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PRODUCTIVITY GROWTH AND PRODUCTION STRUCTURE IN SMALL SCALE INDUSTRIAL SECTOR: A COMPARISION OF PUNJAB AND HARYANA

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ABSTRACT

The major thrust of the present paper is to analyse the inter-temporal variations in the total factor productivity growth of the Small-Scale Industrial sector in India with specific reference to Punjab and Haryana for the period 1971-2006. Total factor productivity (TFP), and Partial productivity during the period 1971-2006, pre-reform period (1971-1990) and Post- reform period (1991-2006) are estimated by using the Kendrick index of TFP growth. The paper also estimates the production structure using Cobb-Douglas and CES production function. The findings of the present study are quite interesting. Results reveal that the economic reform package failed to sustain the TFP growth and led to decline in the average annual growth rates.

KEYWORDS

Small Scale Industrial Sector, Productivity Growth, Production Structure, Regional level.

INTRODUCTION

The Small Scale Industrial sector plays a vital role in the industrial development of any country. The importance of the Small Scale Industrial Sector is well-recognized world over for its significant contribution in gratifying various socioeconomic objectives, such as higher growth of employment, output, promotion of exports and fostering entrepreneurship. The small scale industrial sector in India employs 31.25 million people and produces over 8,000 industrial items with the product range varying from very simple items produced with traditional technology to hi-tech products like electronic goods, television sets, engineering products, etc. At present, the Small Scale Industry (SSI) sector accounts for over 90% of industrial units in the country, 8 percent in the GDP and approximately 40 percent of India's exports Directorate of Industries (2005). Since 2006 small industries include all those units having a fixed capital of Rs. 5 crores invested in plant and machinery. From employment point of view SSI have special significance because of its low investment requirements. As per the census report of the year 2001-02, employment generated by SSI per Rs.1 Lakh investment was 1.39, while employment generated by large scale industry was 0.20 implying that large scale industry requires an investment of Rs. 5 lakh to generate employment for one person whereas SSI generates employment for 7 persons with same investment. Thus, the SSI provides 7 times more employment with the same level of investment in large scale industry.

Further, SSI sector is a major source of raw material for some large scale industries. The spread of the SSI will prevent the concentration of economic power in a section of society. Moreover, most of these industries were characterized as being environmentally friendly. The possibility of establishing these industries in different regions is favorable because they do not need a special infrastructure, once these industries are well established then the encouragement of their spread in the rural regions will help to achieve many of the social and economic goals, such as increasing income in rural areas, controlling the migration from rural areas to cities and controlling demographic growth.

Hence, the SSI sector plays a significant role in determining the growth performance of Indian economy. Thus, the Government of India took a number of steps for promoting SSI sector in India by establishing Handloom board, Handicraft board, Cottage industry board, Khadi and Village industry board, etc. to augment the performance of SSI in India. Despite these efforts of Indian government 1,30,041 sick units in Indian small scale industry have been observed in the year 2005. A huge number of sick units, therefore, portray the gloomy picture of the health status of the Indian SSI. Therefore, any attempt to analyze the sources of growth of Indian SSI gains worth to study the health status of small scale industry of India.

Some of the studies have endeavored to analyze the structure and performance of SSI in India, Punjab and Haryana. Brahmananda (1982), Pandit, (1985), Golder, (1986), Gupta, (1990) Ramaswamy (1994), Chand (2000), Sahoo (2003), Venkataramaiah (2003), Golder, (2004), Latha (2005). Veeramani, (2005), Gupta, (2006), However, none of these studies attempted the task of measuring the production structure and TFP growth in small scale industrial sector at regional level. The present study tries to enrich the existing literature on measuring the TFP growth of SSI in India and endeavored to ascertain the production structure in it.

METHODOLOGY APPLIED

The present study utilizes the simple arithmetic indices, to obtain the total factor productivity (TFP) growth in small scale industrial sector. The TFP is taken as a weighed arithmetic mean of factor inputs with weights being the respective income share:

$$TFP_t = \frac{(y_t / y_0)}{\sum_{i=1}^{k} S_i (X_{i,t} / X_{i,0})} \quad (1)$$

Where S_i is income share of the input i. The most important widely used variant of arithmetic indices is Kendrick index. The Kendrick index (1961) of TFP is based on a linear production function, which assumes infinite elasticity of substitution between factors of production. The Kendrick index is defined as:

$$TFP_t = \frac{y_t}{\sum_{i=1}^{k} W_{i,0} X_i} \quad (2)$$

Where, $W_{i,0}$ refers to the reward of the input in the base year. The arithmetic index of TFP growth rate from base year 0 to period 1 is expressed as:

$$\frac{\dot{TFP}}{TFP} = \frac{y_1 / y_0}{\sum_{i=1}^{k} W_{i,0} X_{i,1} \Big/ \sum_{i=1}^{k} W_{i,o} X_{i,0}} \quad (3)$$

Where TFP indicates the rate of change of TFP with respect to time. The present exercise also attempts to estimate different productivity components of technical change with the use of the production function approach. A production function captures the relationship between the output(s) obtained from a given set of inputs at a specified stage of technical change. The present study restricts itself to the use of the following specific forms of production functions: 1) Cobb-Douglas (CD) Production Function, and 2) Constant Elasticity of Substitution (CES). In the Cobb-Douglas production function, the marginal product of labor and capital, the sources of output growth, and the returns to scale can be estimated. In the CES production function, one can obtain the parameter of elasticity of substitution, apart from those estimated by the CD production function. CES is more general than the CD in the sense that it does not assume the elasticity of substitution to be unity. In algebraically form production function can be represented as:

Q = f(K,L)

Where, K ≥0 and L ≥0 represent the amount of capital and labor, and represent the value added. In particular, CD and CES production functions, respectively, can be specified as follows:

$$Q = AK^{\alpha}L^{\beta} \quad (4)$$

$$Q = A\left[\delta K^{-\rho} + (1-\delta)L^{-\delta}\right]^{\frac{v}{\rho}} \quad (5)$$

In the former case, coefficients α and β represent the elasticity of output with respect to capital and labor respectively. The value of $\alpha+\beta$ provides a measure of *returns-to-scale*, which may be increasing, constant or decreasing according as the value of $\alpha+\beta$ is greater than, equal to, or less than unity, respectively.

However, the introduction of the Harrod neutral type of technical progress in the two production functions adapts the production technology as follows:

$$Q = AK^{\alpha}L^{\beta}e^{\lambda t} \quad (6)$$

$$Q = Ae^{\lambda t}\left[\delta K^{-\rho} + (1-\delta)L^{-\delta}\right]^{\frac{v}{\rho}} \quad (7)$$

Where, *t* represents the time trend and the parameter λ represent the rate of disembodied technical change.

In CES specification, one can estimate the parameters related to efficiency (*A*), technical change (λ), distribution (δ), returns-to-scale (*v*), and elasticity of substitution (ρ). The specification of the Cobb-Douglas production function can be arrived at without and with the rate of technical progress:

$\text{Log } Q = a_0 + a_1 \log K + a_2 \log L$ (8)

and

$\text{Log } Q = a_0 + a_1 \log K + a_2 \log L + a_3 \log t$ (9)

The CES production function is intrinsically non-linear, which means that there is no way that parameters can be estimated directly by ordinary least square (OLS). However, Kmenta (1967) suggested that the OLS technique could be used, by showing that, the CES form (4) could be approximated by the following equation:

$\text{Log } Q = \text{Log } A + v\,\delta \log K + v(1-\delta) \log L - 1/2\,\rho\, v(1-\delta)(\log K - \log L)^2$

This form is similar to the CD specification except for the addition of the squared term. The above form can be written more clearly, without and with technical change

$\text{Log } Q = a_0 + a_1 \log K + a_2 \log L + a_3 (\log K - \log L)^2$ (10)

and

$\text{Log } Q = a_0 + a_1 \log K + a_2 \log L + a_3 (\log K - \log L)^2 + a_4 \log t$ (11)

Respectively, where

Efficiency: $A = e^{a_0}$

Distribution: $\delta = \frac{a_1}{a_1 + a_2}$

Scale: $v = a_1 + a_2$

Substitution: $\rho = \frac{-2a_3}{a_2}$ and $\sigma = \frac{1}{1+\rho}$

Technical Progress: $\lambda = a_4$

The estimation of Cobb-Douglas and the CES functions, without and with 'technical change' parameter, represented by equations (8), (9), (10) and (11), can be estimated by using the-method of ordinary least squares.

SOURCES OF DATA AND CONSTRUCTION OF VARIABLES

It is evident from above discussion that for obtaining the arithmetic index (i.e., Kendrik index) of TFP and estimating a production function requires a well defined set of output and input variables. In the present study, we considered only one output (gross output at constant prices) and two inputs (gross fixed capital at constant prices and number of employees). The required data have been collected from various issues of economic survey, Directorate of Industries

government of Punjab and Haryana and downloaded from the official web site India Stat. The present study is confined to the period from 1971-72 to 2006-07. The choice of terminal year is governed by the availability of latest data from the Ministry of Statistics and Program Implementation (MOSPI). All monetary data have been deflated by using appropriate price deflators. The gross output figures at constant prices have been utilized as an index of output. Following Jayadevan (1995) and Goldar (1986), we preferred the use of 'gross output' in place of 'net output' because depreciation charges in the Indian industries are known to be highly arbitrary and fixed by the income tax authorities and seldom represent true/actual capital consumption.

The gross fixed capital stock has been utilized as a measure of capital input. The standard practice of perpetual inventory method has been followed here to generate the series of gross fixed capital stock at constant prices. This requires a gross investment series, an asset price deflator, a depreciation rate, and a benchmark capital stock. We followed the procedure adopted by Austria and Martin (1995) and Wu (1997) for getting an estimate of initial value of capital stock. This procedure involves the following steps:

Step 1: Download the figure of fixed investment in SSI sector of Punjab, Haryana and of India, deflate the current prices figures at the constant prices using 'Price index of machinery and machine tools', given by using relationship:

$I_t = GFI_t/P_t$

Where,

GFI_t = Fixed Investment at current prices in the year t; and

P_t = Price index of machinery and machine tools in the year t.

Step 2: The logarithm of gross real investment was first regressed against a time trend to obtain its average growth rate ω and a trend value of investment at the beginning of the same i.e., I_0.

Step 3: Making the conventional assumption that the capital stock grows at a steady state at time t_0 the value of capital stock for initial year (K_0) has been estimated as:

$$K_0 = \frac{I_0}{\omega + \delta}$$

Where,

K_0= Gross value of initial capital stock;

ω= Estimated growth rate of investment; and

δ = Annual rate of discarding of capital.

In the present analysis, we have taken annual rate of discarding of capital equals to 5 percent.

Step 4: After obtaining the estimate of fixed capital for the benchmark year, the following equation has been used for the measurement of gross fixed capital series at 1981-82 prices:

$K_t = K_{t-1} + I_t - \delta K_{t-1}$

Where, K_t = Gross fixed capital at 1981-82 prices by the end of year t; I_t = Gross real investment in fixed capital during the year t; and δ = Annual rate of discarding of capital.

In present study, the number of employees consisting of both non-production and production workers has been taken as the measure of labour market. After obtaining all the outputs and factor inputs, the variables have been divided by the number of SSI units operating in Punjab, Haryana and In India. The figures of number of SSI units have also been downloaded from the same above mentioned sources. Thus, the figures obtained by dividing the output and input variables by number of SSI units will provide Gross Output per SSI unit, Labour per unit and GFC per SSI units.

EMPIRICAL RESULTS

Table 1 provides the empirical evidences regarding the partial and total factor productivity growth in small scale industrial sector in India. The total factor productivity in SSI of India has been observed to be growing at an average annual growth rate of 1.11 percent per annum. The inter-temporal analysis of TFP growth provides that the TFP scores vary between the minimum of 0.63 for the year 1996-97 and the maximum of 3.07 for the year 1989-90. Thus, there exist huge variations in the TFP growth of Indian small scale industry. Further, a comparison of the growth rates of three measures of productivity over two different sub-periods (i.e., pre-reforms and post-reforms) reveals an upward trend during the pre-reforms period. However, the economic reforms package failed to sustain the TFP growth as a downward trend for the three measures has been noticed. A decline in the average annual growth rate of TFP from 1.64 percent per annum during the pre-reforms period to the 0.72 percent per annum during the post-reforms period imitate the fact that TFP has declined at a severe rate during the post-reforms period. The observed decline is statistically significant as the observed value of the Kruskal-Wallis test is significant at 1 percent level of significance.

The decomposition of the TFP growth in the partial productivity measures i.e., labour productivity and capital productivity reflects that the labour productivity growth is the major contributor of the TFP growth in Indian SSI sector. The labour productivity is contributing about 83 percent of TFP growth and the remaining portion is contributed by the capital productivity. Moreover, the decline TFP growth has been contributed by the declines in the labour and capital productivities to the tunes of 37.38 percent (i.e., ((0.717-1.145)/0.717)×100) and 98.57 percent (i.e., (0.007-0.490)/0.490)×100), respectively. Thus, the capital productivity regress by about 100 percent is the major factor and labour productivity decline is relatively feeble source of declining TFP growth in Indian small scale industry. The Kruskal-Wallis test also support the inference of significant decline in TFP growth in Indian small scale industry. However, the capital productivity has been observed to be negative during the later years of the study period.

The empirics regarding the production structure of Indian small scale industrial sector have been given in Table 2. The estimated coefficient of technical progress is -0.1 percent per annum and thus, reflects a negative growth of technology in Indian small scale industrial sector. However, this technical regress is statistically insignificant and thus, proves the situation of technology stagnation in Indian SSI sector. Further, the significant value of 3.69 for the squared item supports the suitability of the CES production function and refutes the application of Cobb-Douglas type of production technology in SSI sector of India.

TABLE 1: PARTIAL AND TOTAL FACTOR PRODUCTIVITY GROWTH IN SMALL SCALE INDUSTRIAL SECTOR IN INDIA

Year	Labour Productivity Growth	Capital Productivity Growth	TFP Growth (Kendrick Index)
1971-72	-----	-----	-----
1972-73	0.998	0.049	1.047
1973-74	0.964	0.101	1.065
1974-75	1.033	0.073	1.106
1975-76	0.943	0.158	1.101
1976-77	0.991	0.216	1.207
1977-78	1.032	0.273	1.305
1978-79	0.918	0.388	1.306
1979-80	1.195	0.489	1.684
1980-81	1.252	0.537	1.789
1981-82	1.163	0.532	1.695
1982-83	1.084	0.546	1.630
1983-84	1.153	0.643	1.796
1984-85	1.217	0.748	1.965
1985-86	1.299	0.863	2.162
1986-87	1.392	0.97	2.362
1987-88	1.505	1.084	2.589
1988-89	1.606	1.180	2.786
1989-90	1.756	1.315	3.071
1990-91	0.735	0.487	1.222
1991-92	0.651	0.246	0.897
1992-93	0.569	0.126	0.695
1993-94	0.579	0.069	0.648
1994-95	0.630	0.029	0.659
1995-96	0.655	-0.009	0.646
1996-97	0.662	-0.031	0.631
1997-98	0.682	-0.050	0.632
1998-99	0.710	-0.067	0.643
1999-00	0.716	-0.075	0.641
2000-01	0.744	-0.083	0.661
2001-02	0.718	-0.080	0.638
2002-03	0.741	-0.081	0.660
2003-04	0.795	-0.085	0.710
2004-05	0.854	-0.091	0.763
2005-06	0.890	-0.086	0.804
2006-07	0.991	0.007	0.998
Average	**0.924**	**0.186**	**1.110**
Pre-Reforms	**1.145**	**0.490**	**1.635**
Post-Reforms	**0.717**	**0.007**	**0.724**
Kruskal Wallis	**18.350****	**23.684****	**24.668****
Note: ** represents that coefficient is significant at 1 percent level of significance.			
Source: Author's Calculations			

The estimates of the parameters of CES production function have been provided in Table 3. The efficiency parameter of the CES production function has been observed to the level of 0.774. Thus, the SSI sector of India is operating with an average inefficiency to the tune of 22.6 percent per annum. In general, if the SSI sector of India operates on efficient frontier then 22.6 percent more output can be produced with same bundle of inputs. The distribution parameter observed to the tune of 62.14 percent reveals that the share of capital in total value added is 62.14 percent whereas the remaining of the 37.86 percent of the output is shared by the labour. The value of the returns-to-scale parameter is greater than one and thus, the existence of increasing returns-to-scale has been observed in Indian SSI. Therefore, the modernizations and up gradation of technology in Indian SSI can help to improve the performance of the industry. The elasticity of substitution is less than unity and observe to be very low i.e., 0.2049. Hence, labour and capital are imperfect substitutes and thus, support the inference that labour cannot be substituted for capital and vice-versa.

TABLE 2: THE CES PRODUCTION FUNCTION ESTIMATION FOR INDIAN SMALL SCALE INDUSTRIAL SECTOR IN INDIA

Parameter	Value	*P-Value*
Intercept	-0.256	0.0001
LL	1.900	0.0001
LK	-0.728	0.0001
T	-0.001	0.934
$(LK\text{-}LL)^2$	3.687	0.0001
Notes: i) The Lower and Upper bounds have been obtained using 95 percent level of confidence; ii) * signifies that the coefficient is significant at 5 percent level.		

Source: Author's Calculations

In sum, the analysis reveals a huge variation in the TFP growth and partial productivity measures of Indian small scale industrial sector. The economic reforms have found to be adversely affected the three measures of productivity performance in Indian SSI sector. The characteristics of the production structure in Indian SSI sector reveals increasing returns-to-scale and limited substitutability of two factors of production. The efficiency parameter reflects that SSI sector in India is operating with a high level of production inefficiency which can be mitigated with the introduction of advance and upgraded technology given the increasing returns-to-scale.

TABLE 3: PARAMETERS OF CES PRODUCTION FUNCTION WITH TECHNICAL PROGRESS

Variables/Parameter	Estimated Coefficient
Efficiency ($\hat{A}$)	0.7741
Distribution ($\hat{\delta}$)	0.6214
RTS ($\hat{v}$)	1.172
Elasticity of Substitution ($\hat{\sigma}$)	0.2049
Technical Progress	-0.1000
Notes: RTS represent *returns-to-scale*.	

Source: Author's Calculations

PRODUCTION STRUCTURE IN SSI SECTORS OF PUNJAB AND HARYANA

Regarding the production growth and production structure of small scale industrial sector of Punjab, it has been observed that both capital productivity and total factor productivity (TFP) growth are declining over the study under evaluation. The average TFP growth observed in the Small scale industrial sector of Punjab is at the rate of 3.23 percent per annum. The major contributor of this growth rate is capital productivity improvement. Table 4 depicts sharp decline in capital productivity of small scale industrial sector of Punjab up to 1991, however, after the year 1991, a mild improvement has been observed in labour and capital productivity measures. After 1991, the trend has started rising upward although the average growth rate of TFP has reduced from 3.61 percent during pre-reform period to 2.89 percent during the post reform period. This decline is statistically significant in both capital and labour productivity indices.

TABLE 4: PARTIAL AND TOTAL FACTOR PRODUCTIVITY GROWTH IN SMALL SCALE INDUSTRIAL SECTOR OF PUNJAB

Year	Labour Productivity Growth	Capital Productivity Growth	TFP Growth (Kendrick Index)
1971-72	-----	-----	-----
1971-72	1.002	13.084	14.086
1972-73	1.002	6.755	7.757
1973-74	1.002	4.481	5.482
1974-75	1.002	3.433	4.435
1975-76	1.002	3.330	4.331
1976-77	1.002	3.043	4.045
1977-78	1.002	2.715	3.717
1978-79	1.002	2.602	3.604
1979-80	1.001	2.308	3.310
1980-81	1.001	2.096	3.097
1981-82	1.001	2.053	3.054
1982-83	1.001	2.061	3.062
1983-84	1.001	1.931	2.932
1984-85	1.001	1.789	2.790
1985-86	1.001	1.713	2.714
1986-87	1.001	1.619	2.620
1987-88	1.001	1.563	2.564
1988-89	1.001	1.558	2.559
1989-90	1.001	1.521	2.522
1990-91	1.001	1.493	2.494
1991-92	1.001	1.359	2.360
1992-93	1.001	1.417	2.418
1993-94	1.001	1.650	2.651
1994-95	1.001	1.725	2.726
1995-96	1.001	1.695	2.696
1996-97	1.001	1.765	2.766
1997-98	1.001	1.880	2.881
1998-99	1.001	1.843	2.844
1999-00	1.001	1.918	2.920
2000-01	1.001	1.856	2.857
2001-02	1.001	1.876	2.877
2002-03	1.001	1.897	2.898
2003-04	1.002	1.892	2.894
2004-05	1.002	1.940	2.942
2005-06	1.002	2.023	3.025
2006-07	1.024	2.503	3.527
Average	**1.002**	**2.175**	**3.236**
Pre-Reforms	**1.001**	**2.519**	**3.613**
Post-Reforms	**1.003**	**1.811**	**2.819**
Kruskal Wallis	**3.001**	**20.321****	**18.996****
Note: ** represents that coefficient is significant at 1 percent level of significance.			

Source: Author's Calculations

In nutshell the overall picture reveals that the average TFP growth has although observed less than pre-reform period, yet a U-turn has started a phase of slow improvement in productivity growth rate of small scale industrial sector of Punjab. To explain the production structure of Punjab, CES production function has been estimated, the parameter α_3 has been observed insignificant and thus, CD production function has been found an appropriate choice for explaining the production structure of SSI sector of Punjab. The application of CD production function provides an insignificant technical regress in the SSI sector of Punjab in comparison to capital elasticity of output, labour elasticity of output is much higher in the SSI sector under evaluation. Further the nature of return to scale is increasing, which means that modernization policy can help the SSI of Punjab to improve its output in general and productivity growth in particular.

TABLE 5: THE COBB-DOUGLAS PRODUCTION FUNCTION ESTIMATION FOR SMALL SCALE INDUSTRIAL SECTOR OF PUNJAB

Parameter	Value	P-Value
Intercept	-7.252	0.0001
LL	2.102	0.0001
LK	0.053	0.0001
T	-0.023	0.934
Notes: i) The Lower and Upper bounds have been obtained using 95 percent level of confidence; ii) * signifies that the coefficient is significant at 5 percent level.		

Source: Author's Calculations

TABLE 6: PARAMETERS OF CD PRODUCTION FUNCTION WITH TECHNICAL PROGRESS

Variables/Parameter	Estimated Coefficient
Efficiency ($\hat{A}$)	0.001
RTS ($\hat{v}$)	2.551
Technical Progress	-2.3 Percent
Notes: RTS represent returns-to-scale.	
Source: Author's Calculations	

Source: Author's Calculations

In the Small Scale Industrial sector of Haryana, a cyclical trend, all most like the trend of All India small scale industrial sector, has been observed However in contrast of small scale industrial sector of Punjab, the labour productivity is the major source and capital productivity is the scant source of TFP. Improvement in the SSI sector of Haryana as against stagnate labour productivity growth in SSI sector of Punjab; however an insignificant in capital productivity has been observed in the small scale industrial sector of Haryana. The overall analysis of the growth rate depicts a growth of TFP at the rate of 1.73 percent in the small scale industrial sector of Haryana, about 1 percent of this growth rate has been contributed by labour productivity while the rest is coming from capital productivity growth.

The analysis of impact of economic reforms delineates minute reduction in growth of TFP. However, the major source of this reduction in TFP during the post-reform period is fall in the average growth rates of capital productivity by 0.51 percentage point (0.9566 -0.4467). The analysis of production structure of Haryana also supports application of C-D production function. Table 8; provide the estimated coefficients of C-D production function which reveals an insignificant technical progress at the rate of 1.2 percent per annum. Here also labour elasticity is comparatively large than capital elasticity of output. Return to scale parameters reveals the existence of increasing return to scale in the small scale industrial sector of Haryana. Therefore, the observed production structure calls for modernization in small scale industrial sector in Haryana and exploit the capital productivity up to its optimum extent. These results are in lines of production structure observed in small scale industrial sector of Punjab.

TABLE 7: PARTIAL AND TOTAL FACTOR PRODUCTIVITY GROWTH IN SMALL SCALE INDUSTRIAL SECTOR OF HARYANA

Year	Labour Productivity Growth	Capital Productivity Growth	TFP Growth (Kendrick Index)
1971-72	1.0008	0.6931	1.6940
1972-73	1.0009	0.7578	1.7587
1973-74	1.0012	0.8922	1.8934
1974-75	1.0012	0.8318	1.8330
1975-76	1.0012	0.9454	1.9467
1976-77	1.0014	1.0592	2.0606
1977-78	1.0015	1.1074	2.1089
1978-79	1.0017	1.2899	2.2916
1979-80	1.0017	1.3223	2.3241
1980-81	1.0019	1.4230	2.4250
1981-82	1.0014	1.1503	2.1516
1982-83	1.0012	1.0562	2.0574
1983-84	1.0010	1.0013	2.0023
1984-85	1.0011	1.0397	2.0407
1985-86	1.0010	0.9253	1.9263
1986-87	1.0009	0.9143	1.9152
1987-88	1.0009	0.8510	1.8519
1988-89	1.0008	0.8017	1.8025
1989-90	1.0007	0.7608	1.7615
1990-91	1.0008	0.7069	1.7077
1991-92	1.0006	0.6424	1.6430
1992-93	1.0005	0.6013	1.6019
1993-94	1.0005	0.5714	1.5719
1994-95	1.0004	0.5224	1.5228
1995-96	1.0004	0.4957	1.4961
1996-97	1.0004	0.4844	1.4848
1997-98	1.0004	0.3146	1.3149
1998-99	1.0004	0.2344	1.2348
1999-00	1.0003	0.2349	1.2352
2000-01	1.0003	0.2257	1.2260
2001-02	1.0005	0.3961	1.3966
2002-03	1.0006	0.4454	1.4460
2003-04	1.0007	0.5181	1.5187
2004-05	1.0007	0.5732	1.5740
2005-06	1.0007	0.5836	1.5843
2006-07	1.1256	0.7598	1.8854
Average	**1.0041**	**0.6820**	**1.7306**
Pre-Reforms	**1.0012**	**0.9566**	**1.9677**
Post-Reforms	**1.0079**	**0.4467**	**1.4739**
Kruskal Wallis	**1.258**	**12.668***	**10.254****
Note: ** represents that coefficient is significant at 1 percent level of significance.			

Source: Author's Calculations

TABLE 8: THE COBB-DOUGLAS PRODUCTION FUNCTION ESTIMATION FOR SMALL SCALE INDUSTRIAL SECTOR OF HARYANA

Parameter	Value	*P-Value*
Intercept	-5.858***	0.009
LL	1.397**	0.031
LK	0.341	0.465
T	0.012	0.841
Notes: i) The Lower and Upper bounds have been obtained using 95 percent level of confidence; ii) * signifies that the coefficient is significant at 5 percent level.		

Source: Author's Calculations

TABLE 9: PARAMETERS OF CES PRODUCTION FUNCTION WITH TECHNICAL PROGRESS

Variables/Parameter	Estimated Coefficient
Efficiency ($\hat{A}$)	0.003
RTS ($\hat{\nu}$)	1.738
Technical Progress	1.2 percent
Notes: RTS represent *returns-to-scale*.	

Source: Author's Calculations

CONCLUSIONS AND POLICY IMPLICATIONS

The present study has been conducted with an objective to analyze the production structure and productivity growth in small scale industrial sector in India with specific reference to Punjab and Haryana for the period of 36 years spanning over 1971-72 to 2006-07. The analysis regarding the TFP growth provides that the total factor productivity in SSI is growing at an average annual growth rate of 1.110 percent per annum. The inter-temporal analysis of TFP growth identify a huge variations in TFP growth as the TFP growth rates vary between the minimum of 0.631 for the year 1996-97 and the maximum of 3.071 for the year 1989-90. The comparison of the growth rates of three measures of productivity over two different sub-periods (i.e., pre-reforms and post-reforms) reveals a sharp and statistically significant decline in the trends of three measures of productivity during the post-reforms period in comparison to the pre-reforms period.

The decomposition of the TFP growth in the partial productivity measures i.e., labour productivity and capital productivity reflects that the labour productivity growth is the major contributor of the TFP growth in Indian SSI. The labour productivity is contributing about 83 percent of TFP growth and the remaining portion is contributed by the capital productivity. Moreover, declining in capital productivity is the major source of TFP regress during the post-reforms period. The empirics regarding the production structure of Indian small scale industry provides a negative growth of technology in Indian small scale industry. However, this technical regress is statistically insignificant and thus, proves the situation of technology stagnation in Indian SSI. The estimates of the parameters of CES production function support the existence of increasing returns-to-scale and limited substitutability of two factors of production. The efficiency parameter reflects that Indian SSI is operating with a high level of production inefficiency which can be mitigated with the introduction of advance and upgraded technology given the increasing returns-to-scale.

The comparative analysis of productivity growth trends in Punjab and Haryana reveals a decline in productivity growth rate during the post reform period. In both the states however, if we compare the components of productivity growth then capital productivity growth is the major source of TFP in the small scale industrial sector of Punjab, whereas labour productivity growth is the major source of TFP in the small scale industrial sector of Haryana. The analysis of production structure discloses that in small scale industrial sector of Punjab their exists an insignificant technical regress in comparison to an insignificant technical progress in small scale industrial sector of Haryana. The observation regarding production elasticity and return to scale parameters of CD production function conforms that in both states labour elasticity dominates the capital elasticity and their exists increasing return to scale. Hence their exists ample scope for modernization in the small scale industrial sector both the states under eavluattion.

In sum, the analysis portrays the gloomy picture of Indian small scale industry. The TFP in SSI is growing at a slower rate below 2 percent per annum during the entire and pre-reforms study period. The opening up the economy seems to have adversely affected the performance of the SSI of India. The post-reforms TFP growth has been observed even below unity and thus, supports the inference of adverse effect of economic reforms on the growth performance of SSI. The stiff regulatory environment and cutthroat foreign competition imposed upon the industry during the post-reforms period seems to be imparting significant adverse impact and need to be scrutinized thoroughly by the policy planners of India. An improvement in the product quality via using upgraded technology seems to be the important policy tools for augmenting the TFP growth in Indian SSI sector. Further, the appropriate marketing of the products of SSI sector through arranging trade fairs is required by which the industry owners can sell their product at the relevant prices and avoid the sickness of the industry. Therefore, any policy which consists of the instinct of raising quality of the products of SSI sector will surely help the Indian SSI sector and the region under study to withstand against the deregulatory environment and foreign completion imposed upon after liberalization of Indian economy.

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