Capital-Intensity and the Efficiency of Factor Use

A COMPARATIVE STUDY OF THE OBSERVED CAPITAL-LABOUR RATIOS OF PAKISTANI INDUSTRIES

by

AZIZUR RAHMAN KHAN*

THE PROBLEM

I.1 Introduction

The concept of capital-intensity, defined as the ratio of capital to labour, has been used widely in both theoretical and applied problems of planning. These ratios have often been used in forecasting, *e.g.*, in measuring the possible expansion of employment that would be generated from a given investment programme and in estimating the rate of investment that would be required in achieving a given employment target.

More importantly, these ratios have been recommended for use in optimum decision-making. The usual argument is that in a labour-surplus backward economy with scarcity of capital, it is costless or nearly so to use labour which produces little at the margin. Thus, a given amount of capital, the scarce resource, should be combined with as much labour, the abundant resource, as possible. Minimizing capital-intensity has, thus, emerged as an investment criterion: from alternative sectors those with lowest capital-labour ratios should be expanded and from alternative technical blueprints for each sector the projects with the lowest capital-intensities should be chosen. The corollary in trade theory has been to identify comparative advantage with labour-intensity for the labour-abundant economies.

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By now an impressive volume of theorizing has been made to qualify the above hypotheses. It has been shown that under certain realistic assumptions about the differences in the consumption behaviour of the various groups of income receivers, the degree of optimum capital-intensity would crucially depend on the objective of the society[1]. Only under the extreme assumption that the objective is to maximize current output and consumption will it be optimal to select the lowest capital-intensity of all efficient alternatives. If in the objective of the society any weight is assigned to the future growth of income and consumption, the degree of capital-intensity would have to be greater.

It, however, still remains valid that the socially desirable capital-intensity in a labour-surplus economy would be lower than that in a capital-rich developed economy. Thus, the degree of capital-intensity would still remain an important element of investment criterion and a useful indicator of comparative advantage, although its simple minimization would not be optimal for all kinds of social objective functions. Quantitative information about the capital-intensities of the available range of techniques would, therefore, be useful in optimum decision-making.

I.2 The Definition of Capital-Intensity

We define capital-intensity as the value of fixed capital assets per man-year of employment. This of course is no unique way of defining the concept. There exist other definitions in literature. For example, it has been argued that skilled labour ("human capital") is just as scarce as physical capital. Thus, a generalized measure of capital-intensity would consist of both physical and human capital per worker. Direct measurement would be difficult and would require the solution of such complicated conceptual problem as how to aggregate the value of physical objects like fixed capital with that of an abstract quality like skill. Hal B. Lary has suggested the use of value added per worker as the index of such capital-intensity. He has found, on the basis of the United States data, good linear relation between skill level and wage component of value added per worker and, on the basis of the United States and certain other country data, good linear relation between physical capital and nonwage value added per worker. Thus, total value added per worker would appear to have good linear relation with total capital-intensity as defined by Lary[2].

We have not found it worthwhile to use such a definition of capital-intensity for a number of reasons. First, we want to be able to use the measures of capital-intensity for the purpose of projection (*e.g.*, of employment generation and of investment requirement) and for the evaluation of the efficiency of capital-use. Lary's measure would not enable us to do anything of this sort. From

[1]For a discussion of the issues involved, the reader is referred to Sen [11] and the bibliography therein.

[2]For a detailed account, *see* Lary [8].

his measures we could obtain a ranking of industries according to the degree of such capital-intensity which would be sufficient for purposes such as Lary's. But these would not enable us to make the sort of quantitative projections that we want to make. Nor will these allow us to investigate into such important questions as whether capital-intensity has been more than socially desirable. Secondly, Lary's statistical evidence is hardly conclusive. Particularly in an economy with extensive market imperfections it is not easy to justify such stable relations. In large- and medium-scale industries, nonwage value added per worker explains only 14 and 7 per cent of the variation in physical capital per worker respectively in West and East Pakistan[3]. Finally, it does not appear that one can conclusively argue that value-added data in Pakistan is better than physical-capital data.

Thus, in the present study we shall deal only with physical capital. All our conclusions would have to be qualified that human capital, another scarce resource, is left out.

A further limitation of our estimates is the neglect of working capital. Several considerations dictated its exclusion. The level of demand for working capital at any historical time period is determined not only by technological considerations but also by a large number of behavioural, institutional and other factors. To get a measurement of "normal" working-capital requirement, the effects of these other influences would have to be isolated. With only one or two historical observations at our disposal, it is hardly possible to attempt such isolation. Moreover, the basis of data itself appears to be weaker for working capital than for fixed capital.

The estimates of capital-intensity are made at current prices for twenty manufacturing sectors separately for East and West Pakistan. These sectors belong to the same thirty-five sector classification of the economy which has been used for the compilation of other interindustry data at the Pakistan Institute of Development Economics[4]. The estimates have been made separately for large and medium scale (based on the CMI data) and small scale (based on the surveys of small industries).

I.3 The Use of the Observed, Average Capital-Labour Ratios

Even apart from the problems of measurement, the use of the observed capital-labour ratios would be limited for the purposes of both projection and

[3]The correlations were tried for nineteen industry groups in each region on the basis of 1962/63 data from the Census of Manufacturing Industries. For want of skill data, we have not been able to carry out similar test about the relation between skill level and wage per worker.

[4]Details of the sector-classification scheme have been discussed in Khan and MacEwan [7].

optimization. For projection what we want are the incremental ratios. Observed average ratios are the results of a large number of historical circumstances relating to factor prices, *ex-ante* technological possibilities, *etc.* Whether the incremental ratio would be anything like the average ratio would depend on the intertemporal stability of these circumstances.

The usefulness of the observed measures as guides to the choice of the "right" projects in "right" sectors would remain even more limited. First, for each sector we shall have one observed capital-labour ratio representing the average of the blueprints chosen. We shall not have any information about the available alternative techniques. For the choice of the technical blueprint with optimum capital-intensity such information is indispensable. It is true that each industry is characterized by the existence of plants with varying capital-intensities. But our data refers to the aggregates for each category and the act under which the Census of Manufacturing Industries (CMI) is conducted prohibits the release of information about individual enterprises. Moreover, the interfirm variation in capital-intensity would represent a much narrower range than that of true technological possibilities because each firm would be subject to the same distortions in relative prices and, therefore, end up with the same bias in its choice from the available alternatives.

Secondly, in choosing the "right" sectors for expansion, the observed capital-intensities are likely to be imperfect guides to the potential capital-intensities. If the observed capital-intensity in each sector is to be made an important element of such choice, then it must be ensured that in the past for each sector right decisions were made with respect to factor intensities. In a labour-surplus economy of the Pakistan-type, characterised by a set of relative prices completely out of line with true scarcities, this is hardly a reasonable assumption to make.

From the above discussion it would appear that the observed average capital-labour ratios are of limited use for the purpose of planning for future. The numerical estimation of these ratios is by no means a useless exercise, however. For one thing *these estimates can serve as useful partial indicators of the efficiency in the use of scarce resources in the past.* It is frequently alleged that the distorted factor prices in an underdeveloped economy result in great misuse of scarce capital resources. By estimating capital-labour ratios for the recent past and by making international comparisons and comparisons with available alternative technical blueprints, one can get some idea about the extent of such waste. This seems to us to be a major use of such numerical measurements.

We have indicated that for future projection and planning these historical measurements are inadequate partly because they, being *ex-post* estimates, do not indicate the *ex-ante* range of possibilities and partly because they have been, as the result of distorted relative prices, nonoptimal. However, if the existing

policies with respect to relative prices continue in future, these estimates would remain reasonable indicators for future projection purposes. Again, in the absence of detailed information about *ex-ante* possibilities, one has hardly any reasonable alternative to estimating the incremental coefficients after adjusting the observed coefficients on *a priori* considerations.

II. CAPITAL-INTENSITY IN LARGE-SCALE AND MEDIUM-SCALE MANUFACTURING

II.1 Introduction

Our basic estimates for large- and medium-scale industries refer to the year 1962/63. We also have a set of estimates for 1965/66. "Real value" of fixed capital per worker has been shown in these estimates. Such real values are approximations of replacement cost and are derived through a special procedure from the book-values shown in the CMI. The methodology of estimating these numerical capital-intensities have been set out in details elsewhere [3]. The estimates are shown in Tables I to VI, appended at the end.

We have said that one of the important uses we can make of the measurements of the observed, historical capital-intensities is to treat them as partial indicators of the efficiency of using a scarce factor, *viz.*, capital. To do this satisfactorily, it would be necessary to have information about the range of technological alternatives. No direct estimates for such alternatives are available readily. It is, therefore, inevitable that our discussion of the efficiency of factor use should be based on somewhat indirect evidences through international and interregional comparisons.

Our analysis will be based mainly on the 1962/63 estimates while the 1965/66 ones will be used as additional evidence mainly for comparative purpose. This is because for 1962/63 we have been able to obtain independent measurements of the real values of capital while for 1965/66 such measurements have been based on the implicit 1962/63 correction factors[5]. Our confidence in the estimates for the earlier year is, therefore, greater than those for the latter year.

II.2 Sectoral Comparison

There can be two kinds of wasteful use of capital through the choice of higher than socially desirable capital-intensity. First, through the choice of sectors with such high capital-intensities as to be "expensive" in relation to the factor endowments and second, through the choice of highly capital-intensive blueprints for individual sectors from the available alternatives. It is of course impossible to distinguish the two effects from mere estimates of observed capital-intensities. We have already argued that unless we can separate the two factors, we are really in no position to use with any great confidence the historical, observed capital-intensities as partial indicators of future priorities.

[5] *See* Khan [3] for details.

We should also be quite clear that even in interpreting the efficiency of the past development pattern, the observed, historical coefficients should not be viewed as decisive indicators. Low capital-intensity is just one of the desirable characteristics of an investment project and may of course be outweighed by considerations such as output and investible surplus. What we can claim for our estimates is that they tell us where to look, and what questions to ask. A disproportionately high capital-intensity of a sector should prompt us to ask whether the technical blueprints adopted in the sector have been the least capital-intensive of the available efficient alternatives and/or whether the adoption of such high capital-intensity is justified by considerations of higher productivity and investible surplus per unit of investment. With this warning in mind, let us briefly make a few observations about the sectoral capital-intensities.

The three sectors which stand out with unusually high capital-intensities are fertilizer (in both the regions), paper (which is concentrated in East Pakistan) and petroleum products (which had been located in West Pakistan). It may be mentioned that these sectors (particularly the first two) are also characterized by unusually high capital-income ratios [6]. The combination of these evidences makes us question the efficiency of these sectors. If one wants to have new projects in these sectors, one would either have to argue that alternative techniques with lower capital-intensities are available or find other justifications.

Apart from cement, the three other sectors, with high capital-intensity are all manufactured goods. These are sugar, cigarettes and edible oils. While such high capital-intensities are partly redeemed in the case of cigarettes (in both the regions) and edible oils (in East Pakistan) by low capital-income ratios, in the case of sugar (particularly in East Pakistan) the capital-income ratio is also high. In view of the large number of recent indictments of Pakistan's sugar industry, one would tend to regard its high capital-intensity as an additional consideration against its further expansion.

In view of their very big size, it is of some interest to have a look at the jute and cotton textiles. In East Pakistan their capital-intensities are just above the median while in West cotton textiles have a below-median capital-intensity. The capital-income ratios of these sectors have been much above median with nearly the highest ranks which have been discussed by us elsewhere [6].

At the bottom of the spectrum we have, with the exception of certain heterogeneous sectors of the residual variety, leather and leather products, metal products and wood cork and furniture with very low capital-intensity. It may be noted that the capital-intensity of the capital-goods supplying sectors is not particularly high. One may perhaps add that in neither of the years, these heavy industries reached a big enough size to be representative of the long-term incremental pattern. However, it is worth noting that even in as recent a year

as 1965/66, the capital-intensities of the capital-goods industries have been fairly low.

II.3 Observed Capital-Intensity and the Degree of Capacity Utilization

Observed capital-intensity reflects two different factors, the actual capital-intensity of technical blueprints chosen and the degree of utilization of the plant during the relevant time period. The choice of the technical blueprint itself does not commit a particular project to any rigid capital-labour ratio in the observed, historical sense. Such ratio would still remain the function of the degree of utilization of the plant. Thus, for example, the observed capital-intensity can be reduced by a third (perhaps, more realistically, by somewhat less than a third allowing for some "overhead" labour whose employment does not vary with the number of shifts) by operating a plant for three shifts instead of two.

One could argue that the two factors must be separated for the proper analysis of the wasteful use of capital. Underutilization is not so much a technological phenomenon as a behavioural one which can be removed through appropriate actions. On the other hand, the choice of the technical blueprint commits one to a minimum degree of capital-intensity which is given by the observed capital-labour ratio at the full-capacity level of utilization. Thus, the "permanent" inefficiency in factor utilization should be measured by comparing the full-capacity capital-labour ratio (*i.e.*, the observed ratio corrected for the degree of underutilization) with the technological alternatives. From this point of view, it would be important to measure the full-capacity capital-labour ratios.

It may, however, be pointed out that to a significant extent the causes of underutilization have probably been the same as those for the choice of technological blueprints with capital-intensity higher than is socially desirable [4]. As we shall discuss in details in a later section, in the economy of Pakistan the ratio of the price of capital to the price of labour that confronted the investment decision-makers has been very much smaller than the appropriate ratio between the prices of these factors. The relative underpricing of capital has not only led to the selection of a degree of capital-intensity higher than the socially desirable one (the extent of waste on this account being dependent on the *ex-ante* elasticity of factor substitution) but also created the incentive to build up greater capacity than can be used at any given time period to insure against the difficulties of getting licences for capacity expansion in future, to stop the possibility of new entry at a future date and similar considerations. It is, of course, true that a good deal of the excess capacity may have been caused by inadequate supply of inputs (*i.e.*, the so-called "maintenance imports") or even lack of demand. But the fact that capacity has been created at this rate without any reasonable assurance of the supply of inputs and the level of demand has certainly been due to the reason that the underpricing of capital which meant a low cost of capacity

creation. This has also been the major cause of the choice of blueprints with capital-intensity greater than socially desirable. From this point of view it would not appear to be very important to separate the two factors.

We have, however, made some rudimentary estimates of the full-capacity capital-labour ratios for 1962/63. The details of the methodology have been set out in [3]. The estimates are presented in Tables VII(a) and VII(b). None of the observations made in the above section requires serious modification. They appear to follow equally well from the full-capacity capital-intensities.

Two points need to be made about the full-capacity estimates. First, they are based on the assumption that there is no "overhead" labour, that employment is proportional to the number of shifts. This is extremely unlikely. Usually there would be some overhead labour and if allowance could be made for this, the full-capacity capital-labour ratios would be greater than in our estimates. Secondly, our implicit assumption that all types of fixed capital have been underutilized at the same rate would not be true. If excess capacity is a long-term phenomenon, then it would normally be possible to economize upon certain types of fixed capital, *e.g.*, transport equipment, furnitures and fixtures. In this situation, an increase in the rate of utilization, would require additional fixed capital. In this sense again the full-capacity capital-labour ratios would be higher than our estimates.

It should also be noted that like raw materials, some of the capital goods have to be employed roughly in fixed proportion to each other. Unless these fixed proportions are maintained, some capital equipment will have excess capacity because other equipments are in short supply. Railway tracks will remain underused if rolling stocks are scarce. In this sense one should no longer talk in terms of some generalized measure of excess capacity. The situation should be viewed as the departure from the required proportion among various types of capital inputs.

It is possible that the highly inflexible system of exchange control in Pakistan led to quite a number of cases like this. While the import under licensing at the overvalued exchange rate made the individual capital goods underpriced, the rigidity of the licensing system rendered the cost of equipments not covered by the licences (due either to faulty initial design or unforeseen breakdown) enormously expensive. This must have led to further waste in the use of capital already invested in.

II.4 International Comparison

Capital-intensities are generally lower in East as compared to West Pakistan. For 1962/63 the only significant exceptions appear to be sugar, paper, machinery, and cement. Most of these exceptions are special cases, how-

ever. For paper, the nature of the product in the two regions has been very different and this must be the main explanation of the difference in capital-intensity. Machinery has been a very small and unrepresentative sector in East Pakistan in 1962/63. Cement industry in East Pakistan probably had much greater excess capacity than shown in our comparison of shifts due to the complete idleness of a large proportion of machinery which continued to be entered in the books. Our methods of estimating real values and underutilization of capital have not been able to make corrections for these.

Using the 1965/66 estimates, however, we find that the sectors for which East has higher capital-intensity are no longer cement and machinery but basic metal, cigarettes, and cotton textiles along with sugar and paper of the earlier year. The sudden rise in the capital-intensity in cotton textiles could not have been caused by the increased "technological" capital-intensity of investment in this sector between 1963/64 and 1965/66. Investment during these years could not have been so high a proportion of total capacity as to make the capital-intensity in the later year more than twice as high as in the earlier year under any reasonable assumption with respect to the incremental range of technological alternatives. The only plausible explanation would lie in a sharp decline in the rate of utilization — quite a possible event in the unusual War year with difficulties in the supply of raw materials imported from West Pakistan and abroad[6]. A preliminary look at the production figures tends to reinforce this explanation.

The general pattern that emerges from the interregional comparison, however, clearly suggests that capital-intensity in East is lower than in the corresponding industries in West. This is hardly surprising in view of the regional differences in the relative factor endowments and prices. East Pakistan is known to have a greater excess supply of labour in the form of unemployment, both visible and disguised. As a result, wages have been considerably lower in East than in West Pakistan. An overall comparison of the large- and medium-scale industries shows that for most years wages in West Pakistan have been 25 to 30 per cent higher than in East . But this overall comparison would be unrepresentative if the skill composition of labour in the two regions have been different. That this may have caused an understatement is evidenced by the comparison of wages in cotton textiles which shows that West Pakistan industry paid nearly 50 per cent higher wages than East's[7].

[6]Thus, we have a powerful additional argument why we should not use the 1965/66 estimates as basis for comparison. That year was an unusual one due to the outbreak of the War in its third month. As a result violent fluctuations in the pattern of input supply from West Pakistan and from abroad must have taken place contributing to sharp changes in the capacity utilization. Unless we are able to know a great deal more about the degree of capacity use, we shall not be able to use with confidence the 1965/66 estimates for comparison.

[7]Details of wage data are available in Khan [5].

On the other hand, the effective cost of capital must have been higher in East Pakistan than in West Pakistan in view of the relative difficulty in getting credit, licences and sanctioning. In such a situation it is quite plausible that the technology would tend to be more labour-intensive in East Pakistan than in West Pakistan.

II.5 International Comparison

How does one go about in using a set of historical measures of capital-intensity as partial indicators of the efficiency of resource allocation? One way would be to compare the blueprints chosen with the range of technological alternatives. It is, however, enormously difficult to make comparisons like this. First, it is very difficult to assemble information about technological alternatives. Such information is hardly ever available in complete form, *i.e.*, with specification about the number of labour force. Secondly, it is not justified to compare a technological blueprint with the *average* of a large number of *actually implemented* projects. One has to split up a sector into individual projects and perhaps further split up the projects into smaller components to make any meaningful comparison possible. It is quite impossible to generate information in such details.

Another way to approach the problem is the indirect one of comparing the capital-intensities of the Pakistani industries with those in other countries. By selecting a country with the right factor endowment and appropriate level of economic development and by making sure that the decision-making in the country of reference was guided at least roughly by an appropriate set of relative prices, we can make sure that we have as our standard of reference a roughly relevant set of capital-intensities.

It would be well to recognise that even this approach is full of difficulties. Published data on capital-labour ratios are very scarce and particularly so for a uniform set of sector classification. It is not easy to find a country of Pakistan's factor endowments which can be argued to have followed the dictates of "*appropriate*" relative prices. We cannot, therefore, hope to achieve anything but very general qualitative conclusions. But such conclusions, along with the supporting evidence about the incentive structure, would be of very great use in judging the efficiency of factor-use in the past and in obtaining policy-recommendations for future.

In Table VIII we have assembled some numerical measures of capital-intensities for some Japanese and the United States industries in the mid-fifties. The United States is an enormously capital-rich and labour-scarce economy as compared to Pakistan. Japan in the mid-fifties also certainly had relatively abundant (scarce) supply of capital (labour) as compared to Pakistan in the early

sixties. It would, therefore, appear that the capital-intensities of the Pakistani industries should have been considerably lower than those of the United States and the Japanese industries.

Before using these estimates for comparative analysis, a few words about the international comparability of such data may be useful. The problems of comparison would appear to be overwhelming. First, the use of the existing rate of exchange in converting the value of Pakistan's assets in US dollars. Should we have allowed for the well-known overvaluation of the Pakistani rupee in such conversion? In defence of our procedure, we may point out that a very high proportion of capital, frequently around two-thirds, consists of machines and other equipment. Most of these goods have been imported from abroad (many from Japan and the United States) and evaluated at the official rate of exchange while entered in the accounts (with additions at very low rates for import duty and sales tax, perhaps together no greater than the tax in Japan and the United States). Thus, the use of the official rate for the conversion of these assets should not create any difficulty.

The remaining assets, the products of construction sector, are nontraded goods and the estimation of the relevant rate of exchange for them is rather difficult. But, in view of the high proportion of value added and wage in the output of this sector, it is unlikely that the rate of exchange would be as high as for overall traded goods for a low-wage economy. We are, therefore, convinced that the use of the official rate of exchange does not create any overwhelming problem when the comparison between certain orders of magnitude is all that is intended. There would remain other problems of comparison; prices underlying the estimates for the different countries refer to different (though fairly close to one another) years between which prices of capital goods may have changed. Pakistan, being an importer of capital goods, paid for the transport which entered cost while Japan and the United States paid mainly for internal transport and relatively less for international transport. There is the problem of homogeneity of the products of the industries between countries. There is also the problem of the uniformity of the methods of estimation in the different countries. Finally, one must refer to the inherently knotty problem of the international comparability of the value of capital particularly in view of their heterogeneity and variable proportions.

It, however, appears to us that the qualitative conclusions we are going to derive below would remain unaffected if corrections for the above were possible to make. Such corrections would perhaps change the measures of capital-intensities between countries. But it seems extremely unlikely that the changes would be so violent as to render our conclusions invalid.

An unavoidable conclusion, and a rather startling one in our opinion, is that the capital-intensities are invariably higher for the two regions of Pakistan

than for Japan. The only exception are basic metals. Surprisingly enough, the conclusion is particularly true for textiles, an industry for which a certain amount of intercountry product similarlity can be presumed. What is even more startling is that in many sectors Pakistani capital-intensities are close to the US ones while in some (paper in East Pakistan, chemicals and leather goods in West Pakistan) they are higher. This is quite contrary to usual expectations. Given the relative factor endowments in the three countries, the ratio of the price of labour to that of capital should be the lowest in Pakistan. Assuming positive elasticity of substitution (defined as proportionate change in capital-labour ratio divided by proportionate change in wage-interest ratio), one would expect capital-intensities to be consistently higher in the Japanese and the US economies than in Pakistan.

The comparison between the US and the Japanese capital-intensities is consistent with this theoretical hypothesis. Since Japan is relatively labour abundant and capital scarce as compared to the United States, capital-intensity is consistently lower in Japan than in the United States. Attempts have been made to estimate the elasticity of substitution from these observed capital-labour ratios and relative factor prices in Japan and in the United States[8] and the numerical value of the elasticities have usually been found to be just above or below one. If these elasticities are anything near the true indicators of the elasticities of factor substitution, then a country with Pakistan's relative factor endowments should have far lower capital-intensity than in the corresponding activities in an economy like Japan.

To explain this phenomenon logically one would have to argue that one or more of the following things must have been happening unless one wants to take refuge behind the conventional but dubious argument that it has entirely been due to the irrationality of the investment decision-makers:

a) The relative factor-price ratio that prevailed in the market and confronted the decision-makers was not representative of the true factor endowments. As a result the factor prices have not been true indicators of relative social scarcities. Capital has been priced lower than would be dictated by its scarcity and in some sense labour may be argued to have commanded a price higher than its scarcity value.

[8]The elasticity (e) is measured as follows

$$\frac{\left(\frac{K^U}{L^U}\right)}{\left(\frac{K^J}{L^J}\right)} = \left[\frac{\left(\frac{w^U}{r^U}\right)}{\left(\frac{w^J}{r^J}\right)}\right]^e$$

Where K = capital, L = labour, w = wage rate, r = interest rate, superscript U = USA and superscript J = Japan. *See*, Arrow *et. al* [1] for the numerical measurement of the elasticities.

b) Once an investment decision embodying a specific technical blueprint was made, a good deal of the existing capacity remained unutilized. As a consequence, the observed capital-intensity was higher than would the technical blueprint at the full capacity level of operation.

c) The *ex-ante* technological possibility that underlines the measurement of the elasticity of factor substitution did not in fact exist for one reason or another. The range of technological choice has been far more limited than is shown by the cross-section studies because supply must be obtained from specific countries or for other reasons.

A careful examination of the Pakistan case shows that all these factors have probably been important in rendering the capital-intensity of investment much higher than is socially desirable. Let us discuss each of them briefly.

First, the distortion in relative factor prices. Labour-intensive technique will not automatically be favoured in an economy with relatively scarce (plentiful) supply of capital (labour) unless such factor endowments are appropriately reflected in the relative price structure that confronts investment decision-makers. It is, therefore, important to take a good look at the prices of capital and labour in Pakistan.

The present writer has extensively argued elsewhere that in the Pakistan economy capital has been heavily underpriced while the price of labour has been higher than its "efficiency price"[4]. Here we shall briefly recapitulate the main arguments.

The cost of using a unit of capital, the "effective rate of interest", is the unit price of the capital equipment times the rate of interest (*i.e.*, the rate at which funds have been borrowed). The rate at which funds have been borrowed by the capitalists from the banking system in Pakistan has been very low, between 5 per cent in the late fifties to 7.5 per cent in late sixties. Oligopolistic collusion among commercial banks and their subservience to groups of capitalists along with the connivance of the monetary authorities allowed the rate of interest on deposits and advances to be kept so low [2].

One must also take into account the divergence between the market price and social cost of the capital equipments. The rate of exchange being greatly overvalued and most of the equipments having been imported by the actual users through licensing at very low rates of duty and sales tax, the cost of the equipments to the capitalists have certainly been lower than their social costs. Licences were specific and could not be used for any alternative purpose. Hence, it cannot be argued that since the supply of licences was strictly rationed, their relevant price in the decision-making of their users would reflect their scarcity.

The combined effect of the two factors may be expressed in terms of the effective rate of interest: if the market price of capital equipment is lower than the social cost then the effective rate of interest would be correspondingly lower than the already low market rate. This is because, given the actual market rate of interest, the fund necessary to finance the purchase of the equipment would be lower than if price were equal to social cost. If one conservatively assumes that the market price of capital equipment have been at most two-thirds the social cost, then the effective rate of interest for the users of capital would be two-thirds the nominal rates, *i.e.*, about 3.5 per cent in late fifties and 5 per cent in late sixties. It hardly needs any detailed argument to convince that the social opportunity cost of capital in Pakistan has always been way above these rates. It appears that the social opportunity cost has been several times higher than the effective market price of capital[9].

The divergence between the social cost of labour (the "shadow" or "accounting" wage) and its market price in a labour-surplus economy has been one of the earliest controversies in the theory of investment planning. The orthodox doctrine that the shadow wage should be zero was based on the argument that in a labour-surplus economy the employment of an additional unit of labour would not reduce output elsewhere in the economy. It has been argued against this doctrine that an addition to employment would lead to an increase in consumption even in the situation of widespread unemployment and for a less developed economy with a shortage of savings this would constitute additional cost.

Even allowing for this possibility there seems to be little basis for arguing that shadow wage would be the same as market wage. First, additional consumption need not be as high as wages. Even if the newly employed labour consumed its entire wage, its employment will release the consumption it was having before. A part of this may be saved or even the possibility of taxing a part may be opened up. Secondly, the entire increment in consumption would be regarded as social cost only under the extreme assumption that the society's objective is to maximize consumption at some future date. If present consumption has some weight in the nation's objective function, the shadow wage would be less than the increment in consumption.

A further consideration militating against a shadow wage as high as market wage is the society's egalitarian bias. An extreme example is of a society that guarantees a minimum consumption for its unemployed. Surely the shadow wage can be no greater than the difference between actual wage and the guaranteed minimum consumption. It is a minor step from this standpoint to argue that even for the societies which are not actually able to guarantee a

[9] *See* Khan [4] from which a few of the following paragraphs have been extracted almost verbatim.

minimum consumption but would like to do so, the shadow wage rate should be estimated after subtracting from market wage the "socially desirable minimum consumption".

The decision with respect to the choice of technical blueprints for investment projects was, therefore, guided by a structure of relative prices which was not dictated by the true factor endowments. The ratio of the price of labour to the price of capital that dictated such decisions was much higher than the socially appropriate ratio. As a result the choice of capital-intensity was higher than socially desirable.

We have argued before that the choice of technical blueprint does not uniquely determine the observed capital-intensity. This depends also on the extent of excess capacity. Our estimates of Tables VII-a and VII-b show that the effect of this factor has been important in quite a few sectors. It, however, does not appear that this factor explains all or most of the wasteful use of capital. Even the full-capacity capital-labour ratios are above the Japanese ratios and sometimes close to the US ratios. We have also pointed out that excess capacity and the choice of blueprints with higher than socially desirable capital-intensity is largely the result of the same cause — the distorted relative factor prices.

Given the distortion in factor prices, the extent of wasteful use of capital due to excess capital-intensity (*i.e.*, capital-intensity in excess of what is socially desirable) would depend on the *ex-ante* possibility of substitution. It is doubtful if the tremendous excess capital-intensity (sometimes reaching or nearly reaching the US levels) would be dictated by the distorted factor prices alone. It is doubtful whether the *ex-ante* possibility of substitution was anything near the internationally available technological range.

While a large number of factors, including the irrationality of the decision-makers, could limit the *ex-ante* substitution possibility, we would like to dwell upon two such factors. Our knowledge about the facts being very inadequate, we cannot be sure about the extent of responsibility we can allocate to these factors. But the *a priori* argument is strong enough to create the necessary incentive for relevant research.

The first factor in our list, the tying of foreign assistance, may easily have contributed to the excess capital-intensity. If a factory is being set up in Pakistan against a US tied credit, Pakistan is necessarily limited to the plants available in the United States. These plants would, however, be appropriate to the factor endowments of the most capital-rich economy in the world and perhaps, therefore, be more capital-intensive than plants available elsewhere, say in Japan. Thus, the inability to shop freely in the international market would impose the

socially wasteful excess capital-intensity apart from the alleged high price of the plant.

The second factor in our list is the direct private foreign investment. The foreign investors would frequently tend to behave as slaves of the technology back home. In most cases the subsidiaries in the backward countries would copy the technology of the principals with which they are familiar and end up with a capital-intensity higher than socially desirable in the receiving country. They would not only go for excess capital-intensity themselves but would also spread the demonstration effect among the indigeneous entrepreneurs.

A word about the relative performance of the public and private sectors in this regard is in order. It may be noted that it is inevitable for the private sector to use the distorted market prices as guides to decision-making. It is, however, not necessary for the public sector to be guided by market prices. When these prices are known to be distorted and indications of social scarcities are available, it is possible, in fact desirable, for the public sector to disregard the market prices and be guided by the social scarcities (the "shadow prices"). In practise, however, public sector in Pakistan seems to have suffered equally from the illusions of market prices. Indirect evidence for this is obtained from the excessively high capital-intensities of the public sector dominated industries, *e.g.*, paper in East and fertilizer in both East and West.

II.6 International Comparison of the Ranking of Sectoral Capital-Intensities

It is of some interest to compare the ranking of the sectoral capital-intensities of Pakistan with those of other countries at different levels of factor endowments. There has been a good deal of discussion of the possibility of factor-intensity reversal. If the elasticities of factor substitution are significantly different for different industries, then the existing ranking of capital-intensities are poor guides to specialization because an industry with low capital-intensity today may turn out to be a highly capital-intensive industry with a higher wage-interest ratio which is likely to obtain in future. Thus, the criterion ought to be the elasticity of factor substitution rather than the existing level of capital-intensity. Thus, a relatively capital-intensive sector ought to be favoured if it has low elasticity of factor substitution than a relatively labour-intensive sector with high elasticity of substitution. On the other hand, if little evidence is found for factor-intensity reversal then current factor-intensities would be reasonable indicators of desirable specialization.

B. S. Minhas concluded from the rank correlation of capital-labour ratios in twenty industry groups in the United States and Japan that factor-intensity reversal is a relatively widespread phenomenon. Others have objected to his inclusion of natural-resource-oriented industries like agriculture, grain-mill processing and food processing in his sample of industries. The exclusion

of these three groups raises the rank correlation coefficient above 0.8 and enables them to argue that the phenomenon of factor-intensity reversal is not at all usual[10]. With the kind of data at our disposal we cannot hope to be able to add very much to this controversy. We are not at all sure that a sector is homogeneous between the countries in output composition. Nor are we confident that fixed assets in different countries are comparable. Our evidence can hence be hardly conclusive.

In Table IX we have assembled the information on the ranking of the twelve groups of industries in the United States, Japan, East Pakistan, and West Pakistan. To make the industries in different countries comparable we have done some further grouping of our basic estimates and thus the ranking has been somewhat arbitrary in a few cases. The results of rank correlations are reported in the table below:

SPEARMAN'S RANK CORRELATION COEFFICIENT BETWEEN CAPITAL-INTENSITIES OF PAIRS OF COUNTRIES/REGIONS

	U.S.A.	Japan	East Pakistan	West Pakistan
U.S.A.	—	.85	.85	.49
Japan	.85	—	.77	.63
East Pakistan	.85	.77	—	.41
West Pakistan	.49	.63	.41	—

Note: Rank correlation between East Pakistan and the rest are based on eleven groups. Basic metal has been excluded due to its unrepresentative nature in 1962/63 in East Pakistan.

It is clear that the correlation is strong between East Pakistan and the two outside countries while it is less so between them and West Pakistan. Correlation is weakest between East and West Pakistan! While we are unable to derive any conclusive judgment about the question of factor-intensity reversal we would surmise that the poor correlation between East and West Pakistan is at least partly due to the heterogeneity of sectors. Thus, paper in West Pakistan is very different from what it is everywhere else. This should also partly explain the low correlation between West and the countries abroad.

III. CAPITAL-INTENSITY IN SMALL-SCALE INDUSTRIES

The capital-labour ratios for small-scale industries are shown in Table X and XI[11]. It is interesting to compare the capital-intensities of the large-scale

[10] *See* Minhas [9] and Lary [8] for a general discussion.

[11] Methodology and sources of data are given in Khan [3].

industries with those of the corresponding small-scale industries. Capital-intensity systematically declines with the scale of operation. In East Pakistan it is lower for the 5(1) industries than for the corresponding 2(j) ones[12] and it is lower for the small-scale industries than for the corresponding 5(1) industries. For West Pakistan we have no separate information for 2(j) and 5(1) industries, but small-scale coefficients are systematically much smaller than for the large-scale (*i.e.*, combined 2(j) and 5(1) industries).

These findings should be interpreted with care. In many cases the difference in the level of capital-intensity is accounted for by the difference in the product-mix between the large and small scale. While paper industry in the large scale is engaged in paper making, its small-scale counterpart is concerned with book-binding and the making of paper articles. Large-scale sugar is a more refined product than *gur* and raw sugar produced in small scale. Even for textiles the products are not quite homogeneous: while the small-scale processes mainly consist of weaving, the large-scale processes employ more complicated operations.

One cannot, however, fail to notice that even for the sectors for which the products are close substitutes (*e.g.*, textiles, leather products and wood, cork and furniture), the small-scale capital-intensity is by far smaller than the corresponding large-scale capital-intensity. Another important feature is that the proportion of machinery in total assets is far less for the small-scale industries than for the large.

While it is undeniable that a good part of the lower capital-intensity for small scale is due to difference in product-mix and in the degree of complication of technology, it also seems likely that the small-scale enterprises were faced with a more rational relative price structure than the large-scale enterprises. The small-scale enterprises had far less access to bank credit. It was, therefore, inevitable for them to use in their calculations a rate of interest fairly close to the opportunity cost of loanable funds. It was also far more difficult for them to obtain licences for the import of machineries. Such licences went mostly to the big capitalists and commercial importers. The small-scale entrepreneurs had to buy either the domestically produced machinery or the imported machinery from the commercial importers. For both these the underpricing of capital equipment was negligible as compared to the situation facing the large-scale importers. In fact the West Pakistan survey provides information which shows that the proportion of domestically produced machinery was very high indeed — more than 80 per cent for all small-scale enterprises on the average. One can perhaps safely argue that the prices of these machines were not significantly

[12]The 2(j) factories are large scale employing more than 20 and using power while the 5(1) factories are medium scale either employing less than 20 or using no power.

lower than for such machines from abroad at the *relevant* rate of exchange (*i.e.*, if foreign exchange were priced at social cost). Thus, the underpricing of capital equipment was far less for the small-scale enterprises.

A comparison between the 2(j) and 5(1) industries and the rudimentary information available about the wage structure in the small-scale industries point out clearly that for given skill the small-scale enterprises pay lower wage than their large-scale counterparts. This is perhaps due partly to the locational and environmental factors. Large-scale enterprises tend to concentrate in specific areas where supply-demand balance for labour is less favourable. The need for workers housing and/or transport is often imperative. Trade unions are more organized and able to exert greater pressure. To all these must be added the fact that in the small-scale industries a greater proportion of labour may be supplied by the family. Since the supply of such labour need not balance market wage with marginal product, employment tends to become higher than otherwise.

Thus, it appears, that the relative factor prices confronting the small-scale enterprises were far more rational than those facing the large-scale enterprises. As a consequence the capital-intensity is lower and the proportion of machinery is smaller in small scale than would otherwise be.

Interregional comparison of small-scale capital-intensities gives the same sort of results as for the large scale. Capital-intensities are systematically lower for the East Pakistan industries than for their West Pakistan counterparts. The explanation also seems to be the same as in the case of the large-scale industries: capital (labour) is relatively dearer (cheaper) in East Pakistan.

IV. CONCLUSIONS

In this paper we have presented a comprehensive set of capital-intensity measurements separately for East and West Pakistan economies based on the observed capital-labour ratios in the recent past. These measurements have been made for twenty manufacturing sectors separately for large scale and small scale.

These observed coefficients are the results of historical policies and circumstances. Their use for projection purposes must be made with due allowance for such policies and distortions. If they are to be made the basis for projecting the increase in employment in future, then corrections must be made for price changes, for the possible variation in excess capacity, for the possibility that the relative prices would not be the same as in the past and such other factors as would broaden or limit the technological alternatives.

In using these measurements for the purpose of optimization one would have to be even more careful. To select the "right" sectors for expansion from a ranking of these capital-intensities would amount to the assumption that for each sector the right technique was chosen in the past or that the deviation from

the socially desirable factor-intensities was roughly in the same proportion for all the sectors. Unfortunately, it does not appear that we can argue either of these points. We have quite convincing evidence that factor-intensities have not been "right" in the Pakistan economy. If we had sufficient evidence against factor-intensity reversal hypothesis, we could still argue that the distortions affected all the sectors roughly in the same proportion leaving the ranking unchanged. It does not, however, seem to us that the evidence is so conclusive.

We have argued that the measurements can be used as partial indicators of the efficiency of factor use in the past. The study points out that there has been a great deal of wasteful use of physical capital, a very scarce resource in the Pakistan economy. This waste consists both of the choice of technical blue-prints with higher than socially desirable capital-intensity (as revealed by the international comparisons) and of the significant underutilization of the existing capital-stock (as revealed by the crude estimates of full-capacity capital-labour ratios). One major explanation of this waste seems to lie in the distortion in the relative price structure of the relevant factors of production. The effective cost of capital was much lower than the social cost while it seems that the efficiency wage (labour's opportunity cost) was probably lower and certainly no higher than market wage. Part of the waste may also be explained with reference to the possible limitation on the *ex-ante* range of technical alternatives due to such factors as the tying of foreign loans, the behaviour of the direct foreign investors and so on.

The comparison of capital-intensities between East and West Pakistan and between large-scale and small-scale enterprises indicates that the entrepreneurs are not insensitive to relative factor-price differences. If the relative factor prices facing them could be rationalized, they might be induced to shift to a more desirable capital-labour ratio.

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TABLE I

CAPITAL-LABOUR RATIO — EAST PAKISTAN 1962/63

LARGE- & MEDIUM-SCALE INDUSTRIES 2(J) & 5(1) COMBINED

No.	Sector	Building	Machinery	Others	Total
		(thousand rupees per man-year of employment)			
07	Sugar refining ..	5.092	18.716	1.251	25.059
08	Edible oil ..	5.072	9.469	0.367	14.908
09	Cigarettes ..	9.905	10.957	1.053	21.915
10	Other food, drinks ..	2.266	3.557	0.285	6.108
11	Cotton textile ..	2.176	5.894	0.151	8.221
12	Jute textile ..	3.035	7.058	0.129	10.222
13	Other textile ..	0.770	2.968	0.073	3.811
14	Paper and printing ..	15.123	34.337	5.374	54.834
15	Leather and leather products ..	2.241	2.199	0.168	4.608
16	Rubber and rubber products ..	1.349	3.690	0.348	5.387
17	Fertilizer ..	17.471	149.516	1.653	168.640
18	Other chemicals ..	2.092	1.649	0.226	3.967
(17+18)	All chemicals ..	—	—	—	21.092
19	Cement and concrete ..	3.779	22.508	0.384	26.671
20	Basic metal ..	1.558	2.294	0.194	4.046
21	Metal products ..	1.916	2.851	0.204	4.971
22	Machinery ..	6.620	8.709	0.540	15.869
23	Transport equipment ..	3.943	1.992	0.467	6.402
24	Wood, cork & furniture ..	2.343	3.166	0.426	5.935
28	Miscellaneous manufactures ..	2.312	3.460	0.235	6.007

Note: Sector numbers are those of the PIDE Input-Output Table.

TABLE II

CAPITAL-LABOUR RATIO — WEST PAKISTAN 1962/63

LARGE- & MEDIUM-SCALE INDUSTRIES 2(J) & 5(1) COMBINED

No.	Sector	Building	Machinery	Others	Total
		(thousand rupees per man-year of employment)			
07	Sugar refining ..	4.043	15.181	0.499	19.723
08	Edible oil ..	8.979	17.147	0.290	26.416
09	Cigarettes ..	10.271	11.430	3.180	24.881
10	Other food, drinks ..	3.324	4.750	0.615	8.689
11	Cotton textile ..	4.654	6.763	0.190	11.607
12	Jute textile ..	—	—	—	—
13	Other textile ..	3.194	8.193	0.275	11.662
14	Paper and printing ..	1.607	3.206	0.180	4.993
15	Leather and leather products ..	2.702	2.723	0.164	5.589
16	Rubber and rubber products ..	3.653	9.272	0.344	13.269
17	Fertilizer ..	42.023	133.070	3.046	178.139
18	Other chemicals ..	5.594	13.389	0.611	19.594
(17+18)	All chemicals ..	—	—	—	41.949
19	Cement and concrete ..	5.488	16.002	0.436	21.926
20	Basic metals ..	2.386	4.897	0.139	7.422
21	Metal products ..	1.319	3.298	0.102	4.719
22	Machinery ..	1.799	2.925	0.188	4.912
23	Transport equipment ..	5.034	5.630	1.647	12.311
24	Wood, cork and furniture	1.444	1.589	0.096	3.129
28	Miscellaneous Manufacture ..	2.336	3.211	0.143	5.690
29	Coal and petroleum products ..	14.719	41.062	2.191	57.972

TABLE III

CAPITAL-LABOUR RATIO — EAST PAKISTAN 1965/66
LARGE- & MEDIUM-SCALE INDUSTRIES 2(J) & 5/(1) COMBINED

No.	Sector	Building	Machinery	Others	Total
		(.....*thousand rupees per man-year*.....)			
07	Sugar refining ..	7.079	24.151	1.440	32.670
08	Edible oil ..	6.348	9.891	0.536	16.775
09	Cigarettes and other tobacco products ..	8.789	14.473	1.030	24.292
10	Other food and drinks ..	4.735	6.041	1.706	12.482
11	Cotton textile ..	5.876	15.650	0.447	21.973
12	Jute textile ..	3.885	10.829	0.316	15.030
13	Other textile ..	1.394	3.315	0.108	4.817
14	Paper ..	18.124	32.182	3.652	53.958
14(A)	Printing ..	2.109	4.227	0.592	6.928
15	Leather and leather products ..	2.149	2.510	0.484	5.143
16	Rubber and rubber products ..	3.116	6.629	1.011	10.756
17	Fertilizer ..	39.617	100.804	5.608	146.029
18	Other chemicals ..	2.627	3.289	0.428	6.344
19	Cement and concrete ..	4.747	26.113	0.404	31.264
20	Basic metals ..	8.403	13.734	1.491	23.628
21	Metal products ..	2.607	3.876	0.420	6.903
22	Machinery ..	2.613	4.669	0.592	7.874
23	Transport equipment ..	4.711	7.567	0.960	13.238
24	Wood, cork & furniture..	2.493	4.196	0.572	7.261
28	Miscellaneous manufacture ..	8.249	5.600	0.380	14.229

TABLE IV

CAPITAL-LABOUR RATIO — EAST PAKISTAN 1965/66 LARGE-SCALE INDUSTRIES 2(J)

No.	Sector	Building	Machinery	Others	Total
		(.....*thousand rupees per man-year*.....)			
07	Sugar refining ..	7.079	24.151	1.440	32.670
08	Edible oil ...	6.690	8.772	0.568	16.030
09	Cigarettes and other tobacco products ...	8.985	14.845	1.050	24.880
10	Other food & drinks ..	5.194	6.138	1.829	13.161
11	Cotton textile ..	5.876	15.650	0.447	21.973
12	Jute textile ..	3.885	10.829	0.316	15.030
13	Other textile ..	4.651	14.345	0.357	19.353
14	Paper ..	18.747	33.257	3.779	55.783
14(A)	Printing ..	2.284	4.354	0.641	7.279
15	Leather and leather products ..	2.804	3.308	0.600	6.712
16	Rubber and rubber products ..	3.098	6.651	1.042	10.791
17	Fertilizer ..	39.617	100.804	5.608	146.029
18	Other chemicals ..	2.425	3.026	0.398	5.849
19	Cement and concrete ..	4.565	28.309	0.432	33.306
20	Basic metals ..	8.410	13.791	1.495	23.696
21	Metal products ..	3.007	4.537	0.428	7.972
22	Machinery ..	2.751	4.922	0.638	8.311
23	Transport equipment ..	3.814	9.351	1.031	14.196
24	Wood, cork and furniture	2.493	5.296	0.629	8.418
28	Miscellaneous manufacture ..	10.059	6.776	0.424	17.259

TABLE V

CAPITAL-LABOUR RATIO — EAST PAKISTAN 1965/66
MEDIUM-SCALE INDUSTRIES 5(1)

No.	Sector	Building	Machinery	Others	Total
		(.....*thousand rupees per man-year*.....)			
08	Edible oil ..	4.357	16.427	0.355	21.139
09	Cigarettes and other tobacco products ..	1.183	0.023	0.227	1.433
10	Other food & drinks ..	2.862	5.641	1.203	9.706
13	Other textile ..	0.663	0.840	0.051	1.554
14	Paper ..	0.725	2.186	0.128	3.039
14(A)	Printing ..	1.169	3.548	0.332	5.049
15	Leather and leather products ..	0.833	0.908	0.249	1.990
16	Rubber and rubber products ...	3.625	5.984	0.150	9.759
18	Other chemicals ..	3.525	4.446	0.564	8.535
19	Cement and concrete ..	6.478	5.420	0.137	12.035
20	Basic metals ..	6.800	0.981	0.656	8.437
21	Metal products ..	1.175	1.515	0.390	3.080
22	Machinery ..	1.480	2.598	0.220	4.298
23	Transport equipment ..	7.354	2.314	0.748	10.416
24	Wood, cork and furniture	2.496	1.071	0.514	4.081
28	Miscellaneous manufacture ..	1.595	1.273	0.227	3.095

TABLE VI

CAPITAL-LABOUR RATIO — WEST PAKISTAN 1965/66 LARGE- & MEDIUM-SCALE INDUSTRIES 2(J) & 5(1) COMBINED

No.	Sector	Total
		(thousand rupees per man-year)
07	Sugar refining	29.931
08	Edible oil	25.223
09	Cigarettes	11.502
10	Other food and drinks	18.370
11	Cotton textile	15.448
13	Other textile	11.033
14	Paper	33.177
14(A)	Printing	10.628
15	Leather and leather products	4.138
16	Rubber and rubber products	16.225
17	Fertilizer	217.205
18	Other chemicals	18.106
19	Cement and concrete	85.231
20	Basic metals	13.394
21	Metal products	8.168
22	Machinery	7.964
23	Transport equipment	15.599
24	wood, cork and furniture	7.407
28	Miscellaneous manufacture	8.700

TABLE VII(a)

FULL-CAPACITY CAPITAL-LABOUR RATIOS 1962/63 LARGE-AND MEDIUM-SCALE INDUSTRIES 2(J) & 5(1)

No.	Sector	EAST PAKISTAN		
		observed capital-labour ratio	rate of capacity utilization	Full-capacity capital-labour ratio
		(thousand rupees per man-year)		
07	Sugar refining	25.059	0.7499	18.792
08	Edible oil	14.908	0.5498	8.196
09	Cigarettes	21.915	0.9598	21.034
10	Other food, drinks	6.108	0.3298	2.014
11	Cotton textile	8.221	0.9498	7.808
12	Jute textile	10.222	0.8501	8.690
13	Other textile	3.811	0.4100	1.562
14	Paper and printing	54.834	0.8299	45.507
15	Leather and leather products	4.608	0.4003	1.844
16	Rubber and rubber products	5.387	0.3500	1.885
17	Fertilizer	168.640	0.5099	85.989
18	Other chemicals	3.967	0.4297	1.705
19	Cement and concrete	26.671	0.9398	25.065
20	Basic metals	4.046	0.4197	1.698
21	Metal products	4.971	0.4599	2.286
22	Machinery	15.869	0.1498	2.377
23	Transport equipment	6.402	0.4701	3.009
24	Wood, cork and furniture	5.935	0.4201	2.493
28	Miscellaneous manufacture	6.007	0.5198	3.122

TABLE VII(b)

FULL-CAPACITY CAPITAL-LABOUR RATIOS 1962/63 LARGE-AND MEDIUM-SCALE INDUSTRIES 2(J) & 5(1)

No.	Sector	WEST PAKISTAN		
		observed capital-labour ratio	Rate of utilization	Full-capacity capital-labour ratio
		(thousand rupees per man-year)		
07	Sugar refining	19.723	0.7798	15.380
08	Edible oil	26.416	1.0000	26.416
09	Cigarettes	24.881	0.6501	16.175
10	Other food, drinks	8.689	0.4898	4.256
11	Cotton textile	11.607	0.7599	8.208
12	Jute textile	—	—	—
13	Other textile	11.662	0.4401	5.132
14	Paper and printing	4.993	0.7498	3.744
15	Leather and leather products	5.589	0.3694	2.064
16	Rubber and rubber products	13.269	0.3800	5.042
17	Fertilizer	178.139	1.0000	178.139
18	Other chemicals	19.594	0.4000	7.838
19	Cement and concrete	21.926	0.9099	19.950
20	Basic metals	7.422	0.4200	3.117
21	Metal products	4.719	0.3398	1.603
22	Machinery	4.912	0.4302	2.113
23	Transport equipment	12.311	0.4200	5.171
24	Wood, cork and furniture	3.129	0.4004	1.253
28	Miscellaneous manufactures	5.690	0.4499	2.560
29	Coal and petroleum products	57.972	1.0000	57.972

TABLE VIII

CAPITAL-LABOUR RATIOS IN MANUFACTURING INDUSTRIES (VALUE OF FIXED ASSETS IN U.S. DOLLARS PER WORKER)

Sector	East Pakistan	West Pakistan	Japan	USA
Cotton textile	1,713	2,418	475	2,760
Jute textile	2,130	—	—	—
Paper	11,424	—	508	7,310
Leather goods	960	1,164	422	1,010
Rubber goods	1,122	2,764	269	3,730
Fertilizer	35,503	37,503	—	—
Other chemicals	826	4,082	—	—
All chemicals	4,440	8,831	1,100	8,320
Basic metals	843	1,546	2,558	8,600
Machinery	3,306	1,023	478	4,860
Wood products	1,236	652	367	—

Sources: Pakistani data converted from Tables I & II into US dollars at the current exchange rate. Japanese data from [10]. U. S. estimates are based on the work of Bickel "Factor Proportions and Relative Prices in Japan and the U. S.", reported in [1].

TABLE IX

RANKING OF SECTORAL CAPITAL-INTENSITIES

	USA	Japan	East Pakistan	West Pakistan
Coal and petrol	1	1	1	1
Chemicals	3	3	3	2
Basic metal	2	2	12	7
Paper	4	8	2	10
Textiles	11	7	6	6
Machinery	7	6	5	11
Transport equipment	6	5	7	5
Leather product	12	11	11	9
Rubber product	8	9	10	4
Wood, *etc.*	9	10	9	12
Industry, *n.e.c.*	10	12	8	8
Food, drink, manufactures	5	4	4	3

Note: These rankings are somewhat rough. Capital-intensity for petroleum in East Pakistan (a newly started industry) is assumed to be around what it is in West Pakistan. Sometimes the ranks of several industry groups have been averaged to get that for an aggregated sector. Thus, the rank for food, drink manufactures in East Pakistan is the average of that for cigarettes, edible oils and sugar. Ranks for the United States and Japan are based on data in [9, p. 40]. Note that Japanese ranking on the basis of data in Table VIII would be slightly different. This is due to the difference in Minhas' data and those of Table VIII.

TABLE X

CAPITAL-LABOUR RATIOS IN SMALL SCALE INDUSTRIES EAST PAKISTAN

No	Sector	Machinery	Building and others	Total
		(....*thousand rupees per worker*...)		
07	Sugar and *gur*	0.192	0.601	0.793
08	Edible oil	2.961	1.884	4.845
11	Cotton textiles (handloom)	0.246	0.375	0.621
13	Other textiles	0.542	0.416	0.958
14	Paper products	0.524	0.639	1.163
15	Leather and leather products	0.198	0.723	0.921
16	Rubber products	0.257	0.128	0.385
18	Chemicals	0.310	1.105	1.415
21	Metal products	0.954	1.125	2.079
22	Machinery	1.452	2.032	3.484
23	Transport equipment	0.351	0.506	0.857
24	Wood, cork, furniture	0.374	0.760	1.134
28	Miscellaneous manufactures	0.354	0.731	1.085

TABLE XI

CAPITAL-LABOUR RATIOS IN SMALL-SCALE INDUSTRIES WEST PAKISTAN

No.	Sector	Owned capital			Rented capital	Total
		Building	Machinery	Other		
		(.....*thousand rupees per worker*....)				
09	Tobacco manufacture	0.199	0.151	0.030	0.242	0.622
11	Textiles	0.266	0.784	0.017	0.196	1.263
14	Paper	0.113	0.564	0.100	0.401	1.178
14(a)	Printing, *etc.*	0.441	1.489	0.187	0.859	2.976
15	Leather products	0.458	0.859	0.066	0.429	1.812
16	Rubber products	0.377	2.247	0.045	0.724	3.393
18	Chemicals	0.702	1.167	0.103	0.628	2.600
20	Basic metal	0.611	2.674	0.080	0.460	3.825
21	Metal products	0.414	1.070	0.040	0.123	1.647
22	Machinery	0.797	2.248	0.081	0.586	3.712
23	Transport equipment	0.252	1.110	0.040	0.857	2.259
24	Wood, cork, furniture	0.420	0.685	0.031	0.745	1.881
28	Miscellaneous manufactures	0.356	0.745	0.063	0.358	1.522