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PERFORMANCE OF THE ORGANIZED MANUFACTURING SECTOR IN INDIA AND ANDHRA PRADESH

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Performance of the organized manufacturing sector in India and Andhra Pradesh

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Abstract

This study evaluates the performance of select manufacturing industries in three regions of India, Coastal Andhra (CA), Telangana (Tel) and Rayalaseema (RS) of Andhra Pradesh (AP) from 1981/82 to 2010/11 (15 industries) and from 1980/81 to 2008/09 (17 industries). To gain a more in-depth understanding of the performance of India's and AP's organized manufacturing sector, the period of study is divided into two sub-periods, namely the pre-reform and the post-reform period. The select industries' performance is analysed on the basis of capital labour ratio, labour productivity and total factor productivity. The study classifies the industries into low-tech, medium-tech and high-tech industries.

In the case of India, high-tech industries performed better in terms of total factor productivity (TFP) during the post-reform period (1993-94 and 2008-09) when compared to low- and medium-tech industries. The analysis shows that the average annual growth rates of TFP are negative for the majority of low-tech industries in the post-reform period and in fact during the entire study period. Medium-tech industries also did not perform in terms of TFP growth rates during the post-reform period.

The analysis shows that the average annual growth rates of TFP in AP were highest in Coastal Andhra for most of the industries. The analysis shows that while Coastal Andhra ranks first in terms of average annual TFP growth rates in the organized manufacturing sector (10 out of 15 industries), Telangana second (3 out of 15 industries) and Rayalaseema third (2 out of 15 industries). Coastal Andhra registered the highest average TFP annual growth rate for the manufacture of fabricated metals; in Rayalaseema, the average annual growth rate of TFP was highest for the manufacture of food products and beverages, while in Telangana, it was highest for the manufacture of leather and leather products during the post-reform period. At the state level, the average annual growth rate of TFP was highest (19 per cent) for the manufacture of chemical products during the post-reform period.

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1. Introduction

The link between industrialization and development is intricate and has generated noteworthy discussions among economists. The vast body of literature on the evaluation of the industrialization process in a number of developing countries has noted two crucial features. First, the speed and scope of industrialization are notable mostly when compared with the underdevelopment and stagnation of the colonial past. Second, the process of industrialization has been uneven over time and across space, both within and between countries. This pattern of industrialization resulted in significant regional disparities within countries as well as across industries. Uneven industrial development across regions and different industries of the organized manufacturing sector is a consequence of several structural factors such as distance from the market or from capital, infrastructure development, accessibility to important raw materials, availability of capital and skilled workers as well as of non-structural factors like political stimulus. Empirical evidence indicates that manufacturing is, by far, the sector in which most R&D (research and development) investment is undertaken. It is generally acknowledged that this type of investment has positive externalities that go far beyond the productivity gains achieved in the same sector, significantly contributing to productivity growth in other industries and thus fueling overall economic growth.

Economic reforms introduced in India in 1991 aimed to remove the stringent administrative procedures relating to the acquisition of a license to establish firms, create a single window system, abolish or reduce high tariff rates and opened up Indian firms to global trade activities. The liberalization, privatization and globalization aspects of economic reform are meant to enhance the performance and productivity of the economy in general and of the manufacturing sector in particular.

Against this background, the present study analyses the performance of select industries of India's organized manufacturing sector and the State of Andhra Pradesh during the pre- and post-economic reform period. The analysis of the organized manufacturing sector's performance examines capital intensity, labour productivity and TFP at the national level and in the three regions (Telangana (Tel), Coastal Andhra (CA) and Rayalaseema (RS)) of Andhra Pradesh.

1.1 Literature review

Productivity growth is indispensable, not only in order to increase output but also to increase the effectiveness of an industry both in the domestic and the international markets. An economy's growth is either input- and productivity-driven (Sehgaland Suparn, 2011). Input–driven growth

is achieved through an increase in factors of production and is subjected to diminishing returns; it is therefore—as suggested by Young (1992); Krugman (1994)—not viable in the long term. Productivity-driven growth refers to the growth in outputs that cannot be explained by the growth in total inputs. It is usually attributed to an improvement in knowledge, organizational structure, human resources management, skills attainment, information technology and efficient use of factors of production. In recent years, equal weight has been ascribed to productivity growth and capital accumulation, regardless of whether a structural outlook on development or a classical one is taken. In other the cases, productivity is critical to outcome (Arora and Singh, 2008*)*. Growth in productivity, which is also known as total factor productivity growth (TFPG), is the difference between the actual growth of output and the growth attributable to a composite of all factor inputs. Productivity is not *everything*, but it is *almost* everything in the long run (Krugman, 1990). Thus, the only way to increase gross domestic production (GDP) per capita in the long run is to increase the amount of output produced by a given quantity of inputs, i.e. raising TFP. Productivity growth is accepted as a key characteristic of economic dynamism.

An increase in labour productivity benefits the employer, worker, consumer and the entire nation. To enhance global competitiveness, it is essential to increase labour productivity. Increasing labour productivity also means enhancing wealth shared by the worker, employer and the nation on the whole. According to Leong (2000), it is necessary to increase labour productivity by focusing on quality inputs and effective processes. Chong has identified five factors that influence increases in productivity, namely capital, human resources, materials, information and technology. Solow (1957) argues that labour productivity is the most important determinant influencing a nation's level of income. In a similar vein, Englander and Gurney (1994) assert that low labour productivity represents a barrier to income increment rate and could also affect the incidence of conflicts in income distribution. Labour productivity is closely linked to economic growth and is a determinant of economic stability. Understanding the determinants and sources of increases in labour productivity is important for understanding economic growth in general. Factors that play a role in increasing labour productivity include technology, physical capital and human resources (Ismail, 2009).

In this context, it is crucial to study the pattern and level of growth of productivity as well as the efficiency of the organized manufacturing sector. Such a micro-level study gives an empirical and more accurate picture of the performance of India's organized manufacturing sector at the regional level.

2. Data and methodology

The methodology used to estimate the TFP is the same for both India and Andhra Pradesh. However, there is a difference in data sources and the number of sectors covered at the national and state level. The period of study and the base year prices differ as well and are explained at length below. As such, the study does not aim to compare the State of Andhra Pradesh with India, but presents an in-depth analysis of the performance of the organized manufacturing sector both at the national and state level. Furthermore, the study provides a deeper understanding of the performance of different industries in the organized manufacturing sector at the regional level of Andhra Pradesh. This is a first of its kind in India.

Based on the data availability of the different industries in the organized manufacturing sector, we studied 17 industries for India and 15 for Andhra Pradesh. These industries were further classified into low-technology, medium-technology and high-technology industries (Table 1).

Table 1: Low, medium and high technology industries

Technology	Industries
Low	Food and beverages, tobacco products, textiles, apparel, wood products, paper and paper products and manufacture of furniture
Medium	Leather, rubber and plastic products, coke and refined petroleum, non-metallic mineral products, basic metals and fabricated metals
High	Chemicals and chemical products, machinery and equipment, electrical machinery and apparatus, transport equipment, medical and precision apparatus, motor vehicles

Source: UNIDO classification

The TFP of different industries of the organized manufacturing sector in India and Andhra Pradesh was calculated using the simplest specification of the production function—one that only includes the primary production factors, labour force and capital. We applied the Growth Accounting Approach to calculate the TFP.

2.1 Data depiction and dimension of variables in India

In the case of India, the performance of the 17 industries (see annex) of the organized manufacturing sector was examined from 1980-81 to 2008-09. We further divided the study

period into the pre-reform period (Period I - 1980-81 to 1992-93), the post-reform period (Period II - 1993-94 to 2008-09) and the combined period (CP 1980-81 to 2008-09).

We used three variables—net value added, gross fixed capital formation (GFCF) and number of employees. This data was drawn from INDSTAT (two-digit level ISIC Revision 3). Data on value added and GFCF were available in current prices. To convert these into constant prices (2005), deflators were used. The deflator for value added is given as Deflator = Nominal VA_t/IIPt*VA base year (2005), where VA is value added and IIP is Index of Industrial Production. The nominal value of value added is divided by the above deflator to arrive at the real value added at 2005 prices. Nominal GFCF was converted into real GFCF (2005) by using the manufacturing value added (MVA) deflator and the perpetual inventory method to calculate capital stock (see Section 3.3).

2.2 Data depiction and measurement of variables in Andhra Pradesh

The required two-digit level data for different industries of the organized manufacturing sector in the three regions in Andhra Pradeshare were drawn from the various issues of "Summary Results of Annual Survey of Industries" (ASI). It should be mentioned here that the present analysis of the TFP in the organized manufacturing sector of Andhra Pradesh covers the period 1981-82 to 2010-11. Furthermore, an in-depth analysis of the three regions' data has also been carried out for three sub-periods, i.e. the pre-reform period (Period-I 1981-82 to 1992-93), the post-reform period from 1993-94 to 2010-11 (Period II). Within the post-reform period, we further distinguish a period of financial crisis from 2004-05 to 2010-11 (Period III). Industry data on net value added, fixed capital and total persons was collected for the nine districts in Coastal Andhra, for 10 districts in Telangana and four districts in Rayalaseema. The data for the three regions CA, Tel and RS were then aggregated for the above-mentioned period. Industry data was only collected for 15 industries (see annex), for the remaining industries the required data were not available for the entire study period mentioned above. For the present study, all required time series data was prepared on the basis of NIC-98 by using the available two-digit concordance tables.

As mentioned above, only one output (net value added at constant prices) and two inputs (fixed capital at constant prices and number of employees) were considered. In our data set, nominal variables are converted into real terms: value added figures are deflated by the wholesale price index (WPI) (1980-81 as the base year for the first period, 1993–94 for the second period and 2004-05 for the third period) of the closest commodity group. Fixed assets are deflated by the WPI of machinery and equipment, and the perpetual inventory method is used to measure

capital stock. ASI provides data on the number of workers and of employees. In this study, total employees, including permanent and contract workers, supervisory and managerial staff, are taken as the measure for employment.

2.3 Capital conversion and growth accounting approach

The perpetual inventory method provides a standard way of formulating how capital evolves:

$Kt+1 = (1-\partial) Kt + It$ (1)

where I_t is the investment undertaken in year *t*, K_t is the capital stock at the end of year *t* and δ is the depreciation rate. Substituting back in time to a defined initial period leads to equation (2):

$$K_t = (1-\partial)^t K_0 + \sum_{i=1} (1-\partial)^{t-I} I_i \quad (2)$$

where K_0 represents the initial capital stock. It is assumed that ten years of investment serve as an adequate proxy for the initial capital stock K_0. For example, in the present study, investments from 1970 to 1980 are used to construct K_0 for 1981. The depreciation rate is set at 6 per cent. The average investment rate for the first ten years (1970-1980) serves as a proxy for the investment rate *i*.

After converting the net value added and the fixed capital into real values, we adopt the Hicksian Growth Accounting Approach to calculate TFP. The Hicksian Growth equation is as follows:

$$\Delta ln\, At = \Delta lnY\, t - \alpha * \Delta lnKt - \beta * \Delta ln\, Lt \quad (3)$$

K represents capital and *L* is labour. We assume 1/3 and 2/3 as values of α and β, respectively. Output growth is decomposed into growth of the capital labour ratio and of TFP growth (World Productivity Base, 2007).

3. Capital-labour ratio, labour productivity and total factor productivity of organized manufacturing sector in India

An attempt is made to analyse the average annual growth rates of capital labour ratio, labour productivity and TFP of the organized manufacturing sector for the pre-reform period (Period I – 1980-81 to 1992-93), the post-reform period (Period II – 1993-94 to 2008-09) and the combined period (CP – 1980-81 to 2008-09).

Table 2: Average annual growth rates of capital labour ratio, labour productivity and TFP of the low-technology industries of the organized manufacturing sector, 1980-81 to 2008-09 (percentage)

	Capital Labour Ratio			Labour Productivity			TFP		
	I	II	CP	I	II	CP	I	II	CP
15	2.24	4.89	3.74	4.53	3.73	4.08	3.73	2.09	2.80
16	5.72	9.05	7.61	1.57	0.52	0.97	-0.30	-2.36	-1.47
17	9.70	7.44	8.42	5.06	5.53	5.32	1.80	3.03	2.50
18	-1.40	1.49	0.24	-3.48	-4.56	-4.09	-2.93	-5.00	-4.10
20	4.03	4.96	4.55	2.93	1.40	2.06	1.65	-0.32	0.53
21	7.34	7.25	7.29	5.21	4.64	4.89	2.82	2.44	2.61
36	-0.84	3.02	1.35	-4.05	0.93	-1.23	-3.72	-0.09	-1.67

Source: Own calculations based on INDSTAT, UNIDO data

Note: Food and beverages 15, Tobacco 16, Textiles 17, Wearing apparel 18, Wood products 20, Paper and paper products 21, Manufacture of furniture n.e.c 36.

A close insepction of Table 2 reveals that four of seven low-technology industries registered a negative average annual growth rate of TFP in the post-reform period. In the remaining three industries, we observe that the average annual growth rate of the textile industry (17) was highest (around 3 per cent) during the post-reform period (Table 2).

For industries registering negative TFP growth rates, we observe that the average annual growth rates of their capital labour ratio increased while the average annual growth rates of their labour productivity declined in the post-reform period when compared to the pre-reform period (Table 2).

In the case of other low-tech industries like food and beverages (15), the average annual growth rate of capital labour ratio increased by more than double in the post-reform period and the growth rate of labour productivity decreased by nearly 1 per cent during the same period. In the case of the wearing apparel industry (18) the average annual growth rate of the capital labour ratio turned positive, while the growth rate of labour productivity declined by nearly 1 per cent in the post-reform period. As regards paper and paper products (21), the average annual growth

rate of the capital labour ratio and of labour productivity declined marginally during the post-reform period (Table 2).

For the entire period from 1980-81 to 2008-09, the average annual growth rate of TFP was highest for food and beverages (around 3 per cent). However, the TFP of the tobacco industry (16), wearing apparel (18) and the manufacture of furniture (36) was low as the average annual growth rate of TFP was negative in both the pre- and post-reform period (Table 2).

Table 3: Average annual growth rates of capital labour ratio, labour productivity and TFP of medium-technology industries of the organized manufacturing sector 1980-81 to 2008-09 (percentage)

	Capital Labour Ratio			Labour Productivity			TFP		
	I	II	CP	I	II	CP	I	II	CP
23	7.11	9.36	8.38	1.87	2.36	2.15	-0.79	-0.26	-0.49
25	10.96	4.70	7.41	0.97	2.88	2.06	-2.41	1.60	-0.14
26	15.86	6.39	10.49	5.00	5.97	5.55	0.04	3.74	2.14
27	11.18	6.24	8.38	3.98	6.80	5.58	0.35	4.70	2.81
28	12.13	6.23	8.79	1.53	2.15	1.88	-2.12	0.28	-0.76

Source: Own calculations based on INDSTAT, UNIDO data

Note: Coke and refined petroleum 23, Rubber and plastic products 25, Non-metallic mineral products 26, Basic metals 27, Fabricated metal products 28.

As regards medium-technology industries, the average annual growth rates of TFP registered an increase in the post-reform period for rubber and plastic products (25), non-metallic mineral products (26), basic metals (27) and fabricated metals (28). However, the average annual growth rates of TFP registered a negative growth rate for coke and refined petroleum (-0.26 per cent) in the post-reform period. In fact, the average annual growth rate of TFP for this industry was negative in both periods as well as in the combined period. For the four industries that registered an increase in the average annual growth rates of TFP, we also observed that the average annual growth rate of the capital labour ratio decreased and that that of labour productivity increased in the post-reform period in comparison to the pre-reform period. In the case of coke and refined petroleum (23), the average annual growth rates of both the capital labour ratio and labour

productivity registered an increase in the post-reform period (9.36 per cent and 2.36 per cent, respectively) (Table 3).

The average annual growth rate of TFP was highest for basic metals throughout the entire period of study (2.81 per cent) as well as in the post-reform period (4.7 per cent). Rubber and plastic products registered negative average annual growth rates of TFP, both in the pre-reform period (-2.41 per cent) and in the combined period (-0.14 per cent). The average annual growth rate of labour productivity was highest for basic metals (around 5.6 per cent) in the combined period; non-metallic mineral products registered the highest average annual growth rates of capital labour ratio (nearly 10.5 per cent) during the same period (Table 3).

Table 4: Average annual growth rates of capital labour ratio, labour productivity and TFP of high-technology industries of the organized manufacturing sector 1980-81 through 2008-09 (in %)

	Capital Labour Ratio			Labour Productivity			TFP		
	I	II	CP	I	II	CP	I	II	CP
24	0.25	3.58	2.14	5.88	4.14	4.89	5.78	2.97	4.19
29	6.15	5.11	5.59	4.10	9.19	6.82	2.03	7.39	4.90
31	9.82	6.77	8.19	12.38	22.15	17.62	8.96	19.96	14.86
33	8.25	4.35	6.16	10.01	4.40	7.00	6.90	2.94	4.78
34	5.18	10.38	8.13	2.37	11.93	7.79	0.68	8.08	4.87

Source: Own calculations based on INDSTAT, UNIDO data

Note: Chemicals and chemical products 24, Machinery and equipment 29, Electrical machinery and apparatus 31, Medical and precision apparatus 33, Motor vehicles 34

In the post-reform period, the average annual growth rate of TFP increased for high-technology industries, namely machinery and equipment (29), electrical machinery and apparatus (31) and motor vehicles (34), while registering a decline for chemicals and chemical products (24) and medical and precision apparatus (33). A close look at electrical machinery and apparatus (31) reveals that the industry's average annual growth rates of labour productivity were highest and increased by nearly 10 per cent in the post-reform period. The average annual growth rate of TFP for this industry almost more than doubled in the post-reform period (from around 9 per cent in the pre-reform period to nearly 20 per cent in the post-reform period) (see Table 4).

The average annual growth rate of capital labour ratio increased (by 3.25 per cent) while that of labour productivity dropped (by nearly 2 per cent) in the post-reform period for chemicals and chemical products (24). Machinery and equipment (29), electrical machinery and apparatus (31) and medical precision and apparatus (33) registered a decline in their average annual growth rate of capital labour ratio in the post-reform period, with the highest decrease (4 per cent) recorded in medical precision and apparatus (33). This industry also registered the highest decrease in the growth rate of labour productivity by around 6 per cent during the same period (see Table 4).

During the combined period, electrical machinery and apparatus (31) registered the highest average annual growth rate of TFP (nearly 15 per cent), capital labour ratio (around 8 per cent) and labour productivity (around 18 per cent) (see Table 4).

4. Capital deepening, labour productivity and total factor productivity of the organized manufacturing sector in Andhra Pradesh

This section analyses the capital deepening, labour productivity and TFP of the different industries of the organized manufacturing sector in the three regions of Andhra Pradesh and at the State level.

4.1 Capital deepening, labour productivity and total factor productivity of the different industries of the organized manufacturing sector in the three regions of Andhra Pradesh

We study the capital labour ratio, labour productivity and TFP across 15 industries at the two-digit level of the organized manufacturing sector in the three regions and in Andhra Pradesh as a whole. In the majority of cases, the analysis is confined to a comparison between the pre- and the post-economic reforms. In some cases, we focus on the period of the financial crisis.

Among the low-technology industries, food and beverages recorded the highest average annual growth rate of TFP at around 10 per cent in the post-reform period. This was followed by textiles with an average annual growth rate of TFP of 7 per cent during the same period as compared to the pre-reform period. However, this industry's average annual growth rate of TFP dropped to a negative figure (-10.7 per cent) during the financial crisis period. In fact, the textile industry's average annual growth rate of TFP registered a decline from one period to the next. Wood and wood products registered an average annual growth rate of around 6 per cent during the post-reform period. The average annual growth rates of labour productivity for Tobacco, food and beverages and paper increased during the post-reform period (period II) compared to

the pre-reform period. Tobacco registered another increase in its capital labour ratio growth rate during the post-reform period (see Table 5).

Table 5: Average annual growth rates of capital labour ratio, labour productivity and TFP of select industries of the organized manufacturing sector in Coastal Andhra - 1981-82 to 1992-93 (I at 1980-81 prices), 1993-94 to 2003-04 (II at 1993-94 prices), 2004-05 to 2010-11 (III at 2004-05 prices)

Sectors	K/L			LP			TFP		
	I	II	III	I	II	III	I	II	III
Food	2.12	2.01	-5.86	1.98	1.73	8.73	11.10	10.08	10.38
Tobacco	1.75	3.63	-1.21	1.20	4.56	-1.10	9.80	3.09	-8.50
Textiles	5.36	2.39	-5.44	9.74	5.83	-9.47	10.49	7.03	-10.68
Apparel	3.79	4.94	-3.37	10.81	9.70	-6.82	6.75	2.34	-5.83
Leather	3.54	7.47	2.99	7.84	4.77	5.32	6.12	3.12	3.72
Wood	7.89	6.87	-5.87	4.15	1.78	2.31	3.41	5.81	6.11
Paper	3.47	5.49	-10.49	1.69	4.78	-4.45	3.82	3.46	3.65
Chemicals	5.03	2.64	-2.37	6.93	1.96	3.11	3.74	4.23	2.14
Rubber	4.10	1.25	4.82	5.03	3.06	-10.67	7.81	13.90	6.04
Non-metals	5.27	7.35	4.27	3.74	13.61	-15.41	8.68	10.98	13.35
Metals	22.54	10.99	5.67	4.87	6.21	-5.63	2.28	3.15	4.28
Fabricated metal	5.23	2.70	6.05	1.47	3.21	-1.45	7.22	10.60	9.96
Machinery	1.20	-0.72	-1.82	4.25	3.25	15.16	2.69	4.71	0.71
Electrical	4.07	2.88	5.33	1.75	2.24	-2.39	1.26	1.55	3.12
Transport	3.95	2.98	1.59	1.71	1.07	0.35	4.54	6.67	10.20

Source: Own calculations based on data from the Annual Survey of Industries, Govt. of AP, various issues

We observe that almost all medium-technology industries, with the exception of leather and leather products, and all high-technology industries registered an increase in the average annual growth rate of TFP in the post-reform period (period II) when compared to the pre-reform period. The average annual growth rate of capital labor ratio and labor productivity of non-metallic mineral products increased in the post-reform period (Table 5).

The case of high-technology industries reveals that the average annual growth rate of capital labour ratio of all four industries registered a decline in the post-reform period as compared to the pre-reform period (Table 5).

Table 6: Average annual growth rates of capital labour ratio, labour productivity and TFP of select industries of the organized manufacturing sector in Telangana - 1981-82 to 1992-93 (1 at 1980-81 prices), 1993-94 to 2003-04 (II at 1993-94 prices), 2004-05 to 2010-11 (III at 2004-05 prices)

	K/L			LP			TFP		
	I	II	III	I	II	III	I	II	III
Food	1.13	-8.55	1.64	2.19	2.23	-5.28	0.20	0.54	0.47
Tobacco	3.79	-4.09	2.13	2.46	1.91	-2.10	3.25	4.28	4.79
Textiles	11.33	16.88	15.51	2.55	3.10	-2.14	0.28	0.39	0.19
Apparel	1.68	2.32	6.07	-12.57	-7.66	-4.81	0.27	0.48	0.04
Leather	8.79	-3.53	-1.95	4.10	1.91	-5.16	0.54	0.30	8.62
Wood	8.60	10.64	15.78	-4.09	1.30	-1.49	1.34	0.43	0.44
Paper	1.39	1.02	1.94	-5.91	3.75	-1.77	1.14	0.98	1.23
Chemicals	1.06	-7.11	1.06	2.35	2.13	-3.05	2.91	1.41	2.22
Rubber	4.99	4.78	12.01	4.92	5.61	-2.32	2.37	1.10	0.76
Non-metals	4.20	1.54	5.05	1.89	2.59	-2.43	0.78	1.01	2.90
Metals	7.23	-2.00	6.89	1.87	2.76	-2.41	0.34	0.70	0.48
Fabricated metal	6.22	-3.85	2.53	0.26	3.10	-4.71	0.77	0.81	1.02
Machinery	2.03	-0.92	1.50	-3.27	1.94	-1.55	1.74	1.64	0.70
Electrical	8.25	13.95	10.50	3.42	5.35	-2.59	0.99	1.03	0.84
Transport	4.12	7.21	3.56	6.53	9.56	3.68	2.94	4.70	2.56

Source: Own calculations based on data from the Annual Survey of Industries, Govt. of AP, various issues

When we look at the different industries of the organized manufacturing sector in Telangana, it is clear that the average annual growth rates of TFP are very low except tobacco and tobacco products (around 4 per cent) and transport equipment (around 5 per cent) during the post-reform period as compared to the pre-reform period. However, the average annual growth rate of TFP of leather and leather products, which is classified as a medium-technology industry, increased from 0.3 per cent in the post-reform period to around 9 per cent in the financial crisis period. The growth rate of capital labour ratio was highest for textiles (17 per cent) and that of labour productivity was highest for transport equipment (around 10 per cent) in the post-reform period (Table 6).

Table 7: Average annual growth rates of capital labour ratio, labour productivity and TFP of select industries of the organized manufacturing sector in Rayalaseema - 1981-82 to 1992-93 (1 at 1980-81 prices), 1993-94 to 2003-04 (II at 1993-94 prices), 2004-05 to 2010-11 (III at 2004-05 prices)

Sectors	K/L			LP			TFP		
	I	II	III	I	II	III	I	II	III
Food	3.62	1.89	2.97	5.63	1.99	-5.95	9.86	5.42	7.63
Tobacco	2.46	1.94	2.56	4.30	8.23	5.05	3.76	3.11	3.33
Textiles	2.39	1.45	-8.61	9.76	3.32	1.99	0.89	1.04	1.21
Apparel	4.94	-2.76	-2.29	2.10	2.38	-2.57	1.36	4.58	0.70
Leather	2.05	3.12	-1.64	1.47	1.05	-9.82	-10.32	-9.86	-7.52
Wood	-1.82	-6.08	2.56	-1.47	1.15	5.10	1.04	1.21	1.98
Paper	5.75	3.70	6.73	0.71	1.51	1.77	0.87	0.35	1.10
Chemicals	4.14	-4.41	5.19	5.12	6.49	-1.79	1.97	1.31	1.16
Rubber	2.75	6.72	4.83	-11.22	-9.80	-8.80	-7.59	-1.16	-3.14
Non-metals	2.92	0.07	1.42	8.02	3.03	-9.07	6.67	1.21	1.45
Metals	6.02	7.53	4.51	1.29	1.23	1.02	1.58	1.40	2.25
Fabricated metal	1.86	1.68	6.67	7.39	2.89	-6.97	9.53	2.23	2.66
Machinery	6.44	-4.41	5.78	6.19	4.99	-1.51	2.87	4.34	0.87
Electrical	3.75	3.12	7.38	1.03	1.21	-1.81	1.80	1.83	2.47
Transport	-3.47	7.01	4.82	7.53	10.65	2.92	2.57	4.36	2.01

Source: Own calculations based on data from the Annual Survey of Industries, Govt. of AP, various issues

In Rayalaseema, three low-technology industries, namely food and beverages, tobacco and paper, registered lower average annual growth rates of TFP in the post-reform period. While the

other three low-technology industries, textiles, apparel and wood products, registered an increase in the average annual growth rate of TFP in the post-reform period. It was also observed that the majority of low-technology industries performed well during the financial crisis period as far as the growth rate of TFP is concerned. The average annual growth rates of capital labour ratio registered a decrease for all low-technology industries in the post-reform period. The post-economic reform period brought about the highest growth rate of labour productivity (around 8 per cent) for tobacco and tobacco products (Table 7).

With respect to medium-technology industries, both rubber and leather registered negative growth rates of TFP during all three periods. The average annual growth rate of TFP for the remaining three industries in this category decreased in the post-reform period, with the decrease being highest for non-metallic mineral products from around 7 per cent in the pre-reform period to 1 per cent in the post-reform period, and from nearly 10 per cent for fabricated metals in the pre-reform period to nearly 2 per cent in the post-reform period. Basic metals registered the highest average annual growth rate of capital labour ratio during the post-reform period (Table 7).

The average annual growth of TFP in the high-technology industry was highest for machinery and equipment (nearly 4 per cent) during the second period. Transport equipment registered the highest average annual growth rate of capital labour ratio and labour productivity during the same period (Table 7).

At the State level, the average annual growth rate of TFP of all inudstries falling under the low-technology industry category increased in the post-reform period in comparison to the pre-reform period. For the two industries food and beverages and wood products, the average annual growth rate of both capital labour ratio and of labour productivity increased in the post-reform period as compared to the pre-reform period (Table 8).

As regards medium-technology industries, the average annual growth rate of TFP was negative in the post-reform period for leather while it increased during this period for the remaining four industries, with the highest increase recorded by rubber and plastic products (13 per cent). Basic metals accounted for the highest average annual growth rate of capital labour ratio (around 16 per cent) as well as the highest average annual growth rate of labour productivity in the post-reform as compared to the pre-reform period (Table 8).

Table 8: Average annual growth rates of capital labour ratio, labour productivity and TFP of select industries of the organized manufacturing sector in Andhra Pradesh - 1981-82 to 1992-93 (1 at 1980-81 prices), 1993-94 to 2003-04 (II at 1993-94 prices), 2004-05 to 2010-11 (III at 2004-05 prices)

Sectors	K/L			LP			TFP		
	I	II	III	I	II	III	I	II	III
Food	11.85	21.46	-18.68	9.46	18.61	6.56	8.64	10.74	9.72
Tobacco	18.68	19.8	-20.85	3.54	3.04	-6.94	6.25	7.81	8.6
Textiles	7.99	8.54	-21.78	10.41	5.24	-2.37	4.32	5.4	6.5
Apparel	-6.69	11.5	-3.97	8.59	9.7	-7.51	8.22	9.21	-6.37
Leather	3.97	4.27	-4.39	5.01	1.45	-3.89	5.76	-8.96	1.99
Wood	2.07	2.09	-1.77	4.13	6.75	7.71	3.21	4.56	5.3
Paper	-0.19	26.19	-3.14	1.44	5.69	-1.92	3.22	4.41	2.95
Chemicals	-3.66	1.22	7.47	8.91	4.5	4.84	8.83	3.67	19.49
Rubber	3.07	1.72	-3.29	12.55	7.26	-12.58	6.77	13.23	12.89
Non-metals	2.11	3.51	-2.8	1.31	2.4	4.41	11.81	12.33	8.18
Metals	13.12	16.14	-8.04	2.98	9.79	-2.98	2.02	4.12	4.61
Fabricated metal	1.89	2.9	-2.53	9.67	5.95	-2.83	4.58	5.06	7.21
Machinery	-0.83	3.33	3.98	1.39	8.51	-8.86	4.32	5.65	-8.19
Electrical	-3.47	1.93	-2.03	4.48	3.26	5.23	4.94	2.5	3.46
Transport	1.87	1.99	-1.54	5.14	2.95	6.35	4.33	2.73	12.41

Source: Own calculations based on data from the Annual Survey of Industries, Govt. of AP, various issues

All high-technology industries, with the exception of machinery and equipment, witnessed declining average annual growth rates of TFP during the post- reform period. The machinery and equipment industry also accounted for the highest average annual growth rate of labour productivity as a consequence of economic reforms (Table 8).

5. Summary and conclusions

The case of India

- Of the seven industries in the low-technology group, the average annual growth rate of TFP of tobacco, wearing apparel and furniture were negative between 1980-81 through 2008-09. The average annual growth rate of TFP of these industries remained negative in the post-reform period as well. For all low-technology industries except textiles, the

average annual growth rate of capital labour ratio increased in the post-reform period. On the other hand, the average annual growth rate of labour productivity decreased for all industries during the post-reform period with the exception of textiles.

- With regard to medium-technology industries, only two, basic metals and fabricated metals, performed well in terms of TFP in the post-reform period and in fact during the entire study period. However, the average annual growth rate of labour productivity registered an increase in all industries during the post-reform period. On the other hand, the average annual growth rate of capital labour ratio of all industries, except coke and refined petroleum registered a decline in the post-reform period.

- Among the high-technology industries, we observe that all industries had an average annual growth rate of TFP of around 5 per cent during the entire study period. The average annual growth rate of TFP of medical precision and apparatus grew by nearly 15 per cent. The average annual growth rate of labour productivity increased for all industries, except for chemicals and chemical products in the post-reform period. Of the five industries in this category, the average annual growth rate of capital labour ratio registered a decline in three industries in the post-reform period

Of the 17 industries in the organized manufacturing sector in India, it can be concluded that the high-technology industries performed well in terms of TFP growth rate during the post-reform period as well as during the entire study period. The case of medium-technology industries calls for a policy initiative to boost their performance.

The case of Andhra Pradesh reveals that

- The analysis indicates that the average annual growth rate of TFP was highest in Coastal Andhra for the majority of industries during the post-reform period. The financial crisis affected the performance of industries in the period 2004-05 through 2010-11 in all three regions. However, the entire analysis shows that while Coastal Andhra stands first in terms of the average annual growth rates of TFP the organized manufacturing sector (10 out of 15 industries), Telangana ranks second (3 out of 15) and Rayalaseema placed last (2 out of 15). Coastal Andhra registered the highest average annual growth rate of TFP for fabricated metals in the post-reform period; in Rayalaseema, the average annual growth rate of TFP was highest for food and beverages, and in Telangana for leather and leather products. At the macro level, in

other words at the State level, the average annual growth rate of TFP was highest (19 per cent) for chemical products during the post-reform period.

- Basic metals registered the highest growth rate of capital labour ratio (around 11 per cent) in Coastal Andhra during the post-reform period. Telangana registered the highest growth rate of capital labour ratio for wood and wood products (11 per cent) in the post-reform period, and in Rayalaseema it was rubber (nearly 7 per cent). At the State level, paper and paper products registered the highest growth rate of capital labour ratio during the same period.

- As far as the growth rate of labour productivity is concerned, at the macro level, food and beverages recorded the highest average annual growth rate at nearly 19 per cent in the post-reform period. In Telangana and Rayalaseema, this was highest for transport equipment, and in Coastal Andhra, the average annual growth rate of labour productivity was highest for basic metals in the post-reform period.

For Andhra Pradesh in general, it can be concluded that the organized manufacturing sector in Coastal Andhra performed better in comparison to the other two regions, Telangana and Rayalaseema, during the post-reform period.

Annex

Classification at 2-digit level

Industry Division	Description
15	Food and beverages
16	Tobacco products
17	Textiles
18	Wearing apparel, dressing and dyeing of fur
19	Tanning and dressing of leather
20	Wood and products of wood
21	Paper and paper products
23	Coke and refined petroleum
24	Chemicals and chemical products
25	Rubber and plastic products
26	Other non-metallic mineral products
27	Basic metals
28	Fabricated metal products
29	Machinery and equipment
31	Electrical machinery and apparatus
33	Medical and precision apparatus
35	Motor vehicles and transport equipment
36	Furniture n.e.c

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