

## Factors' Employment Absorption, Growth and Income Distribution through Foreign Trade: Pakistan's Case

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### I. INTRODUCTION

Despite the recent migration of Pakistan's labour to the Middle East countries, Pakistan is still characterized as a labour-abundant and capital-scarce developing country. As such, it is important that Pakistan's production structure should be such as to employ greater labour and lesser capital per unit of output in the different sectors of the economy. To provide pertinent information to the policy makers in this regard, we here try to estimate how much of labour and capital are employed and absorbed per unit of output in Pakistan's internationally traded goods.

Some economists like Ragnar Nurkse [9] and Gottfried Haberler [3] have shown trade to be an engine and hand-maiden of economic growth. The proponents of Export Promotion (E.P.) Trade Strategy have recently argued that the developing countries should export goods which employ more of their labour. They claim that the E.P. Strategy will not only make an efficient use of resources but would also lead to an equitable income distribution. Adoption of the E.P. Strategy would lead to an improvement in income distribution in the poor countries through capital loss and labour gain. The basic reasoning advanced by the exponents of export promotion is that this strategy leads to greater labour absorption and, through it, to a larger total wage bill and lesser capital employment. The share of profits in the GNP is thus reduced.

This view is supported by Heckscher-Ohlin's Factor Endowment Trade Theory [4; 8], according to which the countries that are rich in capital will export capital-intensive goods, and those which are labour-abundant will export labour-intensive goods. However, on empirically testing Heckscher-Ohlin's Theory with reference to the United States, Leontief came up with findings that were paradoxical and incompatible with Heckscher-Ohlin Theory, and which later came to be termed Leontief's Paradox [7]. Further empirical evidence on this issue by Bela Balassa [1], Bharadwaj [2], Tatemoto and Ichimura [10] and Wahl [11], however, showed that

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the Factor Endowment Theory was good enough to explain the basic flow of international trade. In this study, after estimating the factors' employment absorption per million rupees worth of exports and imports, an attempt is made to see whether Pakistan's exports have been labour-intensive and, so, consistent with the natural, national resource base. Thus, this study also enables us to test whether the pattern of Pakistan's foreign trade further supports Heckscher-Ohlin's Factor Endowment Trade Theory, or whether it shows any kind of Leontief's Paradox.

Indeed, this multivariate statistical study is a comparative static analysis of Pakistan's<sup>1</sup> factor requirements in 1962-63, 1969-70 and 1974-75. The methodological framework adopted here for the evaluation of factor requirements is essentially that of Leontief [7, pp. 126-128]. We have thus computed capital and labour requirements per million rupees worth of exports ( $e_i$ ) and import replacements ( $m_i$ ) through an input-output system concisely given below:

$$\begin{bmatrix} k_i \\ 1 \times 33 \end{bmatrix} \begin{bmatrix} X_e \\ 33 \times 1 \end{bmatrix} = \begin{bmatrix} k_i \\ 1 \times 33 \end{bmatrix} \begin{bmatrix} I-A \\ 33 \times 33 \end{bmatrix}^{-1} \begin{bmatrix} e_i \\ 33 \times 1 \end{bmatrix} \quad \dots \quad (1)$$

$$\begin{bmatrix} l_i \\ 1 \times 33 \end{bmatrix} \begin{bmatrix} X_e \\ 33 \times 1 \end{bmatrix} = \begin{bmatrix} l_i \\ 1 \times 33 \end{bmatrix} \begin{bmatrix} I-A \\ 33 \times 33 \end{bmatrix}^{-1} \begin{bmatrix} e_i \\ 33 \times 1 \end{bmatrix} \quad \dots \quad (2)$$

$$\begin{bmatrix} k_i \\ 1 \times 33 \end{bmatrix} \begin{bmatrix} X_m \\ 33 \times 1 \end{bmatrix} = \begin{bmatrix} k_i \\ 1 \times 33 \end{bmatrix} \begin{bmatrix} I-A \\ 33 \times 33 \end{bmatrix}^{-1} \begin{bmatrix} m_i \\ 33 \times 1 \end{bmatrix} \quad \dots \quad (3)$$

$$\begin{bmatrix} l_i \\ 1 \times 33 \end{bmatrix} \begin{bmatrix} X_m \\ 33 \times 1 \end{bmatrix} = \begin{bmatrix} l_i \\ 1 \times 33 \end{bmatrix} \begin{bmatrix} I-A \\ 33 \times 33 \end{bmatrix}^{-1} \begin{bmatrix} m_i \\ 33 \times 1 \end{bmatrix} \quad \dots \quad (4)$$

In the above system,

$k_i$  and  $l_i$  = the capital and labour coefficients row vectors over the  $n$  sectors, i.e.  $n=1,2 \dots i \dots 33$ ;

$X_e$  and  $X_m$  = the amounts of gross domestic product needed to sustain a million rupees worth of exports and imports, respectively;

$e_i$  and  $m_i$  = the column vectors of each sector's individual share of total exports and imports. These vectors of sectoral proportional shares add up to a unit value of a million rupees worth of exports and imports, respectively;

$I$  = an  $n \times n$  identity matrix;

$A$  = an  $n \times n$  matrix of input-output coefficients; and

$[I-A]^{-1}$  =  $[I-A]$  inverse.

<sup>1</sup> Pakistan here refers to the present State of Pakistan, which, until East Pakistan's secession to become Bangladesh in December 1971, was known as West Pakistan.

The data<sup>2</sup> on all the above components of the input-output system have been obtained through various published and unpublished sources. These data processed through the above system of equations enabled us to arrive at results which are presented in the second section of the paper.

## II. RESULTS AND POLICY IMPLICATIONS

To calculate factors' employment absorption through Pakistan's foreign trade, we first estimate the capital and labour employed and absorbed per unit of one million rupees worth of Pakistan's exports and import replacements. Table 1 presents these estimates for 1962-63, 1969-70 and 1974-75. A comparative static analysis of the quantitative estimates shows that in the early years of Pakistan's industrialization, it needed greater capital and labour than in later years to produce a million rupees worth of output in export-producing as well as in import-substituting industries. According to our results, in 1962-63, the production of a million rupees worth of exports required a capital of about Rs. 2.6 million and employed 992 labour man-years. The capital-labour ratio of exports for 1962-63 shows that where employment generation is concerned it took about 2.6 thousand rupees to create each man-year in export industries. In the same year, the production of a million rupees worth of import replacements required a capital of about 1.8 million rupees and absorbed 448 man-years of labour in import-substituting industries. The corresponding capital-labour ratio of imports indicates that it cost about four thousand rupees to create each man-year in import-substituting industries. A discussion of the capital-labour ratios of exports and imports must also involve a consideration of comparative cost and comparative advantage. The smaller capital-labour ratio of exports than that of imports truly reflects a smaller comparative cost (and, hence, greater comparative advantage) in the export goods industries in Pakistan, than in the import-substituting industries. That is why in 1962-63 the entrepreneurs and capitalists in Pakistan invested mainly in export industries, and employed abundant labour, first in the installation and then in the utilization of their increased capital in those industries.

The interested reader may himself interpret the quantitative estimates for 1969-70 and 1974-75, in the light of our discussion of the 1962-63 estimates, but it is noticeable that some better and efficient use of resources was made by 1969-70; for by that year both capital and labour requirements per unit went down for exports as well as for imports. However, by 1974-75 the factor requirements went up slightly again. The per unit requirements, especially those of capital for imports, may have increased partly because of the devaluation of the Pakistani rupee in 1972.

<sup>2</sup> A derivation of the above input-output system of equations, and the reference sources along with all the data are given in detail in [5], available with the author.

Table 1  
The Capital and Labour Absorption per Million Rupees of Pakistan's Exports and Import Replacements for 1962-63, 1969-70 and 1974-75

	1962-63			1969-70			1974-75		
	K	L	$k = \frac{K}{L}$	K	L	$k = \frac{K}{L}$	K	L	$k = \frac{K}{L}$
Exports = E	2,575,852.0	991.84	2,597.04	1,373,483.0	345.11	3,979.84	1,578,957.0	415.85	3,796.94
Imports = M	1,814,208.0	447.87	4,050.75	1,195,975.0	262.35	4,558.70	1,860,678.0	362.2	5,137.16
$\bar{R}_1^*$	1.42	2.215	1.148	1.148	1.315	0.849	0.849	1.148	1.148
$\bar{R}_2^*$	0.704	0.452	0.871	0.871	0.76	1.178	1.178	0.871	0.871
$Z = \frac{\bar{R}_1^* L}{\bar{R}_1^* K}$		1.56			1.15			1.35	

Notes: K = Capital in Rupees at respective year's prices.  
L = Labour Man-Years.

$\bar{R}_1^*$  = Ratio of capital (labour) required for one unit of exports to the capital (labour) required for one unit of imports. For instance;

$$\bar{R}_1^* = \frac{K_E}{L_E} \cdot \frac{L_M}{K_M}$$

$\bar{R}_2^*$  =  $\frac{1}{\bar{R}_1^*}$  = Ratio of capital (labour) required for one unit of imports to the capital (labour) required for unit of exports, e.g.  $\bar{R}_2^* = \frac{K_M}{K_E}$

Anyway, the estimates of capital and labour absorption per million rupees worth of exports and import replacements, as reported in Table 1, and the resulting capital-labour ratios may prove helpful in the national planning of employment absorption, economic growth and trade and development of Pakistan's economy.

The estimates given in Table 1 suggest that Pakistan, being a labour-abundant economy, should export labour-intensive goods, and that in conformity with the Factor Endowment Trade Theory, Pakistan's capital-labour ratio of exports should be smaller<sup>3</sup> than that of imports. In other words,

$$k_E = \left[ \frac{K_E}{L_E} \right] < \left[ \frac{K_M}{L_M} \right] = k_M \quad \dots \quad (5)$$

Table 1 shows that Pakistan's capital-labour ratios of exports are invariably smaller than those of imports for 1962-63, 1969-70 and 1974-75. These empirical results confirm that Pakistan's exports have been labour-intensive and thus positively support Heckscher-Ohlin's Factor Endowment Theory of International Trade. They also give no evidence of Leontief's Paradox in the case of Pakistan.

Following Leontief, we have reduced the figures relating to capital and labour requirements to indices of comparative factor intensities, viz.  $\bar{R}_1^*$ ,  $\bar{R}_2^*$  and  $Z$ . The indices reflect all the special characteristics of the factor requirements discussed above. For instance,  $\bar{R}_1^*$  is the ratio of labour man-years employed and absorbed per unit of exports to the labour man-years employed per unit of imports, i.e.  $\bar{R}_1^* = \frac{L_E}{L_M}$ . The greater than unity the  $\bar{R}_1^*$  is, the more labour-intensive the exports of an economy tend to be. For Pakistan, the  $\bar{R}_1^*$  had the values of 2.22, 1.32 and 1.15 for 1962-63, 1969-70 and 1974-75, respectively. These values show that although Pakistani goods are labour-intensive, their labour intensity is on the decline.

The other ratio, viz.  $\bar{R}_2^*$ , is the ratio of capital required for the production of one unit of exports to the capital required for one unit of import replacements, i.e.  $\bar{R}_2^* = \frac{K_E}{K_M}$ . The lesser than unity the  $\bar{R}_2^*$  is, the less capital-intensive the

<sup>3</sup>This statement becomes clear with a little use of intuition. For the sake of illustration, we begin with the equality case, i.e. the capital-labour ratio of exports is equal to the corresponding ratio of imports. Now, for exports to be labour-intensive,

- (i) either the production of each unit of exports will employ greater labour than the production of each unit of imports,
- (ii) or the production of each unit of exports will require lesser capital than the production of each unit of imports.

Either of the two above positions or both will cause the capital-labour ratio of exports to be smaller than the capital-labour ratio of imports.

exports (and the more capital-intensive the import replacements) of that country tend to be. In Pakistan's case, the values of  $R_1^{*K}$  have shown a decrease, from 1.42 to 1.15 and then to 0.85, suggesting that Pakistan's import replacements have tended to employ greater capital per unit of output than Pakistan's exports,  $R_2$  is just the reverse of the ratio  $R_1^*$ .

Based upon the above ratios, Leontief [7, pp. 111-112] builds an index of comparative capital-labour intensity, i.e.  $Z = \frac{R_1^{*L}}{R_1^{*K}}$ , which leads to a policy implication favouring an increase in labour absorption and expansion of the volume of Pakistan's foreign trade.

In Table 1,  $R_1^{*L} = \frac{L_E}{L_M}$  and  $R_1^{*K} = \frac{K_E}{K_M}$  give the rate of substitution of

competitive imports for each unit of exports based on the relative quantities of labour and capital required for their production.  $R_1^{*L}$  exceeds  $R_1^{*K}$  in all the years, i.e. the rate of substitution of competitive imports for exports is greater for labour. This implies that an increased labour absorption through the substitution of competitive imports for exports, after meeting the domestic level of imports requirements, would raise the level of exports, which in turn could help to finance greater imports. Thus, an increased labour employment absorption would also help to expand the volume of Pakistan's foreign trade. However, the above proposition will hold only when the

index of comparative capital and labour intensities, i.e.  $\frac{R_1^{*L}}{R_1^{*K}} = Z$ , exceeds unity.

It would appear that Pakistan's economy worked in accord with the above proposition during the 1960s, and accordingly the index value got adjusted downward from 1.56 in 1962-63 to 1.15 in 1969-70. The index value rose to 1.35 in 1974-75, thereby necessitating that Pakistan's economy should work in accordance with the above proposition and adjust itself to a better equilibrium position.

Based upon the per unit estimates of Table 1, the estimates obtained for both the factors' employment absorption of Pakistan's foreign trade [5] show that over the years from 1962-63 to 1974-75, Pakistan's exports, averaging about 2,622.6 million rupees, employed 6,013,636.5 million rupees worth of capital and 1,921,835 labour man-years. On the other hand, Pakistan's average annual import replacements, amounting to about 5,734.9 million rupees, employed 9,309,033.9 million rupees worth of capital and 1,976,778 labour man-years. The aggregate average capital-labour ratio of exports has been equal to 3.15 and, as it should be, lesser than the corresponding ratio of import replacements, which is 4.54.

We now turn to two other questions: how much labour-intensive have Pakistan's exports been over the years, and how have factor intensities responded to changes in the compositions of exports and imports? We shall examine these questions with reference to Table 2.

In Table 2, we first compute the per unit capital and labour requirements for exports and imports of the base year, applying the complete methodological system with all the required data of 1962-63. For estimating the capital and labour requirements for each of the succeeding year, we use all the system and the data of the base year, except that now we feed in the foreign-trade vectors of export and import proportions of each of the succeeding year. The difference in the per unit factor requirements of the succeeding year, as compared to that of the base year, will be attributable only to the changes in the nature and composition of the exports and imports of the later years. The resulting estimates of the per unit capital and labour requirements of the succeeding years, and their base-year indices, as reported in Table 2 indicate how much more labour-intensive or capital-intensive our exports and imports have become over the years, when compared with their positions in the base year. Adopting the same rationale, similar computer results have also been obtained for 1969-70 as the base year [5].

It has been asserted that Pakistan's production structure has been increasingly capital-intensive [6]. This started happening around our first base year, viz. 1962-63, when excessive capital accumulation occurred because of under-priced capital imports through overvalued exchange rate, low interest rates and other incentives. Private foreign investment and tied foreign aid also contributed to capital accumulation. Azizur Rahman Khan [6] concludes from international comparisons of factor intensities that Pakistani capital intensities are close to the American level in a number of industries, while in certain cases they are even higher. In this respect, our results show that, on the average, the capital requirements per unit of exports have increased by four percent of the capital requirements of the base years, 1962-63 and 1969-70. The capital requirements per unit of import replacements increased, on the average, by seven percent of the capital requirements of 1962-63 and by 17 percent of the capital requirements of 1969-70.

Although Pakistan's exports have been confirmed as labour-intensive, the per unit labour employment of Pakistan's exports appears, on the average, to have declined by 20 percent of the base year, 1962-63. However, in the early Seventies the per unit labour employment of Pakistan's exports, on the average, increased by six percent of the base year, 1969-70. The labour employment per unit of Pakistan's import replacements increased, on the average, by two percent of 1962-63 and by 17 percent of the base year, 1969-70. In view of the above results, Pakistan's planners would be well advised to take such policy measures as ensure that less capital-intensive and more labour-intensive production processes are adopted in the economy.

Factor Requirements per Million Rupees Worth of Exports and Imports from 1962-63 to 1974-75:  
with 1962-63 as Base Year and Annually Changing Trade Vectors up to 1974-75

Years	Exports				Imports				$k = \frac{K}{L}$
	K	K Index	L	L Index	K	K Index	L	L Index	
1962-63	2575852	100	992	100	1814208	100	448	100	4051
1963-64	2620670	102	898	91	1782194	98	448	100	3979
1964-65	2489301	97	827	83	1883592	104	521	116	3618
1965-66	2601621	101	791	80	1752555	97	433	97	4043
1966-67	2548010	99	796	80	2068898	114	503	112	4111
1967-68	2707251	105	813	82	1997833	110	484	108	4128
1968-69	2626907	102	752	76	1808533	100	354	79	5110
1969-70	2617976	102	684	69	2050475	113	388	87	5281
1970-71	2738766	106	715	72	1779465	98	389	87	4575
1971-72	2822237	110	800	81	1623582	89	436	97	3727
1972-73	2798194	109	733	74	2196536	121	536	120	4095
1973-74	2822677	110	716	72	2254498	124	506	113	4457
1974-75	2776467	108	786	79	2163990	119	476	106	4543
Average	2672762	104	793	80	1936643	107	456	102	4286

Notes: K = Capital in Rupees

$$K \text{ Index} = \frac{K^t}{K^o} \times 100$$

L = Labour Man-Years

$$L \text{ Index} = \frac{L^t}{L^o} \times 100$$

t = 1963-64 ... 1974-75

o = 1962-63

### III. CONCLUSIONS

The main conclusions of this study are briefly as follows. The study based on input-output production structure of the economy, using Leontief's methodological framework, presents estimates of capital and labour required for the output of a million rupees worth of Pakistan's exports and import replacements for 1962-63, 1969-70 and 1974-75. The resulting estimates show that Pakistan's exports have been labour-intensive and so consistent with the natural, national resource base. Thus, the study supports Heckscher-Ohlin's Factor Endowment Theory of International Trade, and fails to find any kind of Leontief's Paradox for Pakistan. Leontief's index of comparative capital and labour intensities has been discussed, which suggests that Pakistan should follow a policy which should encourage enhancement of labour absorption and expansion of the foreign trade. The study submits average estimates of factors' total employment absorption through Pakistan's foreign trade over the years from 1962-63 to 1974-75. It also examines the changes in capital and labour intensities, *vis-a-vis* those in the base years 1962-63 and 1969-70, resulting from the changes in the nature and composition of Pakistan's exports and imports between 1962-63 and 1974-75.

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**Comments on**  
**“Factors’ Employment Absorption, Growth and Income**  
**Distribution through Foreign Trade: Pakistan’s Case”**

In the beginning I must say that it is an interesting paper. It addresses an important subject and produces some useful information. The paper is very promising and as a matter of fact it contains much more than appears on the face of it. The paper does have some weaknesses but I think most of these have their origin “elsewhere”. I should explain both of the last two statements.

The paper has much more to it in the sense that what has gone behind the paper is no less important. Specifically, I mean the data on which the model has been estimated. As one can see, the paper essentially uses Leontief model to test Heckscher-Ohlin (H-O) hypothesis in the case of Pakistan. It does not add any thing as far as the model is concerned. This does not, by itself, mean that the paper does not make any contribution. Theories and models, when tested against facts and case studies such as this, can have great usefulness. Now to test a particular model, one needs data and the available data usually do not readily lend themselves to estimation. One has to generate them. It is here that the importance of data behind this study comes in. The data requirements of this study were such that the data which had to be generated were of significant importance in themselves. I am sure, a lot of useful data must have been generated, which is by no means a trivial job.

I wish the author could share some of that information with us. I am told that it is being done separately in the form of a research report. However, keeping in view the nature of the study, I wish the author could devote a little more space to describing how the data have been generated. This is important not only for its own sake, but also for checking the validity of the results.

Secondly, I should like to make just one observation about the model before I go on to discuss the results and the policy recommendations.

The H-O theorem, which is being tested here, has some basic assumptions which need to be kept in view. I shall mention just two of them: (i) Factor quantities are given and *fully* employed; and (ii) Production functions are the same for the same commodities in the two countries. I think both of these assumptions do not hold in the case of Pakistan. But I don't blame the author. There are people

who before him went ahead and estimated the model in similar conditions. Thus the weakness has its 'origins' elsewhere. If Bharadwaj can estimate the same model for India, why can't Hamadani do that for Pakistan. As a matter of fact this practice is quite widespread among economists. Somebody develops a model for specific conditions and others come around and apply it to all sorts of cases without any regard to the underlying assumptions of the model. Now, if any model is "robust" with respect to any assumptions, why make those assumptions after this fact has been established? As for this particular model, unfortunately even this much has not been established that the model is insensitive with respect to the assumptions made here.

Coming to the results, the paper has computed factor intensities for exports and import-competing products of Pakistan for 1962-63, 1969-70 and 1974-75 to test whether the H-O hypothesis is confirmed or not. The paper finds that the hypothesis is confirmed, i.e. Pakistan exports labour-intensive products and imports capital-intensive goods.

I have a few observations about this finding. Firstly, when one sets out to test whether the structure of imports and exports of a country confirms or refutes the hypothesis, one has to take the "typical" structure of the country, i.e. one should select a period which represents the typical structure of the country's imports and exports. Unfortunately, the author has not been careful in this regard. If one carefully examines the data, one finds that both 1969-70 and 1974-75 were abnormal years with respect to trade flows — 1969-70 because of political disturbances and 1974-75 because of floods and bad climatic conditions. In both these years, the structure of Pakistan's exports and imports was significantly different from its "typical" structure.

The author should have been even more careful in this regard in view of the fact that one of his forerunners, Bharadwaj, had committed the same mistake, though of a much smaller severity. The result was that the Indian case turned out not to be in line with the H-O hypothesis. This was so, at least partly, because of the peculiarity of the year chosen for analysis rather than a factual capital intensity of Indian exports to the United States.

My second observation is much more important. We notice in Table 1 that even though the import-competing industries in Pakistan apparently require less capital than the export goods (something which appears to confirm H-O hypothesis), interestingly the import goods *simultaneously* require lesser labour input as well. That is, for one million's worth of production, import-competing goods need less amounts of both the inputs. This implies that a transfer of resources from exports to import substitutes would increase total production, thus vitiating the result that the trade structure of Pakistan is in conformity with the H-O hypothesis. The H-O hypothesis would demand that Pakistan should, instead, transfer resources to the export industries in order to increase the efficiency of resources utilization. This contradictory result could in part be due to some data problem.

Let me also point out that one should not be led to believe that it may be something analogous to the comparative advantage theory where a country may have an advantage in both commodities but comparative advantage in one of them. Here we are considering production of two commodities in one country, and for the efficiency of resource utilization the choice is very clear. The country should specialize in import-competing industry because it requires less quantities of both capital and labour to produce one unit of output.

Coming to policy prescriptions, I find some inconsistencies in the paper. The author recommends an increase in foreign trade even though his figures show that exports are relatively inefficient in resource use and yet upholds the cause of efficiency as well. He favours policies leading to an increase in real wages to improve income distribution but would not be prepared to accept the resulting loss in competitiveness of its labour-intensive exports and hence a decrease in foreign trade rather than an increase which he prescribes. He recommends labour-intensive technology to increase the share of labour in the gross national product but is not willing to accept a lower rate of growth which may be a result of such a policy.

He may have fairly acceptable reasons for recommending contradictory policies without assigning priorities which he could not present because of "space constraint" just as I have left many things unexplained because of the "time constraint". Well, all of us have our constraints and the paper should be judged keeping those constraints in view.

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