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Growth and Productivity Analysis of non Metallic Minerals Products Industry of Punjab

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Abstract : In the fast changing liberalized global environment where growth and productivity have emerged as the important agents of growth and development, present study is an effort to investigate growth pattern and productivity trends of small scale non metallic mineral products industry in Punjab. The growth of industry has been measured in terms of four variables namely: number of units, fixed investment, direct employment and production. Yearly growth rates have been computed to mirror year to-year fluctuations in growth and compound annual growth rates (CAGRs) have been worked out to find the impact of the policies of liberalized regime on growth of this industry. Productivity trends have been sketched in terms of capital intensity, capital output ratio and partial factor productivities. The study observed that the significant growth rate was observed in the variables namely number of units, fixed investment and production. But the policies of liberalized regime have resulted in qualitative rather than quantitative growth in the small scale non-metallic minerals products industry in Punjab. Highly significant growth rate was recorded in fixed investment and production, a slow growth was noticed in number of units but insignificant growth was gauged in employment during the liberalization period. However, in the overall period of the study, significant growth rate was registered in the case of all the four variables. Thus, it could safely be inferred from the analysis that the liberalization has resulted in jobless growth as the rate of growth of employment has gone down miserably. The profile of labour and capital productivity reflects that in absolute terms the labour and capital productivity and the capital intensity exhibited significant growth rate capital output ratio recorded negative growth during the liberalization period. The comparative profile of pre-liberalization and liberalization period indicates that during liberalization period, productivities of labour and capital accompanied by capital intensity have improved significantly whereas capital output ratio decelerated.

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I. INTRODUCTION

In Punjab, agricultural growth has saturated and the state government is making every effort to develop secondary and tertiary sectors in order to augment the income of its people. But the efforts of the state government faced numerous challenges which are

factors like militancy and global factors like WTO etc. Still, the small scale industry of the state is able to confined not only to the adverse geo-political situation of the state but also relate to various socio-economic withstand all the challenges. The small scale non-metallic minerals products industry which constitutes-manufacture of glass and glass products, cement, lime and plaster, articles of concrete, cutting, shaping and finishing of stones, manufacture of structural non-refractory clay and ceramic products etc., has demonstrated remarkable resilience and succeeded in strengthening its footholds despite the economic challenges unleashed by the policies of the liberalized regime. The policies of the liberalized regime aim to dismantle all the growth retarding structures to trade, investment and productivity. Removal of quantitative and non-quantitative restrictions, rationalization of subsidies, toning up tax administration, easing regulatory controls etc are some of the hallmarks of the liberalized regime. And as a consequence of this, competition has increased manifold, compelling the businesses to enhance productivities in order to survive in the market. Despite the challenges during pre-liberalization and liberalization period, small scale non-metallic minerals products industry of Punjab has made significant growth.. The small scale non-metallic minerals products producing units in the small scale sector were only 756 in the year 1980-81 which soared to 1980 units in 1991-92 and further grew to the level of 2682 in 2004-05. As regards employment the industry provided employment to 8212 persons in the year 1980-81 which surged to 23862 persons in the year 1991-92 and further climbed to the level of 33758 persons in the year 2004-05. In the sphere of fixed capital investment, it was only 6.28 crores of rupees in the year 1980-81 which jumped to Rs. 33.81 crores in 1991-92 and further advanced the level of Rs. 109.36 crores in 2004-05. Similarly the value of production of small scale chemical products industry of Punjab was a only worth Rs. 25.47 crores in the year 1980-81, entailed to the level of Rs. 114.03 crores in the year 1991-92 and further enhanced to the level of Rs. 489.75 crores in the year 2004-05 (Directorate of Industries, Punjab ,2005) .

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II. OBJECTIVES OF THE STUDY

Analysis of growth and productivity of an industry plays an instrumental role in framing a pragmatic and result oriented industrial development strategy. In this study, an attempt has been made to dig the facts about small scale non-metallic minerals products industry in Punjab which can be treated as a catalytic agent for the cause of appropriate policy formulation. The specific objectives of the study were:

- 1 To compute partial productivity of labour (AOLR) and partial productivity of capital (AOCR).
- 2 To analyse the comparative picture of growth of number of units, fixed investment, direct employment and production during pre-liberalization and liberalization periods.
- 3 To calculate average capital output ratio and capital intensity of labour in small scale non-metallic minerals products industry of Punjab.

III. DATA BASE AND METHODOLOGY

Present study is based on secondary data for the period of 25 years i.e. 1980-81 to 2004-05. (Due to change in classification of industries, it is not possible to get the data as per requirement for the next four years because that data will not be in uniformity with that for the last 25 years, still study finds data for the 25 years sufficient to draw various conclusions). The data relating to number of units, direct employment, fixed capital and production of small scale non-metallic minerals products industry at aggregate level for the above said period were culled from Directorate of Industries, Punjab. Since the figures of fixed capital and production were given at current prices, these have been converted into constant prices by deflating them with index number of the wholesale prices of manufactured products total, taking 1993-94 as the base year. Yearly growth rates for all the four variables were computed to capture year-to-year fluctuations in growth.

Partial productivities of labour and capital were obtained as O/L and O/K. For making an assessment of the extent of amount of units of capital that are needed to produce a certain level of output as well as the capital intensity, K/O and K/L ratios were computed. Compound Annual Growth Rates (CAGRs) for overall period (1980-81 to 2004-05) and two sub-periods: pre-liberalization (1980-81 to 1991-92) and liberalization periods (1991-92 to 2004-05) for all the eight variables were estimated by fitting an exponential function of the following form

$$Y_t = \beta_0 \beta_1^t e^{U_t} \quad (1)$$

Where Y_t is dependent variable, β_0 and β_1 are the unknown parameters, and U_t is the disturbance term. The equation (1) could be written in the logarithmic form as follows:

$$\log Y_t = \log \beta_0 + t \log \beta_1 + U_t \quad (2)$$

Above equation was estimated by applying Ordinary Least Square Method and compound rate of growth (gr_c) was obtained by taking antilog of estimated regression coefficient, subtracting 1 from it and multiplying the difference by 100, as under:

$$gr_c = (\hat{\beta}_1 - 1) \times 100 \quad (3)$$

Where $\hat{\beta}_1$ is an estimate for β_1 . The significance of growth rates was tested by applying t – test, given as follows:

$$t = \frac{\hat{\beta}_1}{s(\hat{\beta}_1)} \sim t(n-2) \text{ d.f.} \quad (4)$$

Where $\hat{\beta}_1$ is the regression estimate, $s(\hat{\beta}_1)$ is the respective standard error. All statistically insignificant growth rates are treated as almost zero growth rates. (Gupta and Kumar, 2006).

IV. RESULTS AND DISCUSSION

This section presents the results and discussion of the study. The first subsection is devoted to the analysis of compound annual growth rates of number of units, employment, fixed capital and production. The second subsection is devoted to the profile of capital intensity, capital-output ratio and partial productivities of labour and capital in small scale non-metallic minerals products industry.

V. SECTION – I

a. Growth Performance

Measurement of growth has been one of the most extensively researched areas. The growth rate analysis provides the detailed vision of growth. The year to year growth rates and compound annual growth rates (CAGRs) of number of units, fixed investment, employment and production of small scale non-metallic minerals products industry are shown in table I. The results have been discussed in brief under the following four sub heads:-

Insert Table-I

b. Number of units

The year-to-year growth rates of number of units as demonstrated in column II of table I suggests a growth trend but with a downward bias. Commencing from the level of 12.17 percent in 1981-82 touched the level of 15.67 percent in 1984-85. Then started the decline in growth rate which continued till 1986-87, however fluctuations in growth rates were observed at odd intervals till 1991-92 and the most noticeable one was in the year 1992-93 when it jumped to the level of 48.94 percent. But in the next year, a sharp fall is found to the tune of -26.01 percent. Improved in next year and observing great fluctuations, finally settled at 0.64 percent in 2004-05. Further perusal of the column reveals that the compound annual growth rates for the pre-liberalization period was found to be 9.1 percent which declined to 1.41 percent in the liberalization period. However, a significant CAGR of 5.06 percent was observed during overall period of the study.

c. Fixed Investment

The profile of annual growth rates of fixed investment as envisaged in column III of table I reveals that in 1981-82 rate was 5.72 percent, it touched the level of 13.20 percent in 1983-84.. The yearly growth rate started to fluctuate in the following years and dipped to 0.76 percent in the year 1991-92 and remained in negative zone for next one year and rose to 7.92 percent in 1993-94 and with some fluctuations in following years, escalated to level of 10.47 percent in 1999-2000. Then again witnessing a sharp dip, rate of growth was glanced in 2000-01 of the order of 0.87 but proved to be finalised at the level of -4.67 percent in 2004-05. Further investigation of the column exhibits a significant CAGR of 9.62 percent in the pre-liberalization period which declined to the level of 5.26 percent in the liberalization period. However, a CAGR of 6.40 percent was observed for the entire period of the study.

d. Direct Employment

Perusal of yearly growth rates of employment as contained in column IV of table I exhibits swings of varying magnitude through out the study period. The period 1981-82 observed the rate of growth as 10.83 percent, increased to 16.41 percent in 1983-84 and with fluctuations it became 15.28 percent in 1988-89 and with fluctuations at odd intervals, on the whole declining trend continued to be there till 2004-05 when it became very low of the order of 0.64 percent. Further perusal of the column reveals that the pre-liberalisation period noticed a significant CAGR of 10.52, but the liberalisation period failed to register any growth because of insignificant CAGR of 0.41 percent. However, a CAGR of 5.90 percent was observed for the overall period of the study.

e. Production

The annual growth rates of production as sketched in column V of table I reflects an uptrend with volatility at every alternate step. Starting from a yearly growth rate of 4.72 percent in 1981-82 rose to a level of 15.72 percent in 1983-84 and sharp dive appeared when it became 1.95 percent in the very next year. Thereafter, the growth rate after getting variations in the following years, entered the negative zone in 1991-92 and jumped to the level of 13.79 percent in 1994-95. The growth rate started fluctuating again in the following years and reached a level of -0.81 percent in the year 2004-05. The column further reveals that the CAGR for the pre-liberalisation period was found to be 8.05 percent which accelerated to the level of 6.90 percent in the liberalization period. However, a CAGR of 6.69 percent was observed for the overall period of the study. The conclusion that emanates from the above discussion is that the liberalization period failed to register improvement in compound annual growth rates in any of the four variables. In case of number of units, a clear deceleration was recorded while the direct employment disappointed the most also because of very low rather insignificant CAGR. In the sphere of fixed capital investment, the CAGR also declined. Production variable also find decline in growth. Hence the policies of the liberalization remained unable to touch growth of this particular industry in Punjab.

VI. SECTION – II

a. Productivity Analysis And Profile Of Related Variables

Productivity depends on the relationship between total output and related inputs such as labour and capital which have been used in production of that output. It is evident that the capacity of the economy to produce goods and services mainly depends on productivity of these factors. Productivity can be enhanced through proper utilization of such resources. It is widely agreed that enhancing productivity is a signal of good health of a system which allows producing at lower cost and makes it competitive .

Table –II depicts the profile of capital intensity, capital output ratio and partial productivities of labour and capital of the small scale non-metallic minerals products industry of Punjab. This table also highlights the compound annual growth rates of capital intensity, capital-output ratio and partial productivities of labour and capital for the pre-liberalization and liberalization period. The detailed column wise explanation of table II is discussed as under:

Insert Table-II

b. *Labour Productivity (AOLR)*

The labour productivity as compiled in column II of table II shows a figure of Rs. 0.0080 crores in 1980-81 which continued to fall to the level of 0.0056 till 1992-93 and remained at the same level for the next year. Thereafter the labour productivity escalated in 1994-95 to touch the level of Rs 0.0061 crores and in 2003-04, touched the peak level of 0.0089. The labour productivity finally settled at Rs. 0.0087 crores in 2004-05. The column further reveals that the CAGR for the liberalization period (4.29 percent) registered a remarkable improvement over the CAGR of -2.27 percent belonging to the pre-liberalisation period. However, a CAGR of 0.74 percent was observed for the overall period of the study.

c. *Capital Intensity (DOM)*

The profile of annual growth rates of capital intensity as sketched in column III of table II demonstrates that the capital intensity which was Rs.0.0020 crores in 1980-81 reached a level of Rs. 0.0018 crores in 1990-91 after experiencing minor fluctuations and declined to 0.0016 crores in 1992-93 and kept the level for the next three years and surged to level of 0.0018 crores in 1996-97 and with minor fluctuations, finally settled at a level of Rs. 0.0020 crores in 2004-05. The column further reveals a significant improvement in the CAGR of liberalization period (2.57 percent) from the CAGR of -0.85 percent belonging to the pre-liberalisation period. However, a CAGR of 0.47 percent (insignificant) was noticed in the overall period of the study.

d. *Capital-Output Ratio (Cor)*

The column IV of table II portrays the profile of capital output ratio. Starting from a ratio of 0.25 in 1980-81, continued to increase to the level of 0.30 with marginal fluctuations. Dipped to 0.26 and remaining at the same level for the four years, increased to the level of 0.27 in 1998-99. Showing some fluctuations, ultimately downward march continued till COR settled at a level of 0.22 in 2004-05. Further perusal of the column explains that the CAGR of the pre-liberalisation period which was 1.41 percent declined substantially to reach the level of -1.68 percent in the liberalization period. However, a CAGR of -0.33 percent was observed for overall period of the study.

e. *Capital Productivity (Aocr)*

The column V of table II reflects improvement in capital productivity but also dots fluctuations at odd intervals. Commencing from a capital productivity of 4.06 in 1980-81 fell to the level of 3.36 in 1991-92, accelerated to touch the level of 3.60 in 1992-93. and managed to touch the highest level of 4.48 in 2004-05. The column further reveals that the CAGR which was -1.43 percent for the pre-liberalisation period cheered up

during the liberalization period to reach the level of 1.56 percent. However a CAGR of 0.27 percent was observed for the overall period of the study. From the above discussion it can be safely inferred that the liberalization has encouraged mechanization and technological up gradation in the small scale non-metallic minerals products industry in Punjab. The policies of the liberalization regime have resulted in lower COR and enhancement of factor productivities.

VII. CONCLUSION AND FINDINGS OF THE STUDY

It is quite evident from the entire discussion that despite the problem of militancy during pre-liberalization period, significant growth rate was observed in all the variables namely number of units, fixed investment and production. But the policies of liberalized regime have resulted in qualitative rather than quantitative growth in the small scale non-metallic minerals products industry in Punjab. Highly significant growth rate was recorded in fixed investment and production, a slow growth was noticed in number of units but insignificant growth was gauged in employment during the liberalization period. However, in the overall period of the study, significant growth rate was registered in the case of all the four variables. Thus, it could safely be inferred from the analysis that the liberalization has resulted in jobless growth as the rate of growth of employment has gone down miserably. The profile of labour and capital productivity reflects that in absolute terms the labour and capital productivity and the capital intensity exhibited significant growth rate capital output ratio recorded negative growth during the liberalization period. The comparative profile of pre-liberalization and liberalization period indicates that during liberalization period, productivities of labour and capital accompanied by capital intensity have improved significantly whereas capital output ratio decelerated.

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Table I

Year to year and Compound Annual Growth Rates (in percent)

Year	Number of units	Fixed Investment (in Rs.Crore)	Direct Employment (in no.)	Production (in Rs.Crore)
1981-82	12.17	5.72	10.83	4.72
1982-83	14.39	15.43	13.60	10.96
1983-84	15.67	13.20	16.41	15.72
1984-85	10.78	5.93	9.91	1.95
1985-86	8.61	10.93	7.51	8.04
1986-87	6.00	12.61	10.53	7.02
1987-88	7.41	9.73	9.38	14.03
1988-89	9.50	12.96	15.28	8.78
1989-90	7.43	5.82	8.65	10.85
1990-91	4.70	4.71	6.82	2.42
1991-92	4.60	0.76	3.73	-6.24
1992-93	48.94	-3.60	5.52	3.54
1993-94	-26.01	7.92	7.36	6.31
1994-95	4.26	5.91	4.35	13.79
1995-96	2.11	3.47	3.33	2.45
1996-97	4.52	13.60	1.36	14.51
1997-98	0.54	7.66	1.26	7.99
1998-99	1.84	8.99	2.41	4.51
1999-00	2.65	10.47	2.81	11.94
2000-01	2.04	0.87	2.77	2.72
2001-02	1.38	3.69	1.59	8.04
2002-03	0.34	0.29	1.02	3.99
2003-04	0.6	-3.66	0.96	1.59
2004-05	0.64	-4.67	0.64	-0.81
Pre Liberalization	9.1*	9.62*	10.52*	8.05*
Liberalization Period	1.41*	5.26*	0.41**	6.90*
Overall Period	5.06*	6.40*	5.90*	6.69*

*Significant at 5 percent level of significance.

**Insignificant at 5 percent level of significance.

Source: Calculated from the data supplied by Directorate of Industries, Punjab.

Note:1. Fixed investment and Production figures are taken on 1993-94 constant prices to compute various growth rates.

2.It is not possible to find change for the first year as it is based on previous year so growth for 1980-81 is not quantifiable.

TABLE II

Profile of Capital Intensity, Capital-Output Ratio and Partial Productivity of Capital and Labour

Year	AOLR (ln Rs.Cr.)	DOM (ln Rs.Cr.)	COR	AOCR
1980-81	0.0080	0.0020	0.25	4.06
1981-82	0.0075	0.0019	0.25	4.02
1982-83	0.0073	0.0019	0.26	3.86
1983-84	0.0073	0.0018	0.25	3.95
1984-85	0.0068	0.0018	0.26	3.80
1985-86	0.0068	0.0018	0.27	3.70
1986-87	0.0066	0.0019	0.28	3.52
1987-88	0.0069	0.0019	0.27	3.65
1988-89	0.0065	0.0018	0.28	3.52
1989-90	0.0066	0.0018	0.27	3.69
1990-91	0.0063	0.0018	0.28	3.61
1991-92	0.0057	0.0017	0.30	3.36
1992-93	0.0056	0.0016	0.28	3.60
1993-94	0.0056	0.0016	0.28	3.55
1994-95	0.0061	0.0016	0.26	3.81
1995-96	0.0060	0.0016	0.26	3.78
1996-97	0.0068	0.0018	0.26	3.81
1997-98	0.0072	0.0019	0.26	3.82
1998-99	0.0074	0.0020	0.27	3.66
1999-00	0.0081	0.0022	0.27	3.71
2000-01	0.0081	0.0021	0.26	3.78
2001-02	0.0086	0.0022	0.25	3.94
2002-03	0.0088	0.0022	0.24	4.08
2003-04	0.0089	0.0021	0.23	4.30
2004-05	0.0087	0.0019	0.22	4.48
CAGRs:-				
Pre-liberalization period	-2.27*	-0.85*	1.41*	-1.43*
Liberalization period	4.29*	2.57*	-1.68*	1.56*
Overall Period	0.74*	0.47*	-0.33**	0.27*

Source: Calculated from the data supplied by directorate of industries, Punjab.

Note : *significant at 5 percent level of significance.

** Insignificant at 5 percent level of significance

Terms used:

- DOM: Degree of Mechanization (capital intensity):- It is fixed capital at constant prices per employee.
- COR: Capital output Ratio: - It is ratio of total fixed capital to total production (both deflated).
- AOCR:- Average output capital ratio (Capital Productivity):- It is ratio of total production to total fixed capital (both deflated)
- AOLR: - Average Output Labour Ratio (Labour Productivity):- It is total production at constant prices per employee.