Productivity Trends in the Manufacturing Industries

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This paper attempts to provide empirical evidence on inter-industry differentials in productivity levels and their growth rates, and the distribution of productivity gains among the principal factors of production, i.e. labour and capital. Hardly any work has been done in Pakistan on providing a satisfactory quantitative measure of productive efficiency of the factors of production in the manufacturing industries. A study of this kind should be important not only from the economic but also from the social point of view because an optimal distribution of total gains in productivity is basically an empirical question and can not be discussed in general terms.

The importance of productivity as a factor in economic development is universally recognised. The economic achievement of some of the developed countries is attributed more to increases in productivity than to anything else. Changes in productivity become all the more significant for the developing countries where the resources are limited in supply and have a very high social opportunity cost. Productivity growth is an "absolute requirement" in the developing countries and a "fundamental requisite in any form of planning" irrespective of the stage of development and economic and social system [1, pp. 127-128].

An increase in production is quite different from an increase in productivity, which implies an outward shift in the production frontier. Increased production in one industry or sector may be at the cost of another industry or sector. The resource shift may land us on quite different points on the same production frontier. In Pakistan, the level of production in the manufacturing sector has no doubt increased tremendously during the last decade and a half

However, our main interest here is in seeing whether we have really been able to shift our production curve outward or whether we have been moving along the same curve for a long time. This expansion is possible through the release of labour force and an economy in the use of capital which can then be re-employed in the same or some other industry for further production. What is, therefore, important for economic development is not only the absolute level of output but also the cost involved in terms of economic resources. If the output-input ratio is taken as an index of overall productivity of the economy, any increase in this ratio over time can be interpreted as a more efficient utilisation of resources or simply an "increased productivity".

This paper is divided into three sections. The first section discusses the methodology and data, the second deals with the estimation of productivity trends, and the third section is about the distribution of productivity gains. Finally, a few concluding observations have been made.

METHODOLOGY AND DATA

The productivity of the economic system can be defined as "the ratio between the output of wealth produced and the input of resources used up in the process of production" [3, p.1]. This is a very broad definition and the outcome of any empirical exercise will depend entirely upon how "outputs" and "inputs" are defined.[1] Once these variables have been defined and the productivity ratios estimated, their growth rates then can be easily calculated. There are two ways in which this can be accomplished. Firstly, by fitting trend lines to the already prepared productivity indices, and, secondly, by estimating production functions and then slightly varying the technological coefficients of these functions. The results in both cases are almost the same provided the weights used in the first case are the same as the exponents obtained from the statistical production functions [7, p. 13]. The advantage of the first method, i.e. the ratio of output to inputs, is that it makes possible the intertemporal and inter-industry comparisons of productivities. It was for these reasons that we decided to obtain productivity growth rates from the productivity indices.

Trend rates of the growth of factor productivities were obtained by estimating the following equation:

$$Ln\ P = a + b\ t \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

where P stands for productivity and t denotes the trend variable. For each industry, growth rate is given by b, the coefficient of trend variable t. In order to estimate the above equation, total productivity indices were prepared for each industry covering a ten-year period from 1959-1960 to 1969-1970. Two types of indices were constructed, one based on the value added and the other on the output measure. The formulae used for this purpose were:

$$P_t = \frac{V_t}{w_0\ L_t + r_0\ K_t} \quad \dots\dots\dots\dots\dots(2)$$

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[1]Productivity may be calculated on the basis of either output or value added. Again, output and value added figures could be either at market prices or at factor costs. "Inputs" may refer to either factor inputs or material inputs or both.

$$P'_t = \frac{Q_t}{w_o L_t + r_o K_t + m_o M_t} \quad \ldots\ldots\ldots(3)$$

where $\quad w_o = W_o / L_o, \quad r_o = \dfrac{V_o - W_o}{K_o}$

P = Productivity based on value added,
P' = Productivity based on output,
V = Gross value added,
Q = Value of output,
L = Number of persons employed,
K = Gross value of capital,
M = Raw Materials,
w = Wage rate,
W = Total wages,
r = Rate of return on capital, and
m = Price of raw materials.

Subscripts refer to the time periods.

For equation (2) value added was taken at constant factor costs instead of at market prices, expecting the results to be more consistent with factor cost figures, because in this way the effect of indirect taxes, which is otherwise likely to reflect itself in the form of increased productivity, is separated. The total number of persons were used for calculating labour input, and no distinction was drawn between production and non-production workers as with technological development the difference between the two is becoming increasingly difficult to determine. The best measure of labour input is the number of hours worked but, since no such data are available for any industry, employment figures were taken as the second best measure and were weighted by the base-year wage rates to obtain measures of labour input. Capital stock figures included land and buildings, machinery and other assets, as defined in the Census of Manufacturing Industries and as adjusted by Kemal [5]. Capital data as such show the level of capital stock, but, for comparing efficiency of capital at different points of time, the stocks need to be converted into flows. This conversion was done by multiplying the value of capital stocks by the rate of return on capital. The base-year rate of return was used to construct capital input series. For raw materials, price and quantity figures were not available separately. So raw materials at constant prices were obtained by subtracting value added from output, both of which were available at constant prices.

In the third section, for calculating total productivity gains and the shares received by labour and capital the following relations were used:[2]

$$G_T = \Delta V_T - \Delta I_T$$
$$G_L = \Delta Y_L - \Delta L_T$$
$$G_K = \Delta Y_K - \Delta I_K$$

where G stands for productivity gains. V for gross value added, Y for income and I for input. Subscripts T, L and K stand for total, labour and capital respectively. Total gains are defined as the difference between increases in gross value added and total factor inputs measured at constant factor costs and constant rates of compensation respectively. Labour's share in productivity gains is the difference between an increase in labour income, i.e. wages (at constant prices), and an increase in labour input (at constant wage rate). Similarly, the share of the capital is the difference between an increase in non-wage income (at constant price) and an increase in capital input (at constant rate of return).

All the data used in this paper are the adjusted CMI data taken from the two earlier studies on the subject [4, 5].

PRODUCTIVITY TRENDS

Productivity indices, and prepared on the basis of equation (2) and given in Appendix Table 1, showed unexpectedly large year-to-year fluctuations in many industries. The estimates of trend growth rates also did not show any uniformity: these were very high in some industries and extremely low in some others. These apparently doubtful estimates necessitated verifications of the findings by some other method. An alternative set of trend rates was therefore estimated with the help of equation (3). In this case, output was used instead of value added. Raw material, ignored in the previous equation, thus got explicitly included in the productivity formula. Not relying on the estimated figures for business taxes, we took outputs at market prices instead of at factor costs.

Rates of growth of total factor productivity estimated on the basis of both value added and output are given in Table 1. A comparison of the two estimates confirms the prior belief that owing to the differences in underlying factor intensities and the rates of capacity utilization, the productive efficiency levels differ markedly "between industries" and that they have been changing at different rates "within industries".

The numerical values of the trend rates, based on value added' are higher than those based on output for all industries. This was primarily due to the effect of raw materials which were excluded in the former case but included in the latter. The results in Table I show that out of a total of sixteen industries value added productivity showed an upward trend in thirteen and a declining trend in three industries. The rate of increase was highest in the Leather industry (9.09 percent) and the rate of decline maximum in the Paper industry (—8.09 percent). In contrast, there was only one industry which showed declining output productivity while in all others the output productivities showed upward trends. The growth rate was highest in the Rubber industry (5.96 percent) and lowest in the Paper industry (—1.82 percent). Chemical and

Chemical Products and the Non-metallic Mineral Products were the only two industries which showed declining trends for value added but rising trends for output productivities.

Table 1

Trend Growth Rates of Total Productivity Based on Value Added and Output
(1959-1960 *to* 1969-1970)   (Percentages)

Industry	Trend Growth Rates based on	
	Value Added	Output
Food manufactures	0.53	0.78
Tobacco manufactures	3.43	4.61
Manufacture of textile	6.20	3.20
Manufacture of footwear and other wearing apparel	1.476	1.56
Manufacture of paper and paper product	—8.09	—1.82
Printing, publishing and allied products	5.85	2.41
Leather and leather products	9.09	0.24
Rubber products except rubber footwear	8.66	5.96
Manufacture of chemicals and chemical products	—1.58	0.04
Manufacture of non-metallic mineral products	—3.60	0.97
Basic metals industries	8.60	2.12
Manufacture of metal products	2.40	0.86
Machinery except electrical machinery	3.52	0.84
Electrical machinery	6.76	3.13
Manufacture of transport equipment	3.16	0.97
Miscellaneous industries	11.51	1.35

At first glance, Table I casts doubt on the validity of the results, but if we look at the productivity indices given in Appendix Tables 1 and 2, it becomes quite evident that differences in growth rates were actually due to differences in productivity levels, which, in some cases, showed wide fluctuations from year to year in a particular industry and from industry to industry in a particular year. The output-based productivity indices are on the whole much more consistent than those based on value added. Larger annual fluctuations and the resulting trend rates in the case of value added can be attributed partly to the form of algebraic relationship between the variables used here to prepare the indices. Looking at the two formulae on productivity, we find that the only difference between them is that in the case of output productivity a constant term (viz. the value of raw materials) is added to the numerator and the denominator. If initially the numerator and the denominator are not equal, then

as a result of this addition the two terms will be increased by different percentages and the ratio of these terms will also change.[3]

Changes in productivity levels thus take place on account of disproportionate increases in the output and the inputs. Among the inputs it is mostly the capital input which suddenly shoots up in some years, thus tilting the overall balance. Despite the fact that the available capital has never been fully utilised [5, 12] there is an increasing tendency in some of the industries to adopt more and more capital-intensive techniques of production. A recent visit to a woollen mill revealed that some of the older machines which were still in a perfectly good shape had been replaced by some very sophisticated but highly expensive machines. The result was that although at current prices the output/input ratio was quite high, yet, valued at the base-year prices, there was a much greater increase in the capital input than in the resulting output. This is exactly what seems to have happened in the Paper industry. Up till 1964-1965, total productivity was above the initial year's level but the decline started after 1965 when corresponding to a 44 percent increase in output (from Rs. 109,333,000 in 1964-1965 to Rs. 157,981,000 in 1965-1966) there was a 79 percent increase in the capital input (from Rs. 21,384,000 to Rs. 38,264,000). This phenomenon of comparatively greater increase in capital input continued till the last year.

There was almost no increase in the output productivity in the Chemical industry. Except for three years (from 1963-1964 to 1965-1966), the productivity index remained close to 100. In the case of leather manufacturing the output productivity was 29 percent higher in 1969-1970 than in 1959-1960. But the large yearly fluctuations were mainly responsible for the low trend rate. When only one year, i.e. 1962-1963 (for which the productivity was exceptionally high), was excluded, the annual trend rate increased from 0.24 percent to 0.74 percent. In the Transport Equipment industry, the overall rate of growth was low because of declining production levels after 1967-1968. The trend growth rate of output productivity in this industry was 3.01 percent till 1967-1968, but the last two years pulled down the trend rate to as low as 0.97 percent.

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[3]A numerical example will illustrate the point. In the case of the leather industry, the two productivity estimates for 1960-1961 were as follows:

$$P = \frac{\text{Value added}}{(\text{Labour Input} + \text{Capital Input})}$$

$$= 21227 / (3924.85 + 6292.78) = 2.07$$

$$P' = \frac{\text{Value added} + \text{Raw Materials}}{\text{Labour Input} + \text{Capital Input} + \text{Material Inputs}}$$

$$= \frac{21227 + 47221}{3924 + 6292.78 + 47221} = 1.19$$

Thus the value added productivity was as high as 1.73 times the output productivity. In terms of percentages, whereas P' increased only by 19 percent, p showed 107 percent increase in productivity over the previous year.

In short, the results of this study, as given in Table I, suggest that the total productivity has been increasing at quite high rates in Rubber, Tobacco, Textile, Printing and Publishing, and Electrical (machinery) industries, and at rather moderate rates in the Footwear and Miscellaneous industries. In all other industries the trend growth rates were less than one percent per annum. Except in the Paper, Leather, Chemical and Transport industries, growth rates of output total productivities were significant at the 5 percent level in all other industries. Footwear industry was the only industry wherein the rate was found significant at the 10 percent level.

It is extremely difficult to identify the factors which caused fluctuations in the input-output levels of different industries, as this is possible only in in-depth case studies of individual production units. Irrespective of the nature of industry, one major factor that determines and controls the behaviour of other variable is "management". It would not be too wrong to attribute some of the changes in production and productivity levels to management decisions. An International Labour Organisation, (ILO) productivity study by Kilby [8, p. 305] the results of which are also quoted by Leibenstein [9, p. 400], shows that in the textile industry alone in Pakistan there was a dramatic increase in the labour productivity when only a few minor management decisions were taken. These decisions, which included simple technical alterations, payments by result and workers' training and supervision programmes, resulted in a 14 percent increase in labour productivity in the weaving unit of the mills and a 59 percent increase in the bleaching unit. The production costs in terms of labour and capital were reduced by 29 percent and 37 percent in weaving and bleaching units respectively. The study also gives some interesting results about the effect of labour relations on the productivity level. To quote from the report: "In one of the ILO missions to Pakistan an improvement of labour relations in a textile mill in Lyallpur resulted in a productivity increase of 30 percent. Nothing else was changed except that labour turnover was reduced by one-fifth" [9, p. 401]. But it appears that this increased productivity was not appreciated by the management for some unknown reasons. To their great surprise, when some members of the ILO mission revisited some of the firms they found a reversion to previous methods and productivities. The Cotton Textile industry being one of the largest industries in Pakistan, any generalisation based on the experience of that industry will not be too wrong and it is believed that what is true for Textiles is by and large also true for other industries.

In general, it was noticed that during the ten-year period covered in this study, total productivity levels increased at fairly high rates during the first half and showed variations of different degrees during the second half. The year 1962-1963 did not seem to be normal for many industries as the previously smooth trends showed a sudden change in this year. The war with India in 1965 resulted in lower productivities in eleven out of sixteen industries in either 1965-1966 or 1966-1967. Unsettled political conditions in the country after 1967 also reflected themselves to some extent in lower productivities during the latter part of the 1960's.

DISTRIBUTION OF PRODUCTIVITY GAINS

Total productivity gains and their distribution between labour and capital are given in Appendix Table 3. It appears from the information given below that

a disproportionate share of productivity gains accrues to capital. But before going into the details of this distribution, let us for a moment look at Appendix Tables 4 and 5. Appendix Table 4 gives the shares of labour and capital in the increase in total input from 1959-1960 to 1969-1970 and Appendix Table 5 shows the percentage shares of labour and capital in total input.

It is generally believed that a major share of all gains is invariably taken away by capital while labour hardly gets what it actually deserves. This view does not seem to be far from the reality. Out of a total of sixteen industries, in nine industries capital received more than 60 percent of the productivity gains. Take for example the first industry, viz. Food manufacturing. Out of the total gains of Rs. 1,721,161,000, labour received only 9.8 percent while the rest went to capital. Appendix Table 4 shows that, during the period covered by this study, the increase in labour input in the Food manufacturing industry was 15.65 percent of the total increase in inputs. Productivity gains allocated to labour were thus 6.47 percent less than what it should have received under a proportionate distribution. The increase in capital input, on the other hand, was 84.35 percent of the total input increase but capital received 90.82 percent of the gains for two reasons. Firstly, capital had a very large share in the food industry in 1969-1970 (78.78 percent, to be exact), and there was every reason to expect 78.78 percent of the gains going to capital; secondly, as is clear from the factor price indices, the price of capital increased much more than that of labour, thereby tilting the balance in favour of capital.

The distribution of productivity gains was in favour of labour in Chemical, Metal product, Machinery except electrical, and Transport Equipment Industries, while in all other industries capital received a bigger share of the total gains. In eleven industries, capital's share of gains far exceeded its share in the incremental input, ranging from 4.77 percent in the Basic Metals industry to 60 percent in the Tobacco manufacturing industry.

In absolute terms, productivity gains were a maximum in the Textiles industry (approximately Rs. 619,270,910) but labour got only one-third of it as its share (about 10.99 percent less than its due share) on account of higher proportion of capital in the total input in 1969-1970 and the price of capital being relatively higher than the price of labour.

The results for Paper and Paper Products, Chemicals and Chemical Products, Non-metallic Mineral Products, and Transport Equipment industries look quite unreal. Since the quality of the data cannot be guaranteed, an element of error may be present there but the results are still quite amazing. The paper industry had a downward trend in its total productivity as shown in Table I. During the period 1959-1960 to 1969-1970, the value added in this industry increased by only Rs. 39,216,000 while the corresponding increase in input cost was of Rs. 62,579,000. The industry thus ran a loss of Rs. 23,364,000 owing to decline in productivity. But this loss was not shared by both the factors. Labour income actually exceeded labour input by Rs. 773,000. Productivity loss to capital was of Rs. 24,137,000, *i.e.* cf Rs. 773,000 more than the total loss to the industry—the amount paid to labour at the cost of capital. It might have been due to institutional factors, like trade unions, and downward rigidity in wages.

In the Chemical industry, though the total productivity was 0.72 percent higher in 1969-1970 than in 1959-1960, the trend rate of productivity was —1.58 percent. But in spite of this negative trend, the productivity gains, though nominal, were still positive. There were an incredible gain to labour and a loss to capital. The gain to labour was of Rs. 43,097,000 which is about 15.32 times the total gain to the industry as a whole, while the loss to capital was 14.32 times the industry gains. This probably happened owing to the following reasons. We estimated productivity gains at constant prices. For labour and capital incomes, current figures were deflated by the relevant output price indices, and inputs were calculated at constant rates of compensation. A look at the price indices shows that whereas the price of Chemicals and Chemical products in 1969-1970 had increased by 22 percent, the wage rate during the same period had increased by more than 100 percent in this industry and the price of capital had increased only by 4.05 percent. The labour input at constant wage rate, therefore, was less than the labour income at constant prices, resulting in a 15.32 percent gain to labour. Similarly, the big gap between changes in capital income and capital input was because of the fact that the increase in the price of capital (i.e. 4.05 percent) was much less than the increase in the price of output (22.41 percent) which was used to deflate the capital income. This difference of prices, coupled with the fact that capital formed 80.14 percent of the total factor input in the Chemical industry, resulted in the distribution of gains which was unbelievably in favour of labour and against capital.

The third abnormal industry was the Non-metallic Mineral Products industry. The total factor productivity in this industry in 1969-1970 was 22.09 percent less than its initial level. Over the ten-year period from 1959-1960 to 1969-1970, the productivity declined at a rate of 3.60 percent. During this period, the value added increased only by Rs. 51,763,000 while to produce that much worth of output a cost of Rs. 127,489,480 was incurred. The net loss was of Rs. 75,726,480. Of this loss, 98.48 percent was borne by capital while 1.52 percent was absorbed by labour. This unequal sharing of loss was again due to unequal changes in the factor prices. Although capital input was about 80 percent of the total factor input in 1969-1970 in the Non-metallic Mineral Products industry, the reason for its having absorbed 98.48 percent of the loss was a 32.46 percent fall in the capital price index—form 100 in 1959-1960 to 67.54 in 1969-1970. The prices of labour and output in the meantime had increased by 79.93 percent and 46.14 percent respectively.

Lastly, the Transport Equipment industry requires some elaboration and explanation. In spite of the fact that in 1969-1970 the total factor productivity in this industry was 2.44 percent less than its initial level, there was, on the whole, an upward trend in the productivity. A comparison of the figures for initial and the terminal years shows that there was an increase of Rs. 39,278,000 in the value added and a corresponding increase of Rs. 41,170,000 in the input cost. But even though the industry experienced a loss of Rs. 1,886,600, labour managed to secure a gain of Rs. 11,119,800, which is almost six times the total loss to the industry. This gain to labour, as in some earlier cases, was at the expense of capital, which suffered a productivity loss of Rs. 13,006,400. The explanation here, too, is the same though the degree of our measure (i.e. the price indices) is a little bit different. There was an increase of 25.3 percent in the price of transport equipment and of 63.36 percent in the price of labour but there was a decline of 46.59 percent in the price of capital over the entire period.

CONCLUSIONS

It is believed that in order to achieve economic development over a short period, developing countries will have to increase employment and productivity at the same time [1, p. 127]. From the development point of view, increased productivity becomes even more important than increased production if we keep in mind the scarcity of the productive resources. Most of the industries included in this study showed significant growths in their productivity levels during 1959-1970. The Paper industry represented the only case where a declining productivity rate was observed. The available statistical data have, however, led us to conclude that there were no significant changes in the output productivity levels of Leather, Chemical and Transport Equipment industries. The decline in productivity should be a cause of concern to the Government, which must take appropriate steps to see that productivity does not fall below a minimum level. The magnitudes of productivities given in this paper may not be all true mainly on account of the poor quality of data for some of the industries, especially for the Paper, Chemicals, Non-metallic Minerals and Leather industries. Guisinger [2, p. 22] also makes a passing reference to it. But in spite of all these weaknesses this exercise still gives us a fairly adequate idea about the direction of productivity changes.

The conclusions of "the Meeting of Experts on Productivity in the Manufacturing Industries", held under the auspices of the International Labour Organization in Geneva in 1952 [3, p. 175], can be of great help to the Government in its efforts to increase productivity levels in the economy. The measures suggested in this report relate, firstly, to plant and equipment, secondly, to organization and control of production, and, thirdly, to personnel policy. Concomitantly with this, the Hawthorne experiment [9, p. 401-10], which was a complete success in the textile mills in Lyallpur, can also be tried in other industries.

In the end, a few words of caution for the policy makers may not be out of place. Although higher productivity is desirable, the Government must see to it that it does not aggravate the problem of unemployment or retard the rate of capital formation. The social aspect of this economic question is also equally important. Continuous increases in productivity can not be expected unless a proper distribution of gains and an adequate level of demand and employment are ensured.

Appendix Table 1

Value Added Productivity Indices

Industry	1959-1960	1960-1961	1961-1962	1962-1963	1963-1964	1964-1965
Food manufactures	100	112.11	142.98	166.93	137.88	120.07
Tobacco manufactures	100	117.63	134.50	131.32	112.53	107.99
Manufacture of textile	100	89.75	76.99	113.62	102.90	114.37
Manfuacture of footwear and other wearing apparel	100	92.41	82.82	68.03	80.25	118.47
Manufacture of paper and paper products	100	136.61	150.04	172.18	151.39	134.40
Printing, publishing and allied products	100	127.49	146.90	186.02	158.44	154.23
Leather and leather products	100	223.52	363.51	524.01	439.82	324.24
Rubber products except rubber footwear	100	92.89	86.72	80.30	234.97	250.26
Manufacture of chemicals and chemical products	100	112.89	116.63	112.68	142.80	160.43
Manufacture of non-metallic mineral products	100	103.39	99.56	94.34	145.42	94.00
Basic metals industries	100	83.04	84.33	80.94	142.41	157.83
Manufacture of metal products	100	97.83	99.30	106.35	124.26	112.64
Machinery except electrical machinery	100	—	—	—	—	112.54
Electrical machinery	100	96.58	96.70	92.48	96.55	140.08
Manufacture of transport equipment	100	106.42	99.71	98.84	167.91	150.94
Miscellaneous industries	100	86.43	96.71	93.71	210.12	186.52

Appendix Table 1—*Contd.*

Industry	1965-1966	1966-1967	1967-1968	1968-1969	1969-1970
Food manufactures	129.17	107.71	103.94	121.72	153.63
Tobacco manufactures	135.97	94.97	130.72	158.35	186.91
Manufacture of textile	111.46	102.32	137.76	159.71	178.42
Manufacture of footwear and other wearing apparel	73.60	60.10	59.00	110.09	157.42
Manufacture of paper and paper products	78.58	76.09	72.90	68.78	71.19
Printing, publishing and allied products	155.74	158.14	201.01	210.70	214.73
Leather and leather products	529.29	382.38	337.35	429.76	500.55
Rubber products except rubber footwear	141.87	196.02	211.55	223.22	229.21
Manufacture of chemicals and chemical products	126.77	104.50	89.13	88.14	100.72
Manufacture of non-metallic mineral products	107.00	97.96	106.43	107.44	113.26
Basic metals industries	159.35	155.24	211.63	187.63	149.72
Manufacture of metal products	114.26	119.61	132.74	122.54	115.45
Machinery except electrical machinery	129.65	124.52	135.57	129.11	124.88
Electrical machinery	150.82	164.42	189.83	189.37	125.25
Manufacture of transport equipment	143.58	139.62	184.56	144.27	97.66
Miscellaneous industries	281.60	163.97	205.13	233.04	273.06

Appendix Table 2

Output Productivity Indices

Industry	1959-1960	1960-1961	1961-1962	1962-1963	1963-1964	1964-1965
Food manufactures	100	102.85	109.36	114.68	111.62	110.67
Tobacco manufactures	100	109.06	119.52	123.65	118.66	123.14
Manufacture of textile	100	97.78	100.40	109.35	106.57	113.29
Manufacture of footwear and other wearing apparel	100	97.63	94.28	87.75	93.92	111.11
Manufacture of paper and paper products	100	113.78	117.83	123.49	117.00	111.65
Printing, publishing and allied products	100	114.19	123.56	140.03	173.51	121.46
Leather and leather products	100	119.17	139.78	160.61	135.11	122.05
Rubber products except rubber footwear	100	97.74	95.78	94.54	143.93	144.35
Manufacture of chemicals and chemical products	100	102.85	104.57	103.66	114.99	119.36
Manufacture of non-metallic mineral products	100	97.56	100.76	101.52	95.80	107.81
Basic metals industries	100	93.76	95.35	95.15	110.93	113.76
Manufacture of metal products	100	99.45	99.99	102.70	108.24	105.57
Machinery except electrical machinery	100	101.83	104.85	105.69	98.36	104.73
Electrical machinery	100	99.68	100.80	100.37	103.11	117.10
Manufacture of transport equipment	100	103.00	101.42	102.78	123.48	117.37
Miscellaneous industries	100	98.40	99.92	98.88	107.69	107.85

Continued—

Industry	1965-1966	1966-1967	1967-1968	1968-1969	1969-1970
Food manufactures	112.15	108.73	107.18	112.30	114.32
Tobacco manufactures	132.93	132.29	149.22	158.84	169.85
Manufacture of textile	113.65	114.55	124.50	131.35	134.41
Manufacture of footwear and other wearing apparel	92.88	90.60	95.36	109.51	126.26
Manufacture of paper and paper products	96.73	99.88	98.31	95.95	96.71
Printing, publishing and allied products	122.52	122.79	137.07	140.38	143.01
Leather and leather products	137.34	123.09	115.09	121.68	129.03
Rubber products except rubber footwear	141.83	162.68	152.77	157.10	154.97
Manufacture of chemicals and chemical products	109.23	101.62	100.73	101.68	105.98
Manufacture of non-metallic mineral products	108.42	113.34	111.97	105.63	101.75
Basic metals industries	114.68	114.07	118.94	114.69	109.78
Manufacture of metal products	106.61	107.98	110.38	107.44	105.35
Machinery except electrical machinery	111.11	108.79	111.19	108.13	106.81
Electrical machinery	123.20	126.96	135.56	127.62	120.27
Manufacture of transport equipment	122.23	117.39	125.17	109.53	98.59
Miscellaneous industries	116.55	105.20	109.31	110.48	111.66

Appendix Table 3

Distribution of Productivity Gains (1959-1960 to 1969-1970)

(Value in '000' Rs.)

Industry	TOTAL			LABOUR			
	Change in Value Added $\Delta V.A.$	Change in Input ΔI	Productivity Gain G	Change in Labour Income ΔW	Change in Labour Input ΔL	Productivity Gain to Labour G_L	Percentage Gain $G_L/G\%$
Food Manufactures	464651	232490.14	172169.86	52189.73	36377.15	15812.58	9.18
Tobacco manufactures	232973	96032.32	136940.68	25376.39	44376.78	—19000.39	—13.87
Manufacture of textile	955510	336239.09	619270.91	341749.57	144228.69	197520.97	31.90
Manufacture of footwear and other wearing apparel	161781	92637.36	69143.64	60754.45	40137.91	20616.54	29.82
Manufacture of paper and paper products	39216	62579.68	—23363.68	22489.79	21716.86	772.93	3.31
Printing, publishing and allied products	227438	90894.69	136543.31	72591.45	41781.12	30810.33	22.56
Leather and leather products	100108	13351.60	86756.40	7505.60	7502.91	2.69	00.003
Rubber products except rubber footwear	31176	10603.18	20572.81	7709.43	4775.98	2933.45	14.26
Manufacture of chemicals and chemical products	294433	291620.10	2812.90	94757.1₁	51659.43	43097.28	1532.13
Manufacture of non-metallic mineral products	51763	127489.48	—75726.48	23339.67	24488.14	—1148.47	—1.52
Basic metals industries	62070	29625.78	32446.22	20121.80	10342.14	9779.66	30.14
Manufacture of metal products	136695	112369.23	24325.77	76079.85	51527.08	24552.77	100.93
Machinery except electrical machinery	164964	126307.69	38656.31	83515.49	52799.10	30716.39	79.46
Electrical machinery	98255	72221.62	26033.38	45190.30	32378.25	12812.05	49.21
Manufacture of transport equipment	39278	41164.60	— 1886.60	39517.91	28398.11	11119.80	589.41
Miscellaneous industries	309649	—62881.24	372530.2₄	—21480.19	—26913.48	5433.29	1.46

Appendix Table 3—*Contd.*

Industry	CAPITAL			
	Change in Capital Income ΔR	Change in Capital Input ΔK	Productivity Gain to Capital G_K	Percentage Gain G_K/G %
Food manufactures	352461.27	196112.99	156348.28	90.82
Tobacco manufactures	207596.61	51655.54	155941.07	113.87
Manufacture of textile	613760.43	192010.49	421749.94	68.19
Manufacture of footwear and other wearing apparel	101026.55	52499.45	48527.10	70.10
Manufacture of paper and paper products	16726	40862	—2413661	— 103.31
Printing, publishin and allied products	154846.55	49113.57	105732.98	77.74
Leather and leather products	92602.40	5848.69	86753.71	99.997
Rubber products except rubber footwear	23466.57	5827.21	17639.36	88.74
Manufacture of chemicals and chemical products	199673.89	239960.26	—40284.26	—1432.15
Manufacture of non-metallic mineral products	28423.33	103001.34	—74578.01	—98.48
Basic metals industries	41950.20	19283.64	22666.58	69.86
Manufacture of metal products	60615.15	60842.15	—227.00	—.93
Machinery except electrical machinery	81448.51	73500.59	7939.92	20.54
Electrical machinery	53064.70	39843.37	13221.33	50.79
Manufacture of transport equipment	—239.91	12766.49	—13006.40	—689.41
Miscellaneous industries	331129.19	—35967.76	359163.32	98.54

Appendix Table 4

Incremental Input (1959-1960 to 1969-1970)

Industry	Increase in Labour Input ΔL	Increase in Capital Input ΔK	Increase in Total Input ΔI	Percentage increase in Labour Input ΔL/ΔI%	Percentage increase in Capital Input ΔK/ΔI%
Food manufactures	36377.15	196112.99	232490.14	15.65	84.35
Tobacco manufactures	44376.77	51655.54	96032.32	46.21	53.79
Manufacture of textile	144228.60	192010.49	336239.09	42.89	57.11
Manufacture of footwear and other wearing apparel	40137.91	52499.45	92637.36	43.33	56.67
Manufacture of paper and paper products	21716.86	40862.82	62579.68	34.70	65.30
Printing, publishing and allied products	41781.12	49113.57	90894.69	45.97	54.03
Leather and leather products	7502.97	5848.68	13351.59	56.19	43.81
Rubber products except rubber footwear	4775.97	5827.21	10603.18	45.04	54.96
Manufacture of chemicals and chemical products	51659.83	239960.27	291620.10	17.71	82.29
Manufacture of non-metallic mineral products	24488.14	103001.34	127489.48	19.21	80.79
Basic metals industries	10342.14	19283.64	29625.78	34.91	65.09
Manufacture of metal products	51527.08	60842.15	112369.23	45.86	54.14
Machinery except electrical machinery	52799.10	73508.59	126307.69	41.80	58.20
Electrical machinery	32378.25	39843.37	72221.62	44.83	55.17
Manufacture of transport equipment	28398.11	12766.49	41164.60	68.99	31.01
Miscellaneous industries	—26913.48	—35967.76	—62881.24	42.80	57.20

Appendix Table 5

Factor Proportions in the Total Input

Industry/Factors	1959 – 1960	1960 – 1961	1961 – 1962	1962 – 1963	1963 – 1964	1964 – 1965	1965 – 1966	1966 – 1967	1967 – 1968	1968 – 1969	1969 – 1970
Food manufactures											
Labour	35.85	30.38	31.38	32.69	27.94	28.29	24.47	20.56	23.35	22.59	21.22
Capital	64.15	69.62	68.62	67.31	72.06	71.71	75.53	79.44	76.65	77.41	78.78
Tabacco manufactures											
Labour	13.15	14.19	15.10	16.98	21.31	27.97	24.26	23.19	26.88	30.06	33.30
Capital	86.85	85.81	84.90	83.02	78.69	72.13	75.74	76.09	73.12	69.94	66.70
Manufacture of textile											
Labour	41.30	40.96	39.73	38.47	36.33	37.05	36.18	37.87	45.33	44.03	41.98
Capital	58.70	59.04	60.27	61.53	63.67	62.95	63.82	62.13	54.67	55.97	58.02
Manufacture of paper and paper products											
Labour	23.55	29.51	32.88	35.64	35.53	30.06	25.70	28.19	30.78	30.99	32.61
Capital	74.45	70.49	67.12	64.36	64.47	69.94	74.30	71.81	69.22	69.01	67.38
Printing, publishing and allied products											
Labour	53.73	52.79	52.66	49.71	51.16	46.64	44.75	42.26	47.00	48.18	47.80
Capital	64.27	47.21	47.33	50.29	48.84	53.36	55.25	57.74	53.00	51.82	52.20
Leather and leather products											
Labour	43.70	45.46	48.87	51.13	51.75	51.74	56.80	52.18	55.32	54.51	51.40
Capital	56.30	54.54	51.13	48.87	48.25	48.06	43.20	47.88	44.68	45.49	48.60
Rubber products except rubber footwear											
Labour	51.95	51.10	48.07	48.93	53.64	40.29	36.67	39.34	36.60	42.71	47.35
Capital	48.05	48.90	51.93	51.07	46.36	59.71	63.33	60.66	63.40	57.29	52.65

Appendix Table 5—*Contd.*

	1959– 1960	1960– 1961	1961– 1962	1962– 1963	1963– 1964	1964– 1965	1965– 1966	1966– 1967	1967– 1968	1968– 1969	1969– 1970
Manufacture of chemicals and chemical products											
Labour	26.35	17.55	18.01	18.52	31.82	23.15	20.97	16.52	18.70	20.78	19.86
Capital	73.65	82.45	81.99	81.48	78.18	76.85	79.03	83.48	81.30	79.22	80.14
Manufacture of non-metallic mineral products											
Labour	22.47	21.90	22.55	23.50	16.62	23.55	21.30	22.83	21.41	21.25	20.38
Capital	77.53	78.10	77.45	76.50	83.38	76.45	78.70	77.17	78.59	78.75	79.02
Basic metals industries											
Labour	40.63	38.97	41.64	41.62	40.55	45.87	34.46	37.63	44.36	40.99	38.03
Capital	59.37	61.03	58.36	58.38	59.45	54.13	65.54	62.37	55.64	59.01	61.97
Manufacture of metal products											
Labour	52.73	52.57	44.87	45.78	48.28	50.53	49.59	46.33	49.66	48.54	47.82
Capital	47.27	47.43	55.13	54.22	51.72	49.65	50.41	53.67	50.34	51.46	52.18
Machinery except electrical machinery											
Labour	39.26	38.64	34.68	32.57	34.98	38.89	39.58	37.82	40.39	41.34	31.33
Capital	60.74	63.36	65.32	67.32	67.43	65.02	61.11	60.18	59.61	58.66	58.67
Electrical machinery											
Labour	43.81	53.40	59.69	66.27	58.08	50.42	50.33	51.92	53.47	58.00	44.53
Capital	56.19	56.60	40.31	33.73	41.92	49.58	49.67	48.08	46.53	42.00	55.47
Manufacture of transport equipment											
Labour	56.13	55.56	53.24	51.80	51.03	51.37	59.83	55.29	60.37	61.97	62.71
Capital	43.87	44.44	46.76	48.20	48.97	48.63	40.17	44.72	39.63	38.03	37.29
Miscellaneous industries											
Labour	37.09	33.18	27.93	21.89	36.59	33.95	29.63	32.75	40.04	30.26	35.42
Capital	62.91	66.82	72.07	78.11	63.41	66.05	70.37	67.25	59.95	61.74	64.58

Appendix Table 6

Factor Price Indices

Industries	1959-1960	1960-1961	1961-1962	1962-1963	1963-1964	1964-1965	1965-1966	1966-1967	1967-1968	1968-1969	1969-1970
Food manufactures											
Labour	100.00	108.23	88.11	124.69	141.97	121.84	266.50	228.45	269.60	326.08	382.92
Capital	100.00	163.73	251.64	293.28	233.67	395.79	520.28	483.29	581.82	631.84	923.08
Tobacco manufactures											
Labour	100.00	124.98	169.88	160.86	204.62	257.91	327.74	358.10	365.71	624.54	702.34
Capital	100.00	137.39	179.42	235.48	249.24	296.01	442.13	310.16	423.85	544.51	671.24
Manufactue of textile											
Labour	100.00	103.01	107.76	107.53	120.42	135.98	147.87	176.43	245.01	263.70	303.89
Capital	100.00	9.24	67.41	138.85	120.65	141.68	145.29	138.33	257.33	312.11	332.94
Manufacture of footwear and other wearing apparel											
Labour	100.00	97.45	96.72	96.96	137.03	261.40	231.18	290.30	386.76	496.94	607.29
Capital	100.00	91.67	90.14	90.14	108.26	329.92	197.32	168.82	156.80	471.65	687.10
Manufacture of paper and paper products											
Labour	100.00	123.14	146.81	169.42	229.69	268.24	396.13	561.64	699.47	697.89	890.51
Capital	100.00	157.64	217.78	277.58	232.86	252.41	215.81	216.28	196.17	277.03	257.16
Printing, publishing and allied products											
Labour	100.00	152.18	202.89	305.77	266.29	316.58	388.43	413.52	529.59	567.81	604.39
Capital	100.00	165.56	229.78	364.15	480.67	586.39	803.35	879.10	1241.20	1302.00	1340 36
Leather and leather products											
Labour	100.00	106.97	140.43	143.43	174.52	226.82	340.07	321.29	472.80	545.30	533.41
Capital	100.00	290.81	635.49	895.78	636.58	485.70	1209.61	1066.89	1344.09	2195.21	2892.23
Rubber products except rubber footwear											
Labour	100.00	92.29	89.12	80.63	139.90	247.02	209.46	193.20	195.39	184.96	177.86
Capital	100.00	92.94	80.66	77.93	339.88	268.78	116.62	232.09	286.60	332.77	370.72

Manufacture of chemicals and chemical products											
Labour	100.00	103.01	101.69	101.93	114.30	123.76	141.84	153.73	152.73	152.54	200.93
Capital	100.00	104.99	108.11	108.56	143.54	166.26	135.58	117.40	103.20	95.38	104.05
Manufacture of non-metallic mineral products											
Labour	100.00	105.25	107.63	119.23	126.64	126.80	136.33	133.48	137.79	177.61	179.93
Capital	100.00	94.24	95.24	93.08	70.95	86.58	76.28	97.28	82.86	66.67	67.54
Basic metal industries											
Labour	100.00	102.10	104.64	110.33	127.73	134.75	176.68	147.77	164.35	171.37	174.03
Capital	100.00	78.89	75.63	64.84	143.33	230.76	233.14	217.23	316.20	261.56	182.87
Manufacture of metal products											
Labour	100.00	101.60	104.69	104.60	133.57	121.79	132.88	149.76	146.16	155.86	165.56
Capital	100.00	105.21	102.12	114.70	106.43	144.88	173.91	145.05	165.38	138.02	113.56
Machinery except electrical Machinery											
Labour	100.00	—	—	—	—	134.20	151.72	148.59	152.35	158.84	168.76
Capital	100.00	—	—	—	—	103.69	127.64	125.30	143.30	133.02	120.36
Electrical machinery											
Labour	100.00	76.94	63.75	53.26	70.21	123.00	120.07	142.12	147.19	163.94	174.60
Capital	100.00	113.37	138.07	163.79	143.07	174.26	212.38	230.30	305.20	325.88	146.02
Manufacture of transport equipment											
Labour	100.00	96.67	97.22	91.30	165.46	132.20	91.00	117.71	138.09	147.53	163.36
Capital	100.00	102.33	108.09	124.57	199.27	212.65	280.18	223.85	355.97	233.43	53.41
Miscellaneous industries											
Labour	100.00	98.88	92.58	85.60	146.90	127.21	177.63	138.93	128.18	141.51	162.98
Capital	100.00	79.21	99.70	102.31	271.94	237.94	376.18	217.65	330.73	402.07	478.32

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