphasis on development in East Pakistan, solution (b), resources are shifted to the East by a direct transfer of capital and by a decline in the East's net regional trade deficit. The next shift toward the East — from (b) to (a) — is accomplished completely by adjustment of the trade patterns. In fact, in the solution which favours the East more, the capital inflow to the East is less. At the extreme solution, the expansion of East is very intensive in foreign imports. To finance the increase of foreign imports in the East, capital is transferred to the West and used for import substitution there. The foreign exchange thus saved in the West is then transferred to the East by East's running a large regional-trade surplus.

TABLE VI

TRADE DEFICITS AND SURPLUSES UNDER ALTERNATIVE VALUATIONS OF CONSUMPTION IN THE TWO REGIONS[a]

	Valuation of increments to national per capita consumption (δ^e and δ^w)		Total incremental capital inflow to East = total incremental capital outflow from West	Incremental foreign and regional trade deficits for East = incremental foreign and regional trade surplus for West	
	East	West		Foreign	Regional
	(1)	(2)	(3)	(4)	(5)
(a)	2.00	1.00	38.5	868.4	—829.9
(b)	1.22	1.00	142.7	153.5	—10.8
(c)	1.00	1.00	101.6	—7.9	109.5
(d)	0.79	1.00	91.1	—18.4	109.5
(e)	0.68	1.00	—458.2	—322.0	—136.2
(f)	0.60	1.00	—890.0	—693.6	—196.4

[a] Col. (3) = Col. (4) + Col. (5).

Moving in the other direction from the basic soultion — *i.e.*, toward programmes which favour the West — resources are transferred to the West by direct capital transfer. In fact, as the West is favoured more, both the West's net regional-trade deficit and its net foreign-trade deficit rise. Emphasis

on the development of either region brings about a rise in that region's foreign-trade deficit and a rise in the other region's foreign-trade surplus. However, the alternative solutions illustrate that the way in which the deficit for the favoured region is financed can be by capital transfers from the other region or by import substitution in and foreign-exchange transfers from the other region.

In Table VII the production and trade programmes of the two regions are shown for the basic solution. The programme shown in the table serves as a reference point for the changes which occur when alternative political assumptions are employed.

The nonparallel nature of resource transfers can be explained by the difference in the requirements of the two regions as output expands. Starting from the basic solution, expansion of the East tends to require more foreign exchange than expansion of the West. Thus, when emphasis on development in the East is increased, the economy is forced upon a more import-intensive path. Since foreign-exchange earnings and capital inflow are fixed, the increase in the requirement for (agriculture-based) imports must be accompanied by import substitution in some other sectors. Industries importing in the basic solution in which import substitution is most efficient are West Pakistan industries, *i.e.*, cotton textiles and wood, cork, and furniture. Therefore, substitution for foreign imports takes place in the West. Simultaneously, production in certain East Pakistan industries — rubber, transport equipment, metal products — is expanded to replace either production in the West and/or regional imports to the East from the West. By this process, the foreign exchange saved by the West is transferred to the East.

When West Pakistan expands, the need for additional imports is offset by the contraction of the East Pakistan economy and the consequent release of foreign exchange. The expansion in West does not carry with it the need for elimination of some foreign imports, so that expansion is affected by a direct transfer of resources from the East.

The movement from the basic solution toward greater emphasis upon West Pakistan development does, however, result in some changes in inter-regional trade patterns and the change of the location of expansion form some industries. The expansion of the West cannot be accomplished by a balanced expansion because of the limits on the production of agricultural goods. West Pakistan is forced to import all other agriculture products and edible oils from the East. To offset the increased requirement for these imports, West Pakistan substitutes its own production for the regional import of rubber and fertilizer. Furthermore, West Pakistan, production of cement, machinery, miscellaneous manufacturing, and coal and petroleum products is expanded to replace production of these products in the East by regional trade (although in the case of machinery the elimination of production in the East is only partial).

TABLE VII

SOURCE OF SUPPLY IN THE BASIC SOLUTION

Sector	Producing in East	Producing in West	Importing from abroad
1. Rice	x	x	
2. Wheat		x	
3. Jute	x		
4. Cotton	x	x	
5. Tea	x	x	x
6. All other agriculture	x	x	
7. Sugar		x	x
8. Edible oils	x	x	x
9. Tobacco			x
10. Other food		x	x
11. Cotton textiles	x		
12. Jute textiles	x		
13. Other textiles	x	x	x
14. Paper		x	x
15. Leather	x	x	
16. Rubber	x	x	
17. Fertilizer	x		
18. Other chemicals	x	x	
19. Cement	x	x	
20. Basic metals	x	x	
21. Metal products	x	x	
22. Machinery	x	x	
23. Transport equipment	x	x	
24. Wood, cork, and furniture			x
25. Miscellaneous manufacturing	x	x	
26. Coal and petroleum products	x	x	

Note: There are several products for which there is more than one source of supply. In agricultural sectors this results from limits on the quantity of production or from limits on trade. Some of these agricultural production limits carry over to affect the need for additional sources of supply for agriculture-based manufactures, *e.g.*, edible oils. For several manufacturing sectors the difference between the cost of production in the two regions is not sufficient to warrant interregional trade.

The switches which take place when the relative weights on consumption in the two regions are changed illustrate the changes in comparative advantage which result from variation of the regional emphasis of a national development programme. Although some of the solutions considered may not be politically reasonable, the tendency of comparative advantage to shift will not be

eliminated when only the less extreme solutions are considered. The switching seems to be a clear illustration of the interdependence between regional- and sectoral-allocation programmes.

Economic Determinants of Regional Development

Although the degree of emphasis placed upon development in each of the regions is primarily a political decision, that decision is influenced and constrained by economic circumstances. A regional-allocation programme may, therefore, be viewed as the result of an interaction between political and economic forces. When decision-makers have no preference for one region relative to the other — as in the basic solution — economic circumstances will determine regional allocation.

In the preceding section, economic circumstances were taken as given and the implications of alternative political decisions were examined. In this section, attention is given to the relation between the shape of the consumption frontier and specific economic factors.

The basic solution calls for a development programme which brings about a significant reduction in disparity, the resulting increment to per capita consumption being about the same in each of the regions. As pointed out above, the disparity reduction programme was a result of economic circumstances rather than any political allocation decisions. That is, in the basic solution, increments to national per capita consumption are weighted equally regardless of the region of origin.

Reduction of the savings rate in the East relative to that in the West would raise the relative cost of producing consumption in the East. However, the differential between the savings rate in the two regions would have to be large before a shift toward the West is affected. A solution to the model was obtained with a 12-22 savings rate for East and a 15-25 savings rate for the West[15]. The resulting change from the basic solution was a decline in total resource availability and in consumption in the West. In some East Pakistan sectors the fall in the savings rate was sufficient to eliminate production, and in some West Pakistan sectors the rise in the savings rate led to some import substitution. However, on balance, resources are shifted to the East by a rise in the net capital flow from West to East.

Differential assumptions about the export possibilities of the two regions will not affect a change in regional allocation of consumption. It is possible, of course, that a decline in the assumed level of export expansion for the East would reduce or eliminate certain exports. However, because foreign funds

[15]That is, the rates of savings on value added in agriculture were set at 12 per cent in the East and 15 per cent in the West, and the rates of savings on value added in other sectors were set at 22 per cent and 25 per cent, respectively.

can be transferred between the regions, the decline in export possibilities would have no more effect on overall costs in the East than would a decline in export earnings in the West or a general decline in export opportunities. A solution to the model was obtained in which the export growth rate for the East was reduced to 6.5 per cent per annum while the export growth rate in the West was maintained at 7.5 per cent. As compared to the basic solution, consumption in the West was reduced and consumption in the East was unaffected[16].

Although the shift of consumption away from the East is not affected by a decline in the savings rate (of the magnitude considered) or export growth rate in the East, such a change in distribution is affected by a resource change which raises the availability of capital relative to the availability of foreign exchange. Consumption in the East is relatively less capital intensive and, therefore, a relative increase in capital availability favours the West, *i.e.*, shifts the regional consumption frontier so that the politically neutral assumptions of the basic solution lead to more development in the West. Although a complete consumption frontier has not been obtained under such economic assumptions, it is easy to show how the new consumption frontier would differ from that obtained with the assumptions of the basic solution.

In Figure 2, the theoretical relationship between the two consumption frontiers is illustrated. The curve AA′ represents the consumption frontier under conditions of relative capital scarcity. The curve BB′ represents the consumption frontier under conditions of relative foreign-exchange scarcity. As capital becomes less scarce, the consumption space shifts upward, and to the left, W E represents theline with slope of minus unity, and the optimal solution shifts from P to P′.

A shift in the consumption frontier which will lead to a shift in the allocation of consumption toward the West would also result from an assumption of relatively poor performance in East Pakistan agriculture. Solutions were obtained which show that less success (as compared to the basic solution) of the new foodgrains-production techniques would force the East to import rice and thereby raise the cost of consumption in the East. Under these circumstances a large shift of consumption toward the West results. Also, if the performance of the nonfoodgrains agricultural sectors is less than that assumed in the basic solution, the point on the frontier at which the marginal rate of transformation rises above unity is moved upward to the left. A solution was obtained in which the growth of all other agriculture in East Pakistan was limited to 4.5 per cent per annum over the Plan (rather than the 5 per cent of the basic solution). The result was to change the per capita consumption increment in the East from 144.9 to 118.9 rupees and the per capita consumption increment in the West from 146.4 to 160.3 rupees.

[16]The result is generally the same when exports for both regions are lowered.

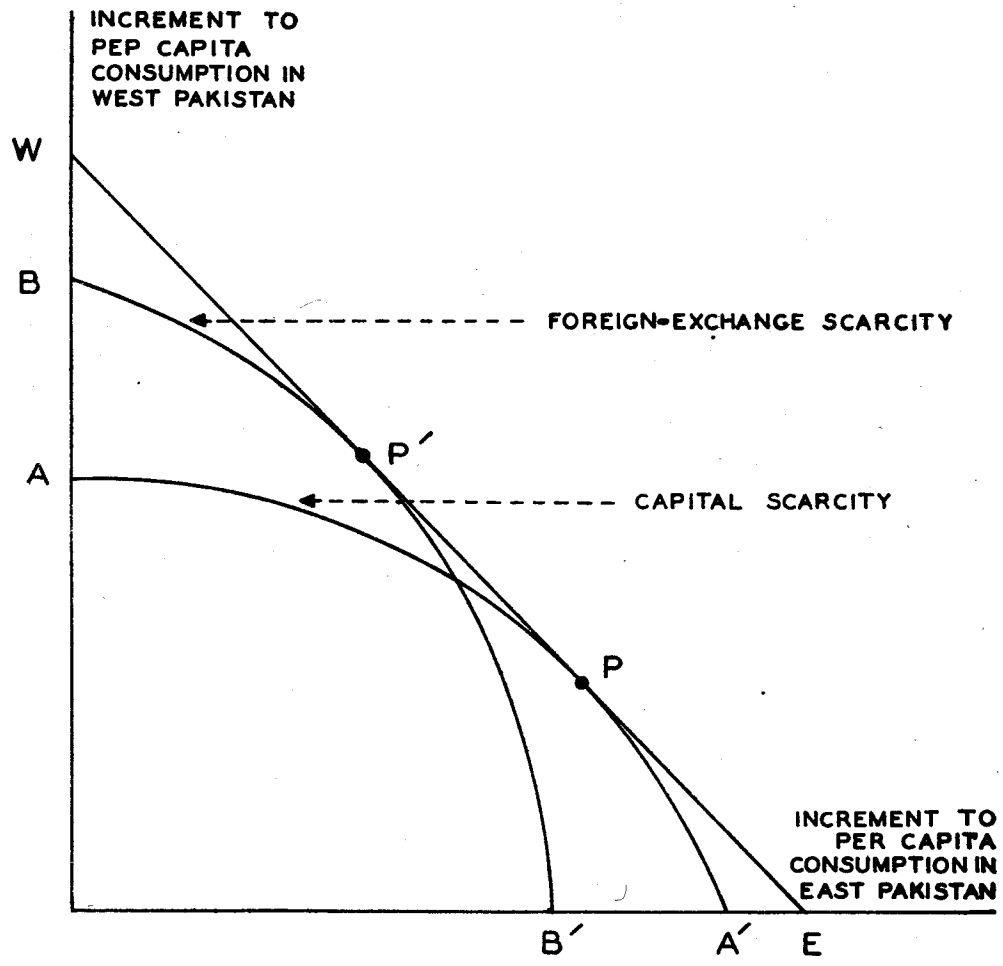

Figure 2. Illustrations of Different Consumption Frontier Positions under Alternative Relative Capital and Foreign-Exchange Availabilities

On the basis of these observations (and the points made in "Disparity and Regional Productivity" above) it can be seen why the macroeconomic results of this study differ in their regional aspect from the results obtained in other regional studies of Pakistan development.

Dr. Azizur Rahman Khan [2], using a seven-sector regional programming model to investigate problems of development during Pakistan's Third Plan (1965-70), obtained results which imply that a reduction of income disparity between the regions is not quite optimal when the political objective is simply to maximize national income (*i.e.*, increments to per capita income in the two regions are weighted by population shares). However, his model shows that the sacrifice in terms of national income caused by a given reduction in disparity is insignificant. Although Khan's model does not include a savings constraint, it does include agricultural growth limits and operates like the model used in this study. The difference between the two studies arises because Khan does not specify rice production as a sector separate from other agricultural sectors and does not consider the cost reductions in rice production resulting from the introduction of the new techniques[17]. When the agricultural growth limits are binding in both regions and agricultural goods must be imported, the Khan model chooses to expand further in that region where industrial development costs are less. According to his data, that region is West Pakistan. In this study, however, because rice can still be produced within East Pakistan even when the nonfoodgrain-agricultural growth limits are binding, some further expansion of the region is warranted.

A study by Stern [8] also shows that an optimal national growth policy will lead to an increase of regional disparity. Stern's optimizing model, however, distinguishes only two sectors, and it thereby obscures the differences in the relative costs of consumption bundles in the two regions[18]. Furthermore, Stern assumes a generally more optimistic set of resource use and resource generation parameters for the West than for the East. With East's advantage on the consumption side eliminated by aggregation, and with the assumption of a more favourable set of production possibilities in the West, the regional allocation results which Stern obtains follow automatically.

Comparison with the Khan and Stern studies brings out one important aspect of disaggregation. When working with more sectors, it is possible to take account of more differences between the regions. The differences revealed by disaggregation can have important implications for regional-allocation decisions.

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[17]Khan deals only with the third-plan period. The reduction in rice production costs will be more important in the fourth-plan period.

[18]Stern used a two-sector optimizing model because he was concerned with long-run dynamic phenomena. He, thus, gave up the sectoral distinctions in favour of the temporal distinctions.

IV. CONCLUSIONS

The regional allocation of welfare (consumption or income) is a function of the interplay between economic circumstances and political motives. The purpose of this paper has been: *i*) to investigate the relationships between regional productivity and the structure of regional demand; *ii*) to determine the implications of alternative sets of political decisions regarding the relative emphasis to be placed upon development in each region; and *iii*) to examine the economic factors most important in determining the range of possibilities within which decision-makers must act. Several conclusions can be drawn:

i) When trade opportunities are limited, regional productivity is a function of the structure of final demand. Therefore, the combination of the facts that East Pakistan, being the poorer region, consumes more foodgrains (rice) and that significant advances in foodgrain production are expected give East Pakistan a productivity advantage. Under such circumstances, disparity reduction becomes an economically optimal programme.

ii) The comparative advantage of each region is a function of the relative emphasis placed upon development in the two regions. That is, the set of industries which should be active within each region cannot be determined independently of the interregional-consumption-allocation programme. One interesting aspect of the changing comparative advantage associated with changing regional-consumption-allocation programmes is the possibility of import substitution taking place in one region to finance increased requirements for imports in the other region.

iii) The relative costs of expanding production in the two regions are not significantly affected by differences between the two regions in savings or foreign-exchange earning abilities. Regardless of where capital and foreign-exchange resources are generated, they are transferable between the regions and will be used to expand consumption in the region where the consumption bundle is "cheaper".

iv) Although differential savings and export performance in the two regions have little effect upon the relative costs of supplying consumption, major changes in the national supplies of capital and foreign exchange will affect changes in the relative costs of the consumption bundles. In particular, if the availability of capital rises relative to foreign exchange, the cost of consumption in the West will drop relative to the cost of consumption in the East.

v) The ability to expand agricultural production can be viewed as a resource which cannot be transferred between the regions. Therefore, changes in the performance in agricultural sectors significantly affect the relative costs of consumption expansion in the two regions. If the performance of the rice sector and/or of the all other agriculture sector in the East does not meet the

expectations implicit in the basic solution, the reduction in disparity will not be so great as in the basic solution.

vi) The differences between the regions in terms of costs of consumption can be seriously obscured by aggregation of the agriculture sectors. Were the rice sector in East Pakistan not specified as an individual sector, the lower costs of East Pakistan consumption would probably be overlooked.

These conclusions give a realistic description of some of the problems related to interregional development in Pakistan and yield some insight into regional problems elsewhere. The particular regional-allocation programme in the basic solution may be subject to question. It should be clear, however, which assumptions are most important in determining the basic solution and how changes of these assumptions change the regional- and sectoral-allocation programmes.

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