

Trends in Partial and Total Factor Productivity in Cotton Textile Industry

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Abstract

In India, the contribution of textile industry to the creation of employment opportunities or the total industrial production or the export earnings in particular had always been phenomenal. This has triggered the probing into its productivity levels, since productivity is the measure of how effectively and efficiently the resources are pooled together and employed by firms to achieve the desired results. In the present study, an attempt has been made to bring out the trends in partial and total factor productivity indices of cotton textile industry in India and in Tamil Nadu over a period of 30 years from 1981-82 to 2010-11, so as to comprise both the pre and post liberalisation eras. Hence, secondary data has been collected for the entire study period of 30 years. The study's key finding that the labour productivity and capital intensity had registered the positive growth in the cotton textile industry in India and in Tamil Nadu during the study period affirms the results disclosed by Subramanian [2] and Kasi [7].

Keywords: Capital Intensity, Capital Productivity, Cotton Textile, Labour Productivity, Total Factor Productivity

1. Introduction

Textile industry is the largest employment generating industry after agriculture and it contributes 14 per cent to industrial production, 4 per cent to the GDP, and 17 per cent to the country's export earnings. It provides direct employment to over 35 million people (Ministry of Textiles Report-2011-12) [1]. The industry consists of organized mill sector and decentralized sector. There are two types of mills in the organized mill sector viz., spinning mills which produce only yarn and composite mills which produce yarn and cloth. The decentralized sector consists of handlooms, power looms and knitting. The industry has got a complex structure comprising traditional hand-spun, hand-woven sector to be sophisticated capital intensive high-speed machine sector. A fast growing intermediate powerloom sector can also be witnessed along with a promising garment and hosiery industry which are spreading their wings through the length and breadth of the country. The traditional hand-spun and hand-woven sectors are mostly located in rural areas, while sophisticated capital-intensive units with high-speed machines are mostly located in

semi-urban areas. Productivity is the measure of how well resources are brought together in organisations and utilized for accomplishing a set of results. The main focus of the study is to examine the trends in partial and total factor productivity indices of cotton textile industry in India and Tamil Nadu during the pre and post-reform period.

2. Review of Literature

Subramanian [2] had explored the partial and total factor productivity of cotton textile industry in Tamil Nadu during the period 1975-76 to 1985-86 employing Kendrick and Solow's indices. The findings clearly ruled out the possibility of a variable elasticity of factor substitution in the Cotton Textile industry in Tamil Nadu. It was concluded that the partial labour productivity had increased at an annual average rate of 2.42 per cent and the real wage of labour had also increased at the rate of 1.36 per cent per annum.* Murugeswari [3] had studied the impact of policy shift on total factor productivity in Indian textile industry. The results disclosed that the textile industry had shown Total

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Factor Productivity (TFP) improvement and technological progress during pre-liberalisation period, indicating that the competition had reduced the productivity performance and the technological progress of the industry. Deshmukh and Pyne [4] examined the labour productivity and export performance, and also the determinants of productivity at firm-level as evidenced from Indian manufacturing industries since 1991. They have concluded that the indigenous firms were highly export-oriented than that of the foreign firms, and between the private and public firms, private firms were more export intensive than public firms. Regarding the determinants of labour productivity at firm level, the two significant determinants were the firm size and the raw material intensity, while the ownership status of the firms had no role.

However, the present study deviates from the earlier researches, since it focuses on the growth pattern in partial and total factor productivity in the cotton textile industry in India and in Tamil Nadu during the specified study period.

3. Objective of the Study

The objective of the study is -

- To analyze the growth pattern of the partial and total factor productivity indices in the cotton textile industry in India and in Tamil Nadu during the study period.

4. Methodology of the Study

4.1 Study Period

The study covers a period of 30 years from 1981–82 to 2010–11, so as to comprise both the pre liberalization and post liberalization eras.

4.2 Data Source

- Secondary data has been employed for the purpose of the study based on the data from Annual Survey of Industries (ASI) published by the Central Statistical Organization (CSO), Government of India [5].
- The trend in partial factor productivity of the cotton textile industry in India and in Tamil Nadu has been analysed through the scores of labour productivity, capital productivity and capital intensity indices.
- The trend in total factor productivity of the industry under study has been analysed through the popularly and commonly employed indices of Kendrick, Solow and Translog [6].

4.3 Tools of Analysis

- Compound growth rate has been computed to determine the trend in the growth of various indices employed in the study focusing the pre liberalized era, post liberalized era and that of the overall period.
- Coefficient of variation has also been computed to determine the variation in the growth rate of the indices employed.
- Linear slope of these indices employed has also been computed with *t-test* to determine the significance of the trend.

Table 1 discloses the growth pattern of the partial and total factor productivity indices in the cotton textile industry (at two digit level) by National Industrial Classification (NIC) code in India during the pre and post-reform periods of the study.

5. Partial Factor Productivity Trend in Cotton Textile Industry - India

Table 1 shows that the index of labour productivity in the cotton textile industry had increased from 100.00 in 1981-82 to 245.96 in 1991-92 with a compound growth rate of 9.62 during the pre liberalisation era. The same had grown from 224.90 in 1992-93 to 735.65 in 2010-11 with a compound growth rate of 7.46. The overall compound growth rate during the entire study period was 7.32 with a coefficient of variation of 1.55.

With regard to capital productivity, it had registered a negative compound growth rate during all the three periods of analysis, i.e., pre-reform (-0.69), post-reform (-1.10) and the overall study period (-2.84). The coefficient of variation was found to be 0.33.

On the other hand, the capital intensity measure had registered a compound growth rate of 9.43, 6.23 and 9.29 during the pre liberalisation, post liberalisation and that of the overall period of study respectively with a coefficient of variation of 0.63 only.

6. Total Factor Productivity Trend in Cotton Textile Industry - India

Table 1 also depicts the growth pattern of the total factor productivity indices of the industry under study in terms of Kendrick, Solow and Translog measures. The compound

Table 1. Partial and total factor productivity indices of cotton textile industry in India

Year	Partial factor productivity			Total factor productivity		
	Index of labour productivity	Index of capital productivity	Index of capital intensity	Index of TFP (Kendrick)	Index of TFP (Solow)	Index of TFP (Translog)
1981–82	100.00	100.00	100.00	100.00	100.00	100.00
1982–83	98.14	79.17	123.96	96.34	80.96	85.15
1983–84	106.22	79.73	156.21	116.35	123.22	104.95
1984–85	126.89	78.14	170.88	109.31	127.73	126.96
1985–86	128.90	73.92	204.29	116.20	135.03	124.66
1986–87	134.87	77.29	198.04	130.61	147.37	129.50
1987–88	146.87	69.87	218.18	122.45	159.59	141.03
1988–89	153.93	73.64	230.65	131.57	184.34	144.82
1989–90	185.90	106.25	225.41	166.31	198.23	161.55
1990–91	230.32	84.22	248.80	177.99	218.57	229.27
1991–92	245.96	71.25	292.39	174.88	288.49	230.49
CGR	9.62	-0.69	9.43	6.32	11.12	9.34
1992–93	224.90	63.20	337.31	186.19	198.86	192.93
1993–94	226.89	69.62	471.79	156.40	177.43	176.41
1994–95	250.45	63.56	567.32	158.55	210.85	199.49
1995–96	342.56	46.14	584.57	194.06	169.25	205.81
1996–97	266.40	45.45	675.73	148.09	180.62	189.82
1997–98	340.23	41.40	710.58	185.00	199.69	192.29
1998–99	289.78	42.12	803.97	145.71	186.05	210.89
1999–00	298.76	36.48	835.60	190.41	197.89	199.85
2000–01	310.45	39.25	897.27	195.36	200.30	217.74
2001–02	320.87	38.61	925.86	172.87	217.35	226.59
2002–03	375.42	42.36	961.06	208.09	241.11	239.88
2003–04	419.50	42.38	969.80	188.20	250.62	265.53
2004–05	584.54	44.04	975.48	209.24	266.68	273.71
2005–06	587.20	44.83	987.51	257.26	251.07	290.92
2006–07	658.84	43.82	1085.34	267.00	278.31	317.22
2007–08	661.56	42.95	1110.90	255.94	299.92	346.96
2008–09	716.72	44.04	1293.16	296.51	349.20	351.70
2009–10	732.63	49.02	1295.80	304.32	365.29	378.12
2010–11	735.65	55.78	1299.78	356.34	390.12	416.39
CGR	7.46	-1.10	6.23	4.04	4.23	4.62
Overall CGR	7.32	-2.84	9.29	3.60	3.71	4.45
Linear	1.55*	0.25*	1.54*	6.56*	7.39*	9.02*
Slope	(14.24)	(-7.09)	(29.16)	(10.96)	(9.31)	(13.99)
C. V	0.62	0.33	0.63	0.34	0.35	0.39

Source: Computed from the data collected from Annual Survey of Industries (ASI).

Notes: 1. Figures in parentheses are the respective calculated t values.

2. *Significant at one percent level.

growth rate pattern of these measures was 6.32, 11.12 and 9.34 respectively during the pre liberalisation era, while during post liberalisation era the same had stood at 4.04, 4.23 and 4.62 respectively. However, over the entire period of study of 30 years, these measures of total factor productivity of the industry though stood positive, had dwindled to 3.60, 3.71 and 4.45 respectively with a corresponding coefficient of variation of 0.34, 0.35 and 0.39.

The linear slope of the growth rate was significant at one percent level in terms of both partial and total factor productivity. However, it was higher in the Translog index of total factor productivity

Table 2 shows the productivity indices in the cotton textile industry at two-digit level of National Industrial Classification (NIC) code in Tamil Nadu during the pre and post-reform period.

Table 2. Partial and total factor productivity indices of cotton textile industry in Tamil Nadu

Year	Partial factor productivity			Total factor productivity		
	Index of labour productivity	Index of capital productivity	Index of capital intensity	Index of TFP (Kendrick)	Index of TFP (Solow)	Index of TFP (Translog)
1981–82	100.00	100.00	100.00	100.00	100.00	100.00
1982–83	97.89	90.30	99.31	89.95	94.80	90.23
1983–84	110.89	98.33	105.61	123.28	95.03	98.67
1984–85	90.71	94.57	128.79	114.11	113.73	95.27
1985–86	129.38	95.23	137.35	121.03	100.91	95.73
1986–87	131.10	99.68	141.68	137.62	94.74	99.99
1987–88	124.74	122.08	149.08	153.95	92.65	123.73
1988–89	154.09	107.96	135.37	155.64	107.10	109.54
1989–90	157.87	116.71	220.96	150.71	107.11	118.98
1990–91	168.08	85.69	212.85	135.67	120.74	137.47
1991–92	156.22	72.78	252.05	123.23	117.65	154.65
CGR	6.06	-0.70	9.58	3.85	1.77	4.61
1992–93	167.96	87.20	281.68	125.20	105.09	173.11
1993–94	274.39	111.98	312.96	129.32	60.63	116.48
1994–95	328.78	95.12	361.01	150.81	121.33	99.54
1995–96	332.87	66.92	340.86	149.38	126.98	100.10
1996–97	344.84	65.39	339.12	136.33	93.23	68.80
1997–98	377.41	65.77	414.77	169.41	121.24	90.67
1998–99	401.23	51.30	472.01	147.24	122.54	98.90
1999–00	444.72	56.75	492.19	125.21	72.57	110.06
2000–01	542.60	66.66	454.02	148.82	95.45	119.96
2001–02	560.84	60.80	485.50	216.68	121.60	124.26
2002–03	562.97	62.09	389.76	245.78	93.93	95.80
2003–04	638.02	55.99	318.22	200.79	99.83	99.79
2004–05	571.03	64.06	515.87	250.01	85.74	88.91
2005–06	481.86	41.48	644.01	176.48	98.80	96.17
2006–07	435.41	39.32	615.87	162.88	104.83	104.12
2007–08	440.46	33.22	627.02	137.50	105.48	117.90
2008–09	458.74	30.97	681.15	117.86	113.76	135.95
2009–10	565.12	37.23	890.10	120.38	129.16	140.28
2010–11	590.34	40.15	899.36	134.02	135.08	154.68
CGR	4.50	-5.40	5.57	0.33	1.06	0.91
Overall CGR	7.34	-3.93	7.58	1.26	0.36	0.45
Linear Slope	1.51*	0.27*	1.65*	1.91*	0.41^{NS}	0.53^{NS}
	(12.80)	(-9.70)	(14.58)	(2.63)	(1.18)	(1.10)
C. V	0.56	0.36	0.68	0.28	0.18	0.19

Source: Computed from the data collected from Annual Survey of Industries (ASI).

Notes: 1. Figures in parentheses are the respective calculated t values.

2. *Significant at one percent level.

3. ^{NS}Indicates non-significant.

7. Partial Factor Productivity Trend in Cotton Textile Industry - Tamil Nadu

It is obvious to note that the index of labour productivity had registered a compound growth rate of 6.06 during the pre-reform period (1981–82 to 1991–92), at 4.50 during

the post-reform period (1992–93 to 2010–11) and an overall compound growth rate of 7.34, all indicating a positive growth with a coefficient of variation of 0.56. On the other hand, the capital productivity index during the above mentioned period had stood at -0.70, -5.40 and -3.93 respectively, there by revealing a negative growth with a coefficient of variation of 0.36. Whereas the compound growth of the index of capital intensity of the cotton textile industry in

Tamil Nadu was also positive as that of labour productivity, by registering at 9.58, 5.57 and 7.58 respectively for the above said period with a coefficient of variation of 0.68. Further the calculated *t* values have indicated that the linear slope of the growth rate was significant in respect of all the three partial factor productivity indices at 1 percent level.

8. Total Factor Productivity of Cotton Textile Industry in Tamil Nadu

To analyse the growth of total factor productivity, the indices of Kendrick, Solow and Translog were employed, which were also disclosed in Table 2. During the pre-reform period (1981-82 to 1991-92), the compound growth of all the above three indices of total factor productivity had stood positive at 3.85, 1.77 and 4.61 respectively. Also, the compound growth of the same during the post-reform period (1992-93 to 2010-11) had all slipped to 0.33, 1.06 and 0.91 respectively, there by confirming a lower compound growth in terms of total factor productivity when compared to the pre-reform period. Further the overall compound growth rate in terms of Kendrick, Solow and Translog indices were also quite low at 1.26, 0.36 and 0.45 respectively when compared to the pre-reform period with the coefficient of variation of 0.28, 0.18 and 0.19 respectively. However the calculated *t* values have brought to the fore that the linear slope of the growth rate in respect of the total factor productivity was significant in case of Kendrick index only, while the Solow and Translog indices were found to be non-significant.

9. Key Findings of the Study

The partial factor productivity of cotton textile industry as analysed through compound growth rate on the scores of labour productivity, capital productivity and capital intensity indices during the study period of 30 years from 1981-82 to 2010-11 representing pre liberalization and post liberalization eras has divulged the following facts:

- The cotton textile industry had accomplished a positive compound growth rate on the scores of labour productivity and capital intensity in all the pre liberalization (India: 9.62, 9.43 and Tamil Nadu: 6.06, 9.58 respectively), post liberalization (India: 7.46, 6.23 and Tamil Nadu: 4.50, 5.57 respectively) and overall period of the study (India: 7.32, 9.29 and Tamil Nadu: 7.34, 7.58 respectively).

- On the contrary, the industry had confronted a negative compound growth rate on the score of capital productivity in all the pre liberalization (India: -0.69 and Tamil Nadu: -0.70), post liberalization (India: -1.10 and Tamil Nadu: -5.40) and overall period of the study (India: -2.84 and Tamil Nadu: -3.93).

Therefore, it can be concluded that in the cotton textile industry, the growth of labour productivity having been positive, while the capital productivity been negative, is undeniably due to a surge in the capital intensity.

- Exploring the total factor productivity of the cotton textile industry in India and in Tamil Nadu in terms of Kendrick, Solow and Translog indices, it has brought to light, a positive compound growth rate manifested in all the pre liberalization, post liberalization and the overall period of study. Therefore it can be asserted that the contribution of the total factor productivity to the industry's output growth had been on acceleration throughout.
- However, among the three indices employed, the overall compound growth rate of Kendrick index had stood the highest of all in case of Tamil Nadu at 1.26 with a linear slope of 1.91 found to be significant at 1 percent level. This indicates its association to the industry's output growth being more fitting than that of the other two indices employed in the study.

10. Conclusion

Modernisation and upgradation of technology is the order of the day in all industries across the country and to this, the cotton textile industry is no exception. In fact, the study has disclosed that the passion for technology, that is, capital intensity has become more visible and a prominent partial factor stimulating productivity in the cotton textile industry in India and as well as in Tamil Nadu. Therefore, the need of the hour is to organize structured training programmes for workers and managers on logical and competent production methods to accelerate the labour and capital productivity to go in pace with the rapid capital intensity. Thus the liberalization policy is undoubtedly a boost to the cotton textile industry to reap favourable results.

11. References

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