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GROWTH OF FACTOR INPUTS AND TOTAL FACTOR
PRODUCTIVITY IN PUBLIC SECTOR ENTERPRISES
IN INDIA

by

Bakul H. Dholakia

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A B S T R A C T

This study makes an attempt to examine the trend in Total Factor Productivity in the public sector enterprises by estimating and analysing the contributions made by major factor inputs to the growth rate of net product originating in the public enterprises. It is divided into six sections. After introducing the problem in the first section, the next three sections deal mainly with the estimation and analysis of the required time series of output, capital and labour respectively for public sector enterprises. In the last two sections, the estimates of contributions made by various sources to the growth of public enterprises are presented and some of their implications are examined.

The major conclusions of the study are that the overall economic efficiency of the public sector enterprises has increased at a significant rate during the period after 1960-61, and that there seems to have been a remarkable acceleration in the growth rate of total factor productivity in public enterprises during the more recent years.

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Bakul H. Dholakia *

I

Over the last two decades, the public sector has emerged as a crucial factor in India's economic growth. Its rate of expansion has been much faster than that of the private sector with the result that the share of public sector in almost each of the significant macroeconomic aggregates such as gross domestic product, gross capital formation, employment in the organised sector, etc. has been steadily rising over the last 15 years. Furthermore, the rate at which these aggregates have been rising in the public sector during the last 15 years makes it quite clear that an increasing amount of scarce national resources would continue to flow to the fast expanding public sector during the years to come. At this stage, one may therefore feel like pausing for a while and asking searching questions about the productivity and efficiency of the factors of production employed in the public sector enterprises in order to obtain a clear idea about the rates of productivity change in the public sector enterprises vis-a-vis those observed for the economy as a whole. Hence, the present study makes an attempt to estimate and examine the broad trend in Total Factor Productivity in the public sector enterprises by estimating and analysing the contributions made by major factor inputs, viz., labour and capital, to the growth rate of real product originating in the public sector enterprises.

A detailed study of the growth of Total Factor Productivity in the public sector enterprises is both necessary and rewarding because of the fact that the rate of growth of Total Factor Productivity indicates broadly the trends in the overall economic efficiency and the extent of technical change in public sector enterprises. The need for such a study is perhaps more urgent now than ever before especially in view of the growing criticism of the management and administration of the public sector enterprises, mainly on account of their low profitability,

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stemming largely from the findings of a number of studies, dealing with profitability and rates of monetary return on capital invested in public sector undertakings, which have been made in recent years. Basically, the rationale of the approach adopted by the present study lies in the contention that the index of Total Factor Productivity is at least a major alternative indicator of the efficiency of economic units over time, the net profitability being the other main indicator. While the latter has been widely used in most discussions centering around the efficiency of public sector enterprises in India, little, if any, attention seems to have been paid to the former, which is perhaps a far more comprehensive index of economic efficiency in its proper sense. One can always argue, for instance, that the total benefit to the economy as a whole accruing from any production process should be measured in terms of the sum of all the four types of related incomes generated out of it, viz., rent, wages and salaries, interest and profit. The conventional net profitability criterion usually focuses attention only on the last of these income flows and thereby ignores the larger gains to the society as a whole. In other words, it can be argued that from a larger social angle, the performance of an enterprise should be judged not by what the enterprise earns in the form of net profits but rather by the total addition it makes to the flow of goods and services in the economy as a whole and the changing efficiency with which it utilises the scarce productive resources over a period of time.

Looked at from this angle, it would be interesting to see whether the public sector enterprises in India pass satisfactorily the efficiency test on productivity criterion at least in terms of the observed rate of productivity change and its contribution to the growth of real product over time. In what follows, we have, therefore, made an attempt to estimate the contributions made by various sources to the estimated growth rate of real net product originating in the public sector enterprises in India by constructing the required time series of labour and capital inputs and deriving therefrom the indexes of total factor input and output per unit of total factor input, for the period 1960-61 to 1972-73.

The broad methodology adopted for conducting the analysis of the major sources of growth of the public sector enterprises is based primarily on the well-known factor share approach, which has been widely used in economic literature, especially on the quantitative analysis of economic growth.*¹ This method, which follows directly from the marginal productivity analysis, provides a fairly satisfactory set of estimates of the

contributions made by various factors to the measured growth rate if the average earnings of the various factors of production are proportional to the value of their respective marginal products. In particular, under the special case of a constant returns competitive equilibrium, this method simply boils down to the direct use of the well-known neo-classical distribution postulate which equates the relative share of a factor to the elasticity of output with respect to that factor at the point of equilibrium².

II

The term public sector, as it is generally defined, includes administrative departments, departmental enterprises and non-departmental enterprises. Of these, the administrative departments consist largely of those which provide direct government services in the form of public administration and defence and also other services. The departmental enterprises comprise those enterprises which are owned and managed directly by government and whose accounts are integrated with those of the respective public authorities. Thus, the term 'departmental enterprises' includes government railways, communication, forests, operation of irrigation systems, road transport, electricity, defence, manufacturing establishments, port trusts, printing presses, etc., whereas the term 'non-departmental enterprises' includes all government owned public and private limited companies and statutory corporations. The departmental and the non-departmental enterprises taken together are referred to as the public sector enterprises. The present analysis pertains to the public sector enterprises taken as a whole, i.e., the public sector excluding the administrative departments.

The major source of data on output from the public sector enterprises is the official publication, National Accounts Statistics, recently issued by the C.S.O.* 3. It provides detailed information on the net domestic product from the public sector enterprises by industry of origin for the period 1960-61 to 1972-73. However, these estimates are given only at current prices. We have, therefore, derived the corresponding estimates at constant 1960-61 prices by applying the appropriate implicit national income price deflators, obtained from the C.S.O. estimates of net domestic product at current and constant 1960-61 prices for each of the fourteen different sectors distinguished in our national income accounts. The estimates of real net product originating in the public sector enterprises, so derived, are

presented in Table 1, while the estimates of factor shares in the corresponding net product at current prices are presented in Table 2. It can be readily seen from Table 1 that the net domestic product originating in public sector enterprises has increased at a very rapid rate during the period 1960-61 to 1972-73, the total percentage increase over the period as a whole being 77% for the departmental enterprises, as high as 476% for the non-departmental enterprises and 173% for both taken together. This implies that during the period under consideration, the average rate of growth of net product originating in public sector enterprises was as high as 8.73% per annum, which is more than two and a half times the corresponding growth rate of India's national income, viz., 3.14% per annum. As a direct consequence of this disparity in the growth rates of the net product from public sector enterprises and the net domestic product (both at 1960-61 prices), the share of the former in the latter has increased sharply from 5.1% in 1960-61 to 8.5% in 1972-73. Rapid growth of net income, however, seems to have been quite neutral to the distribution of total income originating in public enterprises between labour and capital (including other factors). This is evident from the figures given in Table 2. Thus, we find that the relative shares of labour and capital have on an average remained fairly stable during the period as a whole, the average value of, say, the labour share being 61.8% for the first half of the period, 62.4% for the second half of the period and 62.1% for the entire period under consideration.

Table 1

Net Domestic Product Originating
In Public Sector Enterprises, 1960-61 to 1972-73
 (At 1960-61 Prices)

Year	Departmental Enterprises		Non-Departmental Enterprises		Total Public Sector Enterprises	
	Net Product (Rs crores)	Index Numbers	Net Product (Rs crores)	Index Numbers	Net Product (Rs crores)	Index Numbers
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1960-61	522	100.00	165	100.00	687	100.00
1961-62	563	107.85	195	118.18	758	110.34
1962-63	597	114.37	258	156.36	855	124.45
1963-64	653	125.10	310	187.88	963	140.18
1964-65	669	128.16	331	200.61	1000	145.55
1965-66	730	139.85	386	233.94	1116	162.45
1966-67	736	141.00	409	247.88	1145	166.67
1967-68	757	145.02	456	276.36	1213	176.57
1968-69	820	157.09	540	327.27	1360	197.95
1969-70	831	159.20	635	384.85	1466	213.39
1970-71	853	163.41	730	442.42	1583	230.44
1971-72	899	172.22	817	495.15	1716	249.75
1972-73	924	177.01	951	576.36	1875	272.95

Source : See the text

Table 2
Factor Shares In Net Income Originating In
Public Enterprises

Year	Absolute Factor Shares (Rs. crores at Current Prices)			Relative Factor Shares (Per cent)		
	Labour Income	Property Income	Net Income	Share of Labour	Share of Capital	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1960-61	433	254	687	63.03	36.97	100.00
1961-62	473	304	777	60.88	39.12	100.00
1962-63	546	249	795	68.68	31.32	100.00
1963-64	605	465	1070	56.54	43.46	100.00
1964-65	714	459	1173	60.87	39.13	100.00
1965-66	833	543	1376	60.54	39.46	100.00
1966-67	945	577	1522	62.09	37.91	100.00
1967-68	1081	604	1685	64.15	38.85	100.00
1968-69	1208	761	1969	61.35	38.65	100.00
1969-70	1410	868	2278	61.90	38.10	100.00
1970-71	1651	995	2646	62.40	37.60	100.00
1971-72	1841	1152	2993	61.51	38.49	100.00
1972-73	2143	1249	3392	63.18	36.82	100.00

Source : National Accounts Statistics, 1960-61 -- 1972-73.
C.S.O. (January 1975).

III

Having examined the time series of net product and factor shares, the next series that we have to derive for the purpose of present analysis is the time series of real capital stock in public sector enterprises. Since no such series is readily available, we have derived the required series by using the Perpetual Inventory Method.*4 The variant of this method that we have used here, consists in obtaining a bench-mark estimate of net capital stock at base period prices, and then, carrying it forward (or backward) with the help of the estimated capital formation adjusted for depreciation valued at the same base period prices.

The most comprehensive source of information which can be used for obtaining the bench-mark estimates of net capital stock in public sector enterprises is the R.B.I.'s estimate of net reproducible capital stock at current prices by industry of use for the year 1960-61.*5 We have obtained the estimates of net capital stock at current prices for the bench-mark year 1960-61 separately for the departmental and the non-departmental enterprises from the basic information available from the R.B.I.'s study after making certain necessary adjustments*6 . The estimates of gross capital formation by type of assets in the departmental and the non-departmental enterprises along with the corresponding estimates of total depreciation allowance are available from the National Accounts Statistics issued by the C.S.O.*7, for the period 1960-61 to 1972-73. These estimates, however, are available only at current prices. We have, therefore, derived the corresponding estimates at constant 1960-61 prices by applying the suitable price indices for different types of assets computed from the C.S.O.'s estimates of total depreciation allowance and gross capital formation in Indian economy by type of assets at current and constant 1960-61 prices.

Having derived the set of estimates of net capital stock for the bench-mark year 1960-61, and, of the gross capital formation and the depreciation allowance at constant 1960-61 prices for the period under consideration, we have obtained the required time series of real capital stock in public sector enterprises by using the simple identity:

$$K_t = K_{t-1} + GCF_t - D_t ,$$

where, K_t and K_{t-1} is the net stock of capital at 1960-61 prices in the period t and $t-1$ respectively, GCF_t is the estimated gross capital formation at 1960-61 prices during the period t , and D_t is

the estimated depreciation allowance at 1960-61 prices during the period t. The estimates, so derived, are presented in Table 3. The figures given in this table reveal that the real stock of capital has grown at a phenomenal rate especially in the case of the non-departmental enterprises. The average rate of growth of the total capital stock in public sector enterprises during the period 1960-61 to 1972-73 turns out to, as high as 10% per annum. There is a significant divergence, however, between the average growth rates of real capital stock in the departmental and the non-departmental enterprises, the former being 7.1% per annum while the latter being remarkably high at 16.2% per annum. As a direct consequence of such a wide disparity in the growth rates of real capital stock, the share of the non-departmental enterprises in the total capital stock of the public sector enterprises has increased sharply from 22% in 1960-61 to 43% in 1972-73.

Table 3

Growth of Real Net Capital Stock in Public Enterprises

(At 1960-61 Prices)

Years	Departmental Enterprises		Non-Departmental Enterprises		Total: Public Sector Enterprises	
	Net Stock (Rs. crores)	Index Numbers	Net Stock (Rs. crores)	Index Numbers	Net Stock (Rs. crores)	Index Numbers
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1960-61	4522	100.00	1303	100.00	5825	100.00
1961-62	4897	108.29	1642	126.02	6539	112.26
1962-63	5380	118.87	2033	156.02	7413	127.26
1963-64	5936	131.27	2513	192.86	8449	145.05
1964-65	6518	144.14	3037	233.08	9555	164.03
1965-66	7098	156.97	3695	283.58	10793	185.29
1966-67	7580	167.62	4298	329.85	11878	203.91
1967-68	8003	176.97	4918	377.44	12921	221.82
1968-69	8434	186.51	5546	425.63	13980	240.00
1969-70	8828	195.22	6131	470.53	14959	256.81
1970-71	9259	204.75	6746	517.73	16005	274.76
1971-72	9752	215.66	7382	566.54	17134	294.15
1972-73	10333	228.51	7898	606.14	18231	312.98

Source : See the text

IV

In order to complete the picture, we now require the time series of employment in public sector enterprises. The information on employment in the public sector as a whole is readily available from the various publications of the Labour Bureau* 8. By adjusting these figures for the employment in government administrative departments, we have obtained the series of employment in the public sector enterprises. In addition to this, we have also worked out the series of average annual wage rate in public enterprises implicit in the estimates of total employee compensation (given in Table 2) and total employment in public sector enterprises by computing the ratio of the former to the latter. Both these series, along with their respective indexes, are presented in Table 4.

It can be easily seen from this table that the public sector enterprises have generated considerable additional employment during the period under consideration, the number of persons employed in the public sector undertakings having increased by about 76% over the twelve year period. Furthermore, the implicit average annual earnings per worker at current prices also show a remarkable increase, having registered an almost three-fold increase over the period of only twelve years. If we deflate the money value of average earnings for the year 1972-73 by the corresponding wholesale price index, we get a figure of Rs. 1769 at 1960-61 prices, which again indicates an increase of 36% in real earnings per worker when compared with the corresponding figure of Rs. 1303 for the year 1960-61. Thus, both employment and real earnings per person employed have, on the whole, registered a simultaneous increase at significant rates in public sector enterprises during the period under consideration

The estimates given in Table 1, 3 and 4 reveal that there exists considerable disparity among the observed rates of growth of output, employment and real capital stock in public enterprises. The average growth rate observed during the period 1960-61 to 1972-73 turns out to be 8.73% per annum for output, 4.82% per annum for employment and 9.97% per annum for net stock of real capital. These figures indicate, among other things, that some of the important ratios such as labour productivity, capital intensity and capital-output ratio seem to have followed, on the whole, an upward trend during the period under consideration. How steady and smooth have been the trends in each of these ratios can, however, be determined only after examining the complete time series of each of these

Table 4
Growth of Employment And Average Earnings of Labour In
Public Enterprises

Year	Employment		Average Earnings At Current Prices	
	Total No. of persons Employed (In Thousands)	Index Numbers	Earnings Per Person Employed (Rupees)	Index Numbers
(1)	(2)	(3)	(4)	(5)
1960-61	3323	100.00	1303	100.00
1961-62	3521	105.96	1443	110.74
1962-63	3762	113.21	1451	111.35
1963-64	3992	120.13	1516	116.34
1964-65	4222	127.05	1691	129.77
1965-66	4388	132.05	1898	145.66
1966-67	4484	134.94	2107	161.70
1967-68	4566	137.41	2367	181.65
1968-69	4774	143.67	2530	194.16
1969-70	4899	147.43	2878	220.87
1970-71	5124	154.20	3222	247.35
1971-72	5423	163.20	3395	260.55
1972-73	5845	175.90	3670	281.65

Source : See the text.

Table 5

Trends In Labour Productivity, Capital Intensity
and Capital - Output Ratio in Public Enterprises

Year	Average Productivity of Labour (Rupees)	Capital Per Person Employed (Rupees)	Capital- Output Ratio
(1)	(2)	(3)	(4)
1960-61	2067	17529	8.48
1961-62	2153	18571	8.63
1962-63	2273	19705	8.67
1963-64	2412	21165	8.77
1964-65	2369	22632	9.56
1965-66	2543	24597	9.67
1966-67	2554	26490	10.37
1967-68	2657	28298	10.65
1968-69	2849	29284	10.28
1969-70	2992	30535	10.20
1970-71	3089	31235	10.11
1971-72	3164	31595	9.98
1972-73	3208	31191	9.72

Note : All figures are at constant 1960-61 prices

Source: Table 1, 3 and 4 above

ratios. We have, therefore, presented the required time series of labour productivity, capital intensity and capital-output ratio (all at constant 1960-61 prices) in Table 5. It is evident from the figures given in this table that the time series of labour productivity and capital intensity show fairly smooth and continuous upward trend, the observed annual changes being positive in almost every year in both the series. Moreover, the overall upward trend seems to be more pronounced in the case of capital intensity as compared to labour productivity, the average growth rate in the former being 4.92% per annum as against the growth rate of 3.73% per annum in the latter during the period as a whole.

It is the time series of capital-output ratio, however, which reveals a more interesting pattern of behaviour. While taking an overall view of the period as a whole, the capital-output ratio can be said to have an upward trend, a closer look at the series reveals two clearly separable sub-periods which show exactly opposite tendencies in the ratio. Thus, we find that during the first part of the period, i.e., 1960-61 to 1967-68, the capital-output ratio shows a fairly continuous and rapidly rising trend, in the course of which its value has gone up from 8.48 to 10.65. As against this, during the remaining part of the period, i.e., 1967-68 to 1972-73, the capital-output ratio has shown a fairly clear and marked tendency to decline, its value indicating a decrease from 10.65 to 9.72 during the course of the five-year period. Besides the unambiguous and distinctly noticeable reversal of the trend during the year 1967-68, the other thing which is perhaps equally noteworthy is the remarkable continuity and smoothness of the upward trend before, and of the downward trend after, the point of reversal.

The main reason behind this pattern of behaviour of capital-output ratio lies in the divergence between the temporal pattern of growth of labour productivity on the one hand, and of capital intensity on the other. Thus, while the growth of labour productivity seems to have been fairly uniform and evenly spread over the entire period, the growth of capital intensity reveals a highly uneven distribution over time with almost 85% of the total growth having occurred during the first part of the period under consideration. This is readily reflected in the pattern of average growth rates, which reveals that while the growth rate of labour productivity remained more or less constant, being 3.7% during the first

part (1960-61 to 1967-68) and 3.8% per annum during the second part of the period (1967-68 to 1972-73), the growth rate of capital intensity declined steeply from 7.1% per annum during the first part to 1.9% per annum during the second part of the period. The sharp decline in the growth rate of capital intensity during the period of a fairly steady growth of labour productivity, therefore, appears to have been instrumental in bringing about a reversal in the upward trend in capital-output ratio in public enterprises observed during the first part of the period under consideration.

A number of factors can be considered in this context as the possible explanations of the observed decline in the growth rate of capital intensity and, despite this, the observed stability of the growth rate of labour productivity in the public sector enterprises. The foremost among these would be the considerable decline in the absolute level of real capital formation in the public sector enterprises during the period 1968-69 to 1970-71 as compared to the preceding triennium, i.e., 1965-66 to 1967-68. A rapidly growing capital stock requires a progressively increasing level of real capital formation. Obviously, therefore, a declining level of real capital formation would immediately lead to a considerable deceleration in the growth of real capital stock. The observed decline in the level of real capital formation in public enterprises can, to some extent at least, be attributed to the adverse investment climate following the industrial recession since 1966-67. This contention is very well supported by the fact that the level of real capital formation (at 1960-61 prices) in the non-departmental manufacturing enterprises declined sharply from about Rs. 800 crores during the triennium 1965-66 -- 1967-68 to about Rs. 500 crores during the following triennium 1968-69--1970-71. Although the level of real net capital formation shows a rising trend in the subsequent years, it has still not risen significantly above the peak levels reached before 1968-69.

The above explanation, however, represents only one side of the story. The other, and perhaps more interesting side of the story is that, notwithstanding the significant deceleration in the growth of capital per worker, the output per worker kept increasing at a fairly rapid rate during the period following 1967-68. As already indicated earlier, we therefore find that during the period 1967-68 to 1972-73, the average productivity of labour has been rising while the capital-output ratio has been declining. Putting it in a slightly different way, we may say that the average productivity of both labour and capital has been rising simultaneously since 1967-68. A simultaneous increase in labour productivity as well as capital productivity is, by any criterion,

a fairly clear indicator of the phenomenon of "technical progress" defined loosely to include all possible effects which raise the overall economic efficiency of the entire production process. We may, therefore, conclude from the above analysis that significant technical progress seems to have occurred during the process of growth of public enterprises especially during the period 1967-68 to 1972-73, leading to a considerable improvement in the overall economic efficiency of all the public sector enterprises taken together during the said period. This broad contention, however, needs to be supported by a precise quantitative measure of the rate of improvement in the overall economic efficiency of the public sector enterprises during the period under consideration.

V

The quantitative assessment of the extent of increase in the overall efficiency can be made by constructing the indexes of Total Factor Input and Output per Unit of Total Factor Input, and, then, by estimating the contributions made by each of the major factors to the observed growth rate of output. This is done, step by step, in Tables 6 to 8. Table 6 presents the indexes of output and factor inputs, and also the indexes of Total Factor Input and Output Per Unit of Total Factor Input derived therefore,*⁹ while Table 7 shows the estimated average annual growth rates of output, factor inputs and total factor productivity in public enterprises. And, finally, in Table 8, we have presented our estimates of the contributions made by major sources to the growth rate of the public sector enterprises in India.*¹⁰

The estimates presented in these tables, as it can be readily seen, lend a strong support to the contention that the overall economic efficiency of the public sector enterprises has increased at a significant rate in recent years. Thus, according to our estimates, the total factor productivity increased by 22.4% during the period 1960-61 to 1972-73 indicating a highly significant rate of growth of 1.7% per annum. While 1.7% in itself appears to be a fairly high value for the annual growth rate of overall efficiency, it should be regarded as particularly noteworthy that such a remarkable increase in total factor productivity occurred during the period of rapid expansion of factor inputs in public enterprises. The estimates given in Table 7 show that the capital input increased at an average rate of 10% per annum during the period under consideration, the corresponding figure for labour input being 4.8% per annum. Consequently, the average rate of growth of total factor input

Table 6

Indexes Of Total Factor Input and Total Factor Productivity
In Public Enterprises, 1960-61 To 1972-73

Year	Index of Output	Index of Capital Input	Index of Labour Input	Index of Total Factor Input	Index of Output Per Unit of Total Factor Input
(1)	(2)	(3)	(4)	(5)	(6) = (2)/(3)
1960-61	100.00	100.00	100.00	100.00	100.00
1961-62	110.34	112.26	105.96	108.35	101.84
1962-63	124.45	127.26	113.21	118.55	104.98
1963-64	140.18	145.05	120.13	129.60	108.16
1964-65	145.56	164.03	127.05	141.10	103.16
1965-66	162.45	185.29	132.05	151.48	107.24
1966-67	166.67	203.91	134.94	159.57	104.45
1967-68	176.57	221.82	137.41	167.12	105.65
1968-69	197.96	240.00	143.67	177.36	111.61
1969-70	213.39	256.81	147.43	185.46	115.06
1970-71	230.42	274.76	154.20	195.64	117.78
1971-72	249.78	294.15	163.20	207.99	120.09
1972-73	272.93	312.98	175.90	223.05	122.36

Source : Tables 1 to 4 above

during the twelve-year period was as high as 6.9% per annum. These estimates imply that growth of capital accounted for about 45% of the estimated rate of growth of net product originating in public enterprises, while growth of labour accounted for 35% with the remaining 20% being the contribution of the growth of total factor productivity in public enterprises.

Table 7

Average Growth Rates of Output, Factor Inputs and
Total Factor Productivity In Public Enterprises

Factor	(In Per cent)		
	1960-61 to 1967-68	1967-68 to 1972-73	1960-61 to 1972-73
Labour Input	4.64	5.06	4.82
Capital Input	12.05	7.13	9.97
Total Factor Input	7.61	5.94	6.91
Output Per Unit of Total Factor Input	0.79	2.98	1.70
Net Product	8.46	9.10	8.73

Source : Table 6 above

It is interesting to examine the temporal pattern of growth of factor inputs and total factor productivity. The results for the two sub-periods, viz., 1960-61 to 1967-68 and 1967-68 and 1967-68 to 1972-73 are given in Table 7 and Table 8*.¹¹ The figures given in Table 7 reveal that the growth rate of capital declined sharply from 12.05% during the period 1960-61 - 1967-68 to 7.13% during the period 1967-68 - 1972-73, while the corresponding growth rate of labour increased from 4.64% to 5.06%. However, since the decline in the growth rate of capital was quite substantial in relation to the mild increase in the growth rate of labour, the average rate of growth of total factor input declined from 7.61% to 5.94% over the two sub-periods.

Table 8

Contribution Of Major Sources To the Growth Rate of Net
Product Originating In Public Sector Enterprises

Source	Absolute Contribution (in Percentage Points)			Relative Contribution (in Per cent)		
	1960-61 to 1967-68	1967-68 to 1972-73	1960-61 to 1972-73	1960-61 to 1967-68	1967-68 to 1972-73	1960-61 to 1972-73
	Labour Input	2.96	3.28	3.09	35.0	36.0
Capital Input	4.70	2.78	3.92	55.6	30.6	44.9
Total Factor Input	7.66	6.06	7.01	90.6	66.6	80.3
Output Per Unit Of Total Factor Input	0.80	3.04	1.72	9.4	33.4	19.7
Growth Rate Of Net Product	8.46	9.10	8.73	100.00	100.00	100.00

Source: See the text

The direct effect of this kind of temporal pattern of behaviour of factor inputs would be that, if the growth rate of total factor productivity remains unchanged, the growth rate of net product would decline over the two sub-periods. However, the growth rate of net product in fact shows an increase from 8.46% to 9.10% on account of a sharp increase in the growth rate of total factor productivity from 0.79% to 2.98% over the two sub-periods. Thus, it seems that the observed increase in the growth rate of net product originating in public enterprises is due almost exclusively to the significant increase in the growth rate of total factor productivity in public enterprises recorded during the period 1967-68 to 1972-73 as compared to the earlier period 1960-61 to 1967-68.

The trends in the growth rates of factor inputs and output noted above have interesting implications for the analysis of the contributions made by various sources to the growth rate of net product originating in public enterprises. Thus, we find that

the relative importance of the two major sources of growth, viz., capital and total factor productivity has undergone a considerable change between the two sub-periods. The relative contribution of capital to the growth rate of net product has declined steeply from 55.6% to 30.6%, while relative contribution of the growth of total factor productivity has increased sharply from 9.4% to 33.4% over the two sub-periods.

It is indeed remarkable that the contribution made by the increase in total factor productivity to the growthrate of net product from public enterprises; measured in absolute terms, increased from only 0.79 percentage points recorded for the first sub-period to as high as about 2.98 percentage points recorded for the second sub-period. Among the variety of factors which might have been at work in bringing about such a remarkable increase in the rate of growth of overall efficiency of public enterprises during the more recent years, special mention may be made of two broad categories of factors. The first category of factors would obviously include improvement in the capacity utilization rates in the case of enterprises already in operation and reduction in the lag between investment and flow of output achieved through a faster completion of the projects under progress. In addition to this, the other factors, which are likely to have been instrumental in improving productivity and also in reducing the capital-output ratio especially after 1967-68, are "a much more prudent use of working capital, a monitoring of the cash flows and a tight control over inventories" in recent years*12.

As against this, the second major category of factors, accounting for the observed increase in the growth rate of total factor productivity, would include improvement in the quality of factor inputs and technical progress on a relatively greater scale during the more recent years as compared to the earlier years. While it has to be admitted that the measured growth rate of total factor productivity is a sort of 'catch-all' inasmuch as it includes the effects of a variety of factors, a high value of the rate of growth of total factor productivity of the order of about 3% per annum is by any criterion a clear indicator of a good deal of technical progress having occurred in the production process. Thus, it seems that the rapid growth of overall efficiency of public enterprises recorded in recent years is due partly to the improvement in capacity utilisation rate and partly to the phenomenon of significant technical progress.

VI

Having derived the estimates of the contributions made by various sources to the growth rate of net product originating in public enterprises, we may now broadly compare the same with the corresponding estimates for the Indian economy as a whole available from a recent study on the subject.*¹³ It may be noted at the very outset that the latter are more detailed and comprehensive while our estimates presented above are essentially tentative in nature. However, it is possible to make some adjustments in the available estimates for the economy as a whole to make them broadly comparable to our estimates. Accordingly, the estimated long-term rate of growth of total factor productivity, defined as the residual factor including the effect of all factors other than the growth of working force and capital, turns out to be about 1.3% per annum for the economy as a whole during the post-independence period*¹⁴, while the corresponding estimate for the public enterprises works out at 1.7% per annum*¹⁵.

While the difference between the two figures does not appear to be substantial in absolute terms, it cannot perhaps be regarded as insignificant when considered in relative terms.. However, in view of the error margin that may be attached to our estimates, and, also, of some degree of inherent non-comparability of the two estimates, we would not like to draw any strong or definite conclusions from the above comparison. Nevertheless, it is quite satisfying to note that the long-term rate of growth of the overall efficiency with which the scarce resources are being used in the public sector enterprises does not appear to be lower than the corresponding national average; and it is, in fact, all-the-more encouraging to find that the former has shown an upward trend in recent years.

Notes and References

(The author is grateful to his brother, Ravindra H. Dholakia, for his valuable suggestions and comments on an earlier draft of this paper).

*1 For a detailed discussion of the broad methodology of analysing the sources of growth, and also for a discussion of the limitations of the factor share approach, see, Bakul H. Dholakia, The Sources of Economic Growth in India (Baroda: Good Companions, 1974); Chapter 1. See also E.F. Denison, Why Growth Rates Differ (Washington: Brookings Institution, 1967); Chapters 1 & 4.

*2 Cf. Bakul H. Dholakia, Op. cit., page.7.

*3 National Accounts Statistics 1960-61 - 1972-73, issued by Central Statistical Organisation, Department of Statistics, Ministry of Planning, Government of India; January 1975.

*4 For a detailed discussion of the perpetual inventory method, see, Goldsmith: "A Perpetual Inventory of National Wealth", studies in income and wealth vol. 14 (New York: National Bureau of Economic Research, 1951); and, T. Barna: "Alternative Methods of Measuring Capital", in Goldsmith & Saunders (Eds.): Income & Wealth series VIII (London: Bowes & Bowes, 1959). See also, Bakul H. Dholakia: Op. cit., pp. 141-142.

*5 "Estimates of Tangible Wealth in India", Reserve Bank of India Bulletin, October 1972, pp.1718-1748.

*6 The RBI study gives the estimate of net capital stock in the public sector as a whole for the bench-mark year 1960-61, valued at current prices. By deducting the corresponding capital stock in Government administration and roads & bridges from this figure, we have derived the estimate of net capital stock in the public sector enterprises. This total (Rs.5825 crores) is then decomposed into the estimated net capital stock in the departmental enterprises (Rs.4522 crores), and, in the non-departmental enterprises (Rs.1303 crores) by preparing detailed industry-wise estimates net capital stock for both types of enterprises. Since direct estimates could not be obtained separately for the departmental and the non-departmental enterprises in respect of three industrial categories, viz., manufacturing, electricity and transport by other means, we have distributed the total estimated capital stock in the public sector enterprises, for each of these three categories, between the two types of enterprises in proportion to the corresponding net income originating therefrom. The separate estimates for each

of the various industrial categories are then aggregated to arrive at the respective totals for the departmental and the non-departmental enterprises.

*7 National Accounts Statistics, Op. cit.

*8 Indian Labour Statistics, various issues (for the years 1960 to 1974), published by Labour Bureau, Ministry of Labour, Government of India.

*9 The index of total factor input is derived as a weighted average of the index of labour input and the index of capital input, the weights being the respective relative factor shares of labour and capital. In the derivation of the index of total factor input the weights have, however, been changed at the end of each period of five years. Thus, the procedure actually followed is to change the weights each five years with each of the input index taken as 100 each fifth year, and then link the resulting quinquennial series together to arrive at the continuous series of the index of total factor input. This procedure is adopted in order to eliminate as far as possible the affect of short term cyclical fluctuations in income shares on the weights to be used and at the same time confine the restrictive assumptions of the factor share approach only to the range of factor proportions derived during each time period distinguished. The index of output per unit of total factor input is derived simply by dividing the index of output by the index of total factor input. For further details regarding the methodology of derivation of the index of total factor input and the index of output per unit of total factor input, see Bakul H. Dholakia, Op. cit., pp.6-10, 203-208.

*10 For the details regarding the methodology of derivation of the contribution made by various sources to the growth rate of output, see Bakul H. Dholakia, Ibid.

*11 The year 1967-68 has been selected for the purpose of breaking the entire period under consideration into two sub-periods, because, as already noted in Section IV above, it marks the turning point in the behaviour of capital-output ratio.

*12 Cf. P.J. Fernandez: "Public Sector - Performance and Prospects", Lok Udyog, Vol. IX, No.2, May 1975, p.62.

*13 Cf. Bakul H. Dholakia: The Sources of Economic Growth In India, Op. cit.

*14 Ibid, Ch.VI

*15 The long-term rate of growth of total factor productivity is estimated in the case of the economy as a whole for the period 1954-55 to 1968-69, while in the case of public enterprises, it is estimated over the period 1960-61 to 1972-73. Since the measured rate of growth of national income during the period 1960-61 to 1972-73 was much below the average rate observed during the period 1954-55 to 1968-69, it is unlikely that the former would improve in its value if we consider the more recent years while estimating it.
