(69)

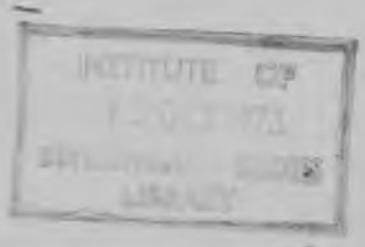
RESEARCH REPORT SERIES, no. 4

New Series No. 4

WHAT HAS BEEN HAPPENING TO PRODUCTIVITY IN THE MANUFACTURING SECTOR OF BANGLADESH? - A CASE STUDY OF SELECTED INDUSTRIES

by

Qazi Kholiquzzaman Ahmad
and
Chowdhury Anwaruzzaman



BANGLADESH INSTITUTE OF DEVELOPMENT ECONOMICS
ADAMJEE COURT, MOTIJHEEL COMMERCIAL ... EA, DACCA-2
BANGLADESH

New Series No. 4

WHAT HAS BEEN HAPPENING TO PRODUCTIVITY IN THE MANUFACTURING SECTOR OF BANGLADESH? - A CASE STUDY OF SELECTED INDUSTRIES

by

Qazi Kholiquzzaman Ahmad
and
Chowdhury Anwaruzzaman

September 1972.

Bangladesh Institute of Development Economics,
Adamjee Court, Motijheel Commercial Area,
Dacca-2, BANGLADESH.

September 1, 1972

WHAT HAS BEEN HAPPENING TO PRODUCTIVITY IN THE MANUFACTURING SECTOR OF BANGLADESH? - A CASE STUDY OF SELECTED INDUSTRIES

by

QAZI KHOLIQUZZAMAN AHMAD
and
CHOWDHURY ANWARUZZAMAN*

I. INTRODUCTION

The industrial sector of Bangladesh achieved quite a rapid rate of growth during the 60's. But, as far as we are aware, no systematic efforts have been made to evaluate the efficiency of this growth. With the emergence of Bangladesh as an independent nation committed to socialism, all the questions relating to industrial development have to be re-examined in the light of hopes and aspirations of the new nation on the one hand and her resource endowments on the other for the purpose of setting the targets and priorities and recasting the policies for the planned development of the country. In the present context, proper allocation of resources and realisation of maximum productivity have assumed even more significance than before as policy goals in the development planning of Bangladesh. Indeed, in order to ensure a sound foundation for rapid industrialization, it is extremely important that every effort is made right from the beginning in

---

* Authors are respectively a Research Economist and a Staff Economist at the Institute. They are grateful to Dr. Arjun Sengupta, Economic Counsellor at the Indian High Commission in Bangladesh, for helpful comments on an earlier draft; but sole responsibility for any remaining errors and inadequacies rests with authors alon Assistance provided by Dilip Kumar Roy, an Assistant Staff Economist at the Institute, in compiling data is thankfully acknowledged.

independent Bangladesh to organise most efficient allocation of resources and to improve the productivity of the production system. To be able to design realistic future strategies to this end, the planners must know, among other things, the level of efficiency of the existing industries. It is, therefore, necessary to carefully examine the nature of the industrial growth that has already taken place in the country before future strategies are worked out. The present study is an effort in that direction.

The term 'productivity' is generally used rather broadly to denote the ratio of output to associated inputs, taken singly or some or all together, in a given period of time, in real terms. Ratios of output to particular inputs are more appropriately called partial productivity ratios. The resource whose productivity is most frequently measured is the labour[1/]. But, when other resources are used in significant proportions and factor substitutions are taking place, partial productivity of labour, or any other input for that matter, not only may not provide an insight into changes in overall productive efficiency or even in the efficiency with which the particular resource is being

---

1/ In fact, the term productivity used without any qualifying word is commonly taken to imply labour productivity.

utilized but, in fact, may not even point in the right direction[1]. Partial productivity ratios are, however, useful as measures of saving achieved or loss incurred overtime in the use of particular inputs per unit of output. In order to messure changes in overall productive efficiency, i.e. real cost per unit of output, all the associated inputs will have to be considered. John W. Kendrick [7] first proposed that productivity should be measured by relating the output to the combined use of all the resources and called the concept 'total factor productivity' or simply 'total productivity'. Total productivity is the ratio of the output to all the associated inputs combined. The inputs are combined by reference to their relative importance in the base year so that effects of factor substitutions cancel out in the productivity indices. Hence, with the effect of factor substitutions neutralized, total productivity indices reveal changes in productive efficiency[2] (i.e. real cost per unit of output), which comprises the effects of technical progress, changes in the scale of output, changes in

---

1/. Only in the case where a particular resource is the most important input and the possibility of factor substitution is negligible, the partial productivity of the resource concerned may not be in serious error as an index of efficiency - overall as well as in the use of the particular resource. For further discussions on this see [1], [4], [6] and [7].

2/. It may be noted that total productivity purports to measure efficiency in terms of costs to business only. It does not measure efficiency in terms of costs to the economy as a whole i.e. it does not tell us whether or not various types of resources are employed in their most productive uses in a given situation.

the rate of utilization etc.[1]

The best measure of productivity is obtained when all the resources used are taken into consideration; and, indeed, the broader the coverage of resources, generally, the better is the productivity measure [6, p. 6] and [7, chapter 1]. One may, therefore, treat explicitly all the four input categories of capital, labour, raw materials and fuel and power so that all the important tangible inputs are given their due weights. However, in actual practice, after recognising that all the inputs should be taken into consideration, frequently one works with labour and capital only[2]. The underlying assumption is that there exist fixed co-efficients with respect to raw materials, fuel and power etc. But as there is the scope of economies and diseconomies in the use of these resources, the assumption of fixed co-efficients with respect to them is not valid. Raw materials and fuel and power should, therefore, be treated as factor inputs like labour and capital [8, p. 9] and [11, p. 65].

Again, one might argue that it is the scare factors that one should worry about so that productivity of the scarce factors only need be investigated into. But, if we concentrate

---

1/. To be sure, total productivity index catches the combined effect of these factors on the productive efficiency; and, although, it is analytically possible to separate out the effect of some of the factors this is outside the scope of this paper.

For detailed discussion on the concept of total productivity and the meaning of productivity change see [7].

2/. Both Fabricant [6] and Kendrick [7] have worked with factor inputs of labour and capital only.

on scarce factors only, we shall be led to be concerned primarily with devising techniques for saving that particular factor only. There is no guarantee, however, that better utilization of scarce factors will necessarily lead to better utilization of other factors also. Indeed, scarce factors should be given the greatest possible attention, but that does not mean that other factors should be neglected. It, therefore, makes good sense to give due emphasis on 'other' factors also in any review of productive efficiency. Thus, not only should we be concerned with the productivity of capital, if capital is the scarce factor, but also with labour productivity, raw materials productivity, fuel and power productivity etc.

In this paper, therefore, we shall use a resource classification of labour, capital, raw materials and fuel and power[1/]. Our primary concern here, then, is the computation of total productivity indices in respect of labour, capital, raw materials and fuel and power to analyse the growth of productive efficiency overtime. We shall also analyse partial productivity ratios with respect to these four factors to get an insight into changes overtime in the use of these resources per unit of output.

1/. Beri [1] and Sinha and Sawhney [10] have used a similar resource classification.

II. Construction of Partial and Total Productivity Indices - The Methodology

The first step is to construct output and input indices. Input indices are compiled separately for each of the four selected input categories, viz., capital, labour, raw materials and fuel and power.

The Census of Manufacturing Industries (CMI) is the main source of our data. Other sources consulted are statistical yearbooks (C.S.O., Pakistan) and Statistical Digests of the Bangladesh Bureau of Statistics.

1962-63 has been chosen as the base year. It would seem sensible to choose a year in early 60's as the base because a reasonable industrial growth had taken place by then and 1962-63 is the only year in that period and, in fact, also the earliest year, for which detailed data required for this study are available. Also, all evidence suggests that 1962-63 was reasonably free from abnormalities.

Coming now to the choice of measured years, we first intended to compute indices for all the years following 1962-63 upto the most recent year for which data are available. But the required data for this study are available in published form only for 1964-65 and 1965-66 since 1962-63; and although, the Bangladesh Bureau of Statistics holds CMI returns for other years upto 1969-70 and could be persuaded to let us have access to them, we found that we could not compile the required data

for all the years from unpublished records as it is too time consuming and laborious to do so manually. We, therefore, decided to work with the most recent year for which data can be collected from the CMI records available with the Bureau and one year in between as measured years. This will give us an insight into productivity level in a recent year and also some idea about its behaviour overtime[1/].

As already mentioned, the latest year for which CMI is available is 1969-70. But the coverage for this year is poor. 1968-69 has been found to be the latest year for which the Bureau holds relevant information with fairly good coverage. We have, therefore, taken 1968-69 as the latest measured year and compiled relevant data from unpublished records of the Bureau. The other year chosen for evaluation is 1965-66, the required data for which have been taken from the published CMI report for that year.

Ideally, physical quantities should be used in constructing output and input indices. But, in most cases, consistent and reliable physical quantity data are not available. In such cases we have used value figures by suitably deflating them into constant 1962-63 rupee figures (i.e. real terms)[2/]. Indeed, when full information on quantities, values and prices are available, indices

---

1/. We understand that CMI reports for all the years will be compiled from the schedules and published in due time. It may be worthwhile to compute productivity indices for all the years when these reports will be available.

2/. The next section will contain the procedure followed in the construction of output and input indices.

based on deflated value figures are the same as those obtained from physical quantity figures. Hence, when we have only the value figures and full information on prices are lacking, the deflator used should be such as will represent prices as closely as possible so that the index based on deflated value figures is as close as possible to the true real product index. This has been a guiding force in the choice of deflators.

Once output and input indices are compiled for the measured years, partial productivity ratios with respect to each input is obtained by dividing the relevant input index into the output index while total productivity is obtained by dividing the relevant total input index into output index. Total input index has been computed as the weighted average of individual input indices - the weights being proportional to the value of inputs in the base year.

III. THE CONCEPTS AND MEASUREMENT OF OUTPUT AND INPUTS

Definitions of variables used are also an important determinant of the results obtained. In this section we shall spell out in details the concepts of variables used and the procedure followed in their measurement.

Output

Output may be measured in physical quantities or by the value of production or by value added. The value-added approach

is used on the assumption that material inputs have a fixed relation to output. But there may be economies or diseconomies in the use of materials at different levels of productive operation as well as overtime [5,p. 97] and [4]. Hence, the use of value-added as a measure of output in structural analysis involves specification error of unknown magnitude [2,p. 121]. Also when raw materials and fuel and power are included as separate input categories along with labour and capital, the more relevant measure of output is the value of production. We have, therefore, measured output either by value of production or by physical quantities depending on the availability of information. In the cases where value figures have been used, they have been deflated by relevant wholesale price indices to obtain real measure of output.

Capital :

Fixed capital data is available in the CMI reports in three components such as land and contruction, plant and machinery and other assets. We have taken plant and machinery and other fixed assets and constructed a single series by lumping them together. The exclusion of land and construction from fixed assets is due to the fact that there has been large appreciations in the value of land over the past years but no suitable deflator is available to correct for such violent uptrend in land prices. Again the relationship between land and output growth is less affected by technological change. Also, in the process of excluding

land we are rather forced to exclude buildings since CMI do not provide separate figures for land and buildings.

The gross value of fixed assets (excluding land and constructions) in constant prices[1/] has been used as the measure of capital[2/], because depreciation charges rarely represents actual capital consumption. Moreover, the use of gross value is particularly relevant in the context of underdeveloped countries where capital stocks are probably more often used at approximately constant levels of output for a period far beyond their accounting life, measured by depreciation, until it is eventually discarded or sold for scrap [9,p. 55]. The gross value of fixed assets computed as above has been weighted by the base year rate of return to give a measure of capital input that is used up in the process of production. The rate of return has been defined as the ratio of nonwage value-added net of indirect taxes to fixed assets as used here.

1/. The yearly net additions to capital stock were deflated by the wholesale machinery price index. These price corrected yearly increments were cumulatively added to the initial stock at 1962-63 to obtain the value of capital stock at constant prices. The initial stock however could not be corrected for price changes due to non-availability of past investment figures. All figures for capital stock are gross of depreciation.

2/. Working capital was excluded due to its peculiar composition which involves great difficulties to arrive at a suitable price index for applying price correction to such data. Moreover, like land its relation to/growth is less influenced by technological factors. output

Labour :

It is customary to represent labour input by the number of man-hours actually worked or the average number of persons on the pay roll in a day of the year. But data on man-hours actually worked are not available. Besides, the conventional method suffers from some limitations. In the first place, it assumes homogeneity of labour and thus assigns equal importance to all types of labour. Secondly, changes in the occupation-mix are not represented in such measures. To mitigate such difficulties we have distinguished three occupation categories viz., production workers, professional and administrative employees and other workers and used the number of employees in each category to construct labour input index.

Raw Materials:

The variety of materials used in each industry have been suitably divided into several groups, wherever possible, for the purpose of constructing raw materials index with due weights to the components of each input. In most cases both physical as well as value figures are available. Wherever value figures have been used, they have been deflated by wholesale raw material price index or other suitable price index to obtain a real measure.

Fuel & Power:

This category of inputs are measured in value terms throughout due to non-availability of quantity figures. The value figures are deflated either by electricity price index or mineral oil price index[1/] whichever is found suitable in a particular case. However, electricity that is generated within the industry has not been taken into account as cost of such electricity is not reported in the value of electricity consumed.

IV. THE MEASUREMENT OF PRODUCTIVITY IN SELECTED INDUSTRIES

IV.I In the preceding sections, we have discussed the approach followed in this paper for productivity measurement. This section is devoted to the measurement and interpretation of total and partial productivities of four key industries of Bangladesh viz., jute manufacturing, cotton, cigarette and match.

But, first, a few words about the importance of the selected industries in the economy of Bangladesh. The jute manufacturing is the premier industry of the country. Judged by any of the criterions - capital invested, employment, value of production, value added by manufacture or foreign exchange earnings - it is by far the largest industry of the country. Its position in the economy of the country is thus preponderant; and an examination of its past performance, therefore, merits a special attention.

1/. Mineral oil price index has been applied to value of fuel items. To be accurate, a composite price index should be used to deflate the value of fuel items. In its absence, the use of mineral oil price index will be a close approximation since fuel oils constitute the major share in fuel items.

The cotton textile is the second largest industry of the country when judged by the size of the capital invested and employment. Normally, the mill production and handloom production of cloth together meets a substantial proportion of the country's total cloth requirements. Besides meeting its own demand for yarn, the industry also feeds the handloom industry with most of its yarn requirements. Clearly, in addition to the direct employment of about 58,000 workers, it has a definite influence on the livelihood of about one million handloom weavers and associated workers in the country.

Judge by the criterion of value added, the cigarette is the second largest industry of Bangladesh. It is also one of the most capital intensive industries of the country.

Of the four industries dealt with in this paper, match is the smallest from the point of view of capital invested and value added. Nevertheless, it is an important industry as it employs a sizeable labour force and also, under normal circumstances, not only meets the total demand for matches in the country but in fact products exportable surpluses.

All the four industries under consideration in this paper achieved growth at different rates during the period under review. While the cigarette industry registered a tremendous rate of growth, jute manufacturing and cotton textile industries grew at a relatively high rate with the match industry making the

slowest progress. The production indices for the four industries for the measured years i.e. 1965-66 and 1968-69 are shown in table 1. These indices have been used for determination of partial and total productivities in the respective industries.

Table 1

Production Indices in the Selected Industries
(1962-63 = 100)

Industry	Index	
	1965-66	1968-69
Jute Manufacturing	126.19	214.97
Cotton Textile	116.57	208.89
Cigarette	249.43	519.31
Match	134.07	136.54

(Source:- Computed from CMI data)

IV.2 THE TOTAL PRODUCTIVITY

Total productivity indices for the four selected industries in 1965-66 and 1968-69 relative to 1962-63 are as follows:-

Table 2

Total Productivity Indices for the Selected Industries
(1962-63 = 100)

Industry	Index	
	1965-66	1968-69
Jute Manufacturing	75.61	84.87
Cotton Textile	106.75	113.35
Cigarette	81.95	128.99
Match	88.43	77.91

(Source:- Relevant tables in the appendix)

The above figures depict a poor performance picture for the jute manufacturing industry. Although the performance tended to improve in 1968-69 relative to 1965-66, it was still about 15% below 1962-63 level. The picture depicted of the cotton textile industry by the productivity indices is an encouraging one while that of match industry is a gloomy one. The performance of the cigarette industry was poor in 1965-66 but was very encouraging in 1968-69.

A. The Jute Manufacturing Industry

In the case of jute manufacturing, the total productivity was down, in relation to 1962-63, by about 24% in 1965-66 and, then, picked up in 1968-69 by some 9 percentage points but was still about 15% below the 1962-63 level. A look at table A-7 of

the appendix reveals that this happened as all the partial productivities were lower in both 1965-66 and 1968-69 relative to 1962-63, except for the labour productivity which remained more less constant throughout. The comparatively better performance in 1968-69 was due to the fact that partial productivity of raw materials and fuel and power tended to improve somewhat in 1968-69 after being very low in 1965-66. The capital productivity remained more or less the same in both 1965-66 and 1968-69 at about 18-19% below the 1962-63 level. An explanation for the finding that total productivity declined sharply since 1962-63 may be attempted as follows.

As an export industry, the jute manufacturing industry was enjoying a high rate of subsidy in the from of export bonus, examption from excise duties for export, easy credit etc. The rate of subsidy was so high that the industry was able to earn a good profit rate even when the export price was substantially lower than the cost of production. There was the market to sell to and there was the subsidy to ensure profit even for the most inefficient producer. All that was necessary to earn profits was to put out goods. Also, setting up of a jute mill was a very easy job as the government would finance the major cost of its establishment through the former EPIDC, IDBP and PICIC[1/] and import

---

1/. Iqbal Haidari, Ed., Jute Industry in Pakistan: Economic and Industrial Publications, Survey series No. 2, p.1.

licences for machinery were obtainable fairly easily. This is the background against which more and more jute mills came to be established during 1960's. One can, therefore, argue that the productivity was bound to decline because, as the profit was easy to come by, the producers, particularly the new-comers, neglected productivity aspect. Also the lack of experience on the part of newcomers as well as lack of able managers and skilled workers and high labour turnover[1/] due to transitory nature of a large proportion of the labour force must have contributed to the declining productivity.

The evidence that total productivity picked up by about 9 percentage points in 1968-69 relative to 1965-66 is an encouraging feature. This may imply that, by then, the productivity aspect of the industry began to be taken more seriously, although the performance was still significantly poorer in relation to 1962-63.

B. The Cotton Textile Industry

The figures show that total productivity in the cotton textile industry had a rising trend during the period under review -- rising to 106.75 and 113.35 respectively in 1965-66 and 1968-69. Although the performance has tended to improve rather modestly, it is definitely an encouraging feature. The partial

---

1/. Although labour productivity has been found to remain more or less constant (appendix table A-7), the capital/labour ratio was increasing, which would suggest that labour productivity might actually have gone down.

productivity (table B-6 of the appendix) show that, by 1965-66, the industry became substantially more efficient in the use of labour and also achieved a significant saving in the use of raw materials. In 1968-69, the performance with respect to labour and raw materials tended to remain about the same as in 1965-66. But the capital productivity was very poor in 1965-66 and, although somewhat better in 1968-69, was still about 23% lower than in 1962-63. The industry became much more efficient in the use of fuel and power by 1968-69, the performance in 1965-66 having remained about the same as in 1962-63.

C. The Cigarette Industry

It will be seen from table 2 that, in 1965-66, the total productivity in the cigarette industry was substantially below the 1962-63 level but, in 1968-69, it rose by about 57% on 1965-66 and by about 29% on 1962-63. As can be seen from table C-7 of the appendix, capital, which accounts for about 48% of the total input mix and raw materials, which account for about 46% are the main input items. Labour accounts for 5% and fuel and power is negligible. The poor total productivity in 1965-66 relative to 1962-63 occurred as capital and materials productivities were down in that year. In 1968-69, the total productivity showed a significant improvement as capital productivity made a tremendous headway rising by about 45% on 1962-63 and materials productivity also rose by about 18% on 1962-63.

D. The Match Industry

The total productivity in the match industry declined continuously during the period under review -- falling to 88.43 and 77.91 respectively in 1965-66 and 1968-69. The capital productivity was at a low ebb both in 1965-66 and 1968-69, falling to 76.32 and 64.86 respectively (table D-7 of the appendix). The labour productivity also tended to be poorer in the measured years. Fuel and power productivity was also discouraging in both 1965-66 and 1968-69, but fuel and power forms a negligible proportion of total inputs. In the use of raw materials also, the performance was much poorer in 1968-69, although in 1965-66 it tended to remain at 1962-63 level.

IV.3 PARTIAL PRODUCTIVITIES

The behaviour of the total productivity of the four selected industries over the period 1962-69 has been discussed in the preceding sub-section. With a view to obtaining further insight, partial productivities with respect to the four selected input categories in each industry are discussed below:-

A. The Jute Manufacturing Industry

The partial productivity indices in the jute manufacturing industry for 1965-66 and 1968-69 relative to 1962-63 are shown in table A-7 of the appendix.

It appears that the labour productivity tended to hold its own at about 1962-63 level in both 1965-66 and 1968-69. Reference to appendix table A-2 indicates that there was a highly disproportionate increase in the professional and administrative cadres in 1968-69. This saddled the industry with high administrative expenses per unit of output. It may also be noted that production workers appear to be about equally efficient in 1965-66 relative to 1962-63 and tended to become somewhat more efficient in 1968-69.

Regarding capital productivity, even though our capital data may be poor, the evidence that capital productivity was about 18-19% lower in both 1965-66 and 1968-69 than in 1962-63 does indicate significant diseconomies in the use of the capital input. Indeed, it is quite possible that part of the installed capacity included in our capital input and assumed to have been utilized at the base year rate was not, perhaps, yet put to production in the relevant production period.

Coming to material productivity, normally, there should not be excessive fluctuations in the material productivity index as materials required per unit of output cannot vary much from time to time. This is especially true of raw jute. But our indices show that materials productivity in 1965-66 was about 2/3rd of

1962-63 level if all the materials are taken into account and the situation is even worse when only raw jute is considered (table A-4 of the appendix). The decline of this order in the ratio of raw materials to output could not possibly have happened. It is more likely that there was possibly something wrong with the raw material input data for 1965-66. The raw material productivity of 84.50 in 1968-69 relative to 1962-63 would seem to be within the possibility range. Indeed, the fall of 15.5% in the raw material productivity shows a significant diseconomy in the use of raw materials. Assuming that our raw materials input data for 1968-69 are reasonably reliable, the explanation of the result obtained may be sought in terms of widespread wastage and loss of materials, particularly of jute, in the production processes and/or, perhaps, before release to the factory. Also, inefficient purchase of jute which may take the form of buying jute with more than normal moisture may cause loss.

Regarding fuel and power productivity, our indices show that it was lower by about 43% in 1965-66 and by about 25% in 1968-69 relative to 1962-63. This means that, per unit of output, fuel and power consumption was substantially higher in 1965-66 and also significantly higher in 1968-69 relative to 1962-63. The steep increase in the use of fuel and power for given output was due to steep increase in electricity consumption (which accounted for about 80% of the total fuel and power consumption) relative to increase in output, although some economy would appear

to have occurred in the use of fuel (table A-5 of the appendix). The electricity consumption rose by 150% in 1965-66 and by 220% in 1968-69 relative to 1962-63 while production rose by only 26% and 115% respectively.

B. The Cotton Textile Industry

The partial productivity indices in the cotton textile industry in 1965-66 and 1968-69 are shown in appendix table B-7.

The figures show that labour productivity in the cotton textile industry went up by about 41% in 1965-66 and by a further 4% in 1968-69 relative to 1962-63. But, the fact that the capital labour ratio was about 91% and 52% higher in 1965-66 and 1968-69 respectively relative to 1962-63 would suggest that the actual productive efficiency of labour was, in relation to 1962-63, perhaps substantially lower in 1965-66 and also somewhat lower in 1968-69. However, considering the utilization of labour per se in its various categories, it will be noticed that administrative expenses per unit of output rose rather steeply in 1968-69 relative to 1962-63 as the index of administrative and professional staff was 281.23 as against the production index of 208.89. However, increasing economy was achieved in the use of production workers in 1965-66 and 1968-69 (tables B-1 and B-2 of the appendix). This is an encouraging feature.

The capital productivity was the snag in the cotton textile industry. It has been found to be as low as 61.99 in 1965-66 compared to 1962-63 and, although somewhat better, was still about 23% lower in 1968-69 than in 1962-63. There was perhaps widespread underutilization of capacity in 1965-66 as well as 1968-69, more acutely so in 1965-66. This seems to be borne out by the fact that fuel and power index showed moderate increases of about 18% and 70% respectively in 1965-66 and 1968-69 relative to 1962-63 in the face of about 88% and 172% increase in capital input indices. To the extent this is so, our capital input index represents capacity installed but unused in actual production and, therefore, our capital productivity figures do not represent true productivity of employed capital to that extent. The fact that the capital productivity picked up somewhat in 1968-69 is certainly a welcome feature, although still a long way to go before even the 1962-63 level could be reached.

The material productivity index rose to 118.62 in 1965-66 and was only marginally lower in 1968-69. During the 60's, new mills were coming into existence with new machinery and some of the older machinery in the older mills were also being replaced by new machinery. Under the circumstances, one would expect that

efficiency in the use of raw materials would increase and this is exactly what happened.

Coming to fuel and power productivity, it will be seen that it remained at about the same level in 1965-66 but rose by about 23% in 1968-69 relative to 1962-63. A look at the individual items in table B-5 of the appendix will show that while the consumption of fuel was down to some 22% and 41% of the 1962-63 level respectively in 1965-66 and 1968-69, that of electricity was up to 199% and 280%. This shows that there was substitution of fuel oils by electricity. This happened as the relative price of electricity fell during the period.

C. The Cigarette Industry

The partial productivities in the cigarette industry for 1965-66 and 1968-69 relative to 1962-63 are shown in appendix table C-7.

As evidenced by the indices, the efficiency of labour tended to increase during 1962-69. It would appear that the increase in the labour productivity index for 1965-66 might be largely attributed to the increase in capital intensity as indicated by capital-labour ratio for the year relative to 1962-63. But, the figure for 1968-69 would seem to reflect a genuine increase in the efficiency of labour, where the capital intensity in fact declined in relation to the base year. Considering the different types of labour (see table C-2 of the appendix), we note

that administrative expenses per unit of output went up substantially during 1962-69. However, it appears that in 1965-66, the production labour was about as efficient as in 1962-63 and was more efficient in 1968-69. 'Other' workers showed still better results.

Regarding capital productivity, it will be seen that although it declined in 1965-66, it is very encouraging to note that, in 1968-69, it was about 45% higher than in 1962-63. Although there may be room for suspicion about the 45% efficiency gain in the use of capital as being too high, there may be little doubt that substantial economy was achieved in the use of capital by 1968-69 relative to 1962-63.

Regarding the material productivity, the indices show that it declined in 1965-66 but, in 1968-69, not only recovered to 1962-63 level but, in fact, registered a significant increase on 1962-63. Coming to individual items of materials distinguished (table C-2 of the appendix), it appears that, in 1965-66, the efficiency in the use of tobacco declined while the efficiency in the use of cigarette paper and other materials remained more or less the same as in 1962-63. But, it will be noticed that, in 1968-69, the efficiency in the use of tobacco improved significantly compared to 1962-63. However, in that year, the productivity of cigarette paper and other materials declined. Yet, due to the higher weight-age of tobacco, the total material productivity showed improvement in 1968-69.

Regarding fuel and power productivity, the figures show that more and more economy was achieved in the use of fuel and power during the period under review. However, while the consumption of both fuel and electricity increased from year to year, the rate of growth for the two items was vastly different. Thus, while the fuel index rose by 17% and 78% in 1965-66 and 1968-69 respectively, the electricity index rose by 507% and 1529%. Obviously, there was substitution of fuel by electricity. This occurred as relative price of electricity fell.

D. The Match Industry

Partial productivities in the match industry for 1965-66 and 1968-69 relative to 1962-63 are shown in the appendix table D-7.

It appears that the labour productivity, after going down in 1965-66, tended to pick up in 1968-69 almost reaching the 1962-63 level. It is encouraging to note that production workers were found to be more productive in 1968-69 than in both 1965-66 and 1962-63 as will be seen from the production and production labour indices in the respective years (table D-2 of the appendix). 'Other' workers also did well in 1968-69. But, as was the case with jute manufacturing and cotton textile, administrative expenses per unit of output went up substantially in the match industry in 1968-69.

Capital productivity was declining continuously during the period, falling to 76.32 and 64.86 respectively in 1965-66 and 1968-69 relative to 1962-63. This is a disturbing feature and calls for a thorough enquiry to ascertain the reasons therefor. Available evidence suggest that there was considerable under-utilization of capacity in both 1965-66 and 1968-69.

Coming to the material productivity, the figures show that, in 1965-66, it was about the same as in 1962-63 but, in 1968-69, it was down by about 19%. It appears that the efficiency in the use of wood, blue match paper and chemicals was declining during the period under review as evidenced by the relevant indices, shown in table D-4 of the appendix, considered along with corresponding production indices. However, the relevant indices show that in respect of other inputs, which constitute about half the total input mix, a substantial measure of economy was achieved in 1965-66 relative to 1962-63. In 1968-69, the performance in respect of these other inputs would appear to be significantly better than in 1962-63, although somewhat poorer than in 1965-66.

Regarding fuel and power productivity, the indices reflect a declining trend in fuel and power productivity during the period under study. It appears that while in both cases the picture was discouraging, the efficiency in the use of fuel was relatively lower compared to electricity (table D-5 of the appendix).

V. SUMMARY AND CONCLUSIONS

The four industries selected in this study have experienced growth at different rates. Among these, the cigarette industry grew at a tremendous rate while jute manufacturing and cotton textile industries expanded at a relatively high rate with the match industry making slower progress. But the concern of this paper is not the growth itself but the efficiency of this growth. Attempts have, therefore, been made to evaluate the efficiency of resource utilisation in each industry. This has been done by computing partial and total factor productivity indices. While partial productivity indices show the pattern of use of individual inputs, total productivity indices measure changes in over all productive efficiency i.e. real cost of production per unit of output. The main findings of the study are summarised as follows:

1. The total productivity of the jute manufacturing industry declined by about 24% in 1965-66 relative to 1962-63 and, then, rose by about 12% in 1968-69 relative to 1965-66, but was still about 15% below the 1962-63 level. This means that the real cost of production was substantially higher in 1965-66 relative to 1962-63 and, although somewhat lower than in 1965-66, it was still significantly higher in 1968-69 than in 1962-63. It appears that the industry became increasingly inefficient in the use of capital during the period under review. Labour productivity remain more or less constant during the period. The productivity of raw materials and fuel and power declined steeply in 1965-66

and picked up somewhat in 1968-69, but still remained significantly lower than in 1962-63.

2. A rather encouraging picture of the cotton textile industry has been depicted by the above analysis. The productive efficiency of the industry had a rising trend during the period under review -- rising by about 7% in 1965-66 and about 13% in 1968-69 relative to 1962-63. The industry has been found to have achieved higher efficiency in the use of all the resources except capital. In the case of capital, the efficiency declined very steeply in 1965-66 relative to 1962-63, and, although the situation improved somewhat in 1968-69 relative to 1965-66, the efficiency in 1968-69 was still about 23% lower than in 1962-63.

3. Compared to the other industries under study, the cigarette industry, on the whole, fared best in 1968-69. Although, the performance of the industry was rather poor in 1965-66 as the total productivity index fell by about 18%, it was very encouraging in 1968-69 with the total productivity index standing at 128.99. The industry achieved higher efficiency in the use of all the resources in 1968-69 relative to both 1962-63 and 1965-66, although in the case of capital and raw materials the efficiency was significantly lower in 1965-66 relative to 1962-63.

4. The match industry suffered a continuous decline of productivity during the period under review as revealed by the total productivity indices of 88.43 and 77.91 respectively

in 1965-66 and 1968-69. The efficiency of the industry in the use of all the resources was lower in both 1965-66 and 1968-69 relative to 1962-63, except in the case of material use in 1965-66 when it tended to remain about the same as in 1962-63.

5. In the end, it is to be noted that heavy reliance on our results are not warranted because of questionable accuracy of the data used. Yet, even though one may not put great reliance on the magnitude of our resultant indices, the trends shown by them are believed to reflect the underlying real state of affairs in the industries studied. The evidence presented in this study underlines the need for laying due emphasis on improving the productivity of the industries.

REFERENCES

1. Beri, G.C.,:- "Measurements of Production and Productivity in Indian Industry" - with special reference to some methodological aspects. (Asia publishing house, London, 1972).

2. Brown, Murray:- On the Theory and Measurement of Technological Change, Cambridge University Press (1966).

3. Davidson, J.P., P.Sargant Florence, Barbara Gray and N.S. Ross:- "Productivity and Economic Incentives". (George Allen and Unwin Ltd., Museum Street, London,(1958).

4. Deurinck, G:- "Productivity Measurement Coocepts, Volume 1" (The organisation for Economic Co-operation and Development, 1955).

5. Domar, E.D.:- On Total Productivity and All That: Journal of Political Economy: Vol. LXX, Feb-Dec. 1962: pp.597.

6. Fabricant, Solomon:- "Basic Facts on Productivity Change", (National Bureau of Economic Research, Inc. New York, 1959).

7. Kendrick, John W.:- "Productivity Trends in the United States" -- a study by the National Bureau of Economic Research, New York,(Princeton University Press, Princeton,1961).

8. Klein, L.R.:- "An Introduction to Econometrics", (Prentice - Hall, Inc. Englewood Cliffs, N.J., 1963).

9. Rosen,George:- Industrial change in India - "Industrial Growth, Capital Requirements, and Technological Change,1937-1955". (The Free Press, Glencoe, Illinois, June,1961).

10. Sinha,J.N. and Sawhney, P.K.:- Institute of Economic Growth, Delhi - "Wages and Productivity in Selected Indian Industries". (Vikas Publications, Delhi, Institute of Economic Growth, 1970).

11. Yotopoulos, Pan A. Research Monograph Series No.18. "Allocative Efficiency in Economic Development -- A cross Section analysis of Epirus Farming, (Centre of Planning and Economic Research, Athans, Greece,1967).

APPENDIX

All the following tables have been prepared on the basis of CMI data and data taken from statistical year-books (CSO, Pakistan) and Statistical Digests of the Bangladesh Bureau of Statistics.

A. The Jute Manufacturing Industry

Table A.1

Production Indices in the Jute Manufacturing Industry
(1962-63 = 100)

Year	Index
1965-66	126.19
1968-69	214.97

Table A.2

Labour input indices in the Jute Manufacturing Industry
(1962-63 = 100)

Type of Labour	Weights	Index in	
		1965-66	1968-69
Production workers	.87	127	194
Professional and administrative workers	.07	106	541
Others	.06	165	109
Total labour	1.00	127.81	213.19

Table A.3

Capital input indices in the Jute Manufacturing Industry
(1962-63 = 100)

Year	Index
1965-66	153.66
1968-69	265.71

Table A.4

Material input Indices in the Jute Manufacturing Industry
(1962-63 = 100)

Type of Materials	Weights	Index in	
		1965-66	1968-69
Raw Jute	.78	227	277
Batching Oil	.01	481	701
Dyes and Chemicals	.06	120	124
Others	.15	137	226
Total Materials	1.00	203.14	254.41

Table A.5

Fuel and Power input Indices in the Jute Manufacturing Industry
(1962-63 = 100)

Item	Weight	Index in	
		1965-66	1968-69
Electricity	.80	250	320
Fuel	.20	102	156
Total Fuel & Power input	1.00	220.40	287.20

Table A.6

Total Input indices in the Jute Manufacturing Industry
(1962-63 = 100)

Type of Inputs	Weight	Index in	
		1965-66	1968-69
Labour	.18	127.81	213.19
Capital	.47	153.66	265.71
Raw material	.32	203.14	254.41
Fuel & Power	.03	220.40	287.20
Total input	1.00	166.90	253.29

Table A.7

Partial and total productivity Indices in the Jute Manufacturing Industry

(1962-63 = 100)

Type of Productivity Index	Index in	
	1965-66	1968-69
Labour	98.73	100.83
Capital	82.12	80.90
Raw material	62.12	84.50
Fuel & Power	57.26	74.85
Total Productivity	75.61	84.87

(Computed by relating production indices in table A.1 to input indices in table A.6).

B. THE COTTON TEXTILE INDUSTRY

Table B.1

Production indices in the Cotton Textile Industry
(1962-63 =100)

Year	Index
1965-66	116.57
1968-69	208.89

Table B.2

Labour input indices in the Cotton Textile Industry
(1962-63 =100)

Type of labour	Weights	Index in	
		1965-66	1968-69
Production Worker	.82	84.28	134.30
Professional & Administrative employees	.10	51.83	281.23
Other Workers	.08	103.25	75.83
Total labour input	1.00	82.55	144.32

Table B.3

Capital input indices in the Cotton Textile Industry
(1962-63 =100)

Year	Index
1965-66	188.04
1968-69	271.48

Table B.4

Material input indices in the Cotton Textile Industry (1962-63 =100)

Year	Index
1965-66	98.27
1968-69	178.63

Table B.5

Fuel and Power input indices in the Cotton Textile Industry (1962-63=100)

Items	Weights	Index in	
		1965-66	1968-69
Electricity	.54	199.03	280.31
Fuel	.46	21.91	40.56
Total Fuel & Power input	1.00	117.56	170.03

Table B.6

Total input indices in Cotton Textile Industry (1962-63=100)

Type of input	Weights	Index in	
		1965-66	1968-69
Labour	.19	82.55	144.32
Capital	.14	188.04	271.48
Raw Material	.60	98.27	178.63
Fuel & Power	.07	117.56	170.03
Total input index	1.00	109.20	184.29

Table B.7

Partial and Total Productivity indices in the Cotton Textile Industry (1962-63=100)

Type of Productivity index	Index in	
	1965-66	1968-69
Labour	141.21	144.74
Capital	61.99	76.94
Raw material	118.62	116.94
Fuel & Power	99.16	122.86
Total Productivity	106.75	113.35

(Computed from tables B.1 and B.6).

C. THE CIGARETTES INDUSTRY

Table C.1

Production indices in the Cigarette Industry
(1962-63 =100)

Year	Index
1965-66	249.43
1968-69	519.31

Table C.2

Labour input indices in the Cigarette Industry
(1962-63 = 100)

Type of Labour	Weights	Index in	
		1965-66	1968-69
Production worker	.54	258.22	434.35
Professional & administrative employees	.05	443.75	3587.50
Other workers	.41	173.33	150.00
Total labour	1.00	232.69	475.42

Table C.3

Capital input indices in the Cigarette Industry
(1962-63 =100)

Year	Index
1965-66	309.23
1968-69	357.86

Table C.4

Material input indices in the Cigarette Industry
(1962-63 = 100)

Type of material	Weights	Index in	
		1965-66	1968-69
Tobacco	.57	350.21	325.14
Cigarette paper	.04	264.11	814.24
Others	.39	255.02	574.24
Total material input	1.00	309.64	441.85

Table C.5

Fuel and Power indices in the Cigarette Industry
(1962-63 = 100)

Item	Weight	Index in	
		1965-66	1968-69
Electricity	.14	607.14	1628.97
Fuel	.86	117.20	178.62
Total Fuel & Power	1.00	185.79	381.66

Table C.6

Total input indices in the Cigarette Industry
(1962-63 =100)

Type of inputs	Weight	Index in	
		1965-66	1968-69
Labour	.05	232.69	475.42
Capital	.48	309.23	357.86
Raw material	.46	309.64	441.85
Fuel & Power	.01	185.79	381.66
Total input	1.00	304.35	402.61

Table C.7

Partial and Total Productivity indices in Cigarette Industry (1962-63 = 100)

Type of productivity index	Index in	
	1965-66	1968-69
Labour	107.19	109.23
Capital	80.66	145.12
Raw material	80.56	117.53
Fuel & Power	134.25	136.07
Total productivity index	81.95	128.99

(Computed from tables C.1 and C.6).

D. THE MATCH INDUSTRY

Table D.1

Production indices in the Match Industry (1962-63 =100)

Year	Index
1965-66	134.07
1968-69	136.54

Table D.2

Labour input indices in the Match Industry (1962-63 = 100)

Type of labour	Weights	Index in	
		1965-66	1968-69
Production workers	.81	149.03	122.74
Professional and administrative workers	.10	106.90	325.86
Others	.09	146.63	75.46
Total labour input	1.00	144.60	138.80

Table D.3

Capital input indices in the Match Industry
(1962-63 = 100)

Year	Index
1965-66	175.66
1968-69	210.52

Table D.4

Material input indices in the Match Industry
(1962-63= 100)

Type of material	Weight	Index in	
		1965-66	1968-69
Wood	.36	135.99	182.45
Blue Match paper	.06	218.80	324.49
Chemicals	.09	355.19	448.08
Others	.49	80.71	87.25
Total material input	1.00	133.60	168.23

Table D.5

Fuel and Power input indices in the Match Industry
(1962-63 =100)

Item	Weight	Index in	
		1965-66	1968-69
Fuel	.45	254.84	301.54
Electricity	.55	168.91	163.52
Fuel & Power input	1.00	207.58	225.63

Table D.6

Total input indices in the Match Industry
(1962-63 = 100)

Type of inputs	Weights	Index in	
		1965-66	1968-69
Labour	.27	144.60	138.80
Capital	.34	175.66	210.52
Raw material	.38	133.60	168.23
Fuel & Power	.01	207.58	225.63
Total input	1.00	151.61	175.25

Table D.7

Partial and Total productivities in the Match Industry
(1962-63 = 100)

Type of productivity index	Index in	
	1965-66	1968-69
Labour	92.72	98.37
Capital	76. 32	64.86
Raw material	100.35	81.16
Fuel & Power	64.59	60.52
Total productivity	88.43	77.91

(Computed from tables D.1 and D.6).