CHAPTER VI

SUMMARY AND CONCLUSIONS
6.1 SUMMARY:

This study has been taken up to examine the behaviour of productivity trends and the nature of factor substitution among factor inputs in the select industries of the Indian manufacturing sector. The following twelve industrial groups of the Indian manufacturing sector have been selected for the study:

1. Beverages, Tobacco and Tobacco Products
2. Food and Food Products
3. Jute, Hemp and Mesta Textiles
4. Paper and Paper Products
5. Wood and Wood Products
6. Rubber, Plastic, Petroleum and Coal Products
7. Leather and Leather & Fur Products
8. Chemical and Chemical Products
9 Cotton Textiles
10 Basic Metal and Allied Industries
11 Transport and Equipment
12 Electricity

The analysis has also been carried out for the Indian manufacturing sector as a whole for purposes of comparison.

Assuming that the production process follows the translog technology in all the industries, the four input translog function is adopted for the study. The four inputs chosen are Capital (Y), Labour (L), Energy (E) and Material input (M). The time variable T also added to the function, symmetrically as an input, in order to study the technical progress in the industries. The data for the study covers the period 1970-1971 to 1985-1986.

The four input translog function is estimated using the Iterative Zellner's Seemingly Unrelated Regression Estimation (SURE) Tests have been carried out for the existence of symmetry - CRTS restrictions and Hicks Neutral Technical Change (HNTC). The Allen elasticities of substitution and price elasticities of substitution are computed to assess the possibility of substitution among the factor inputs. Tests for functional separability have also been performed.
Though there are several methods for measuring total factor productivity, the Divisia index of total factor productivity has been chosen to measure technical progress in industries, since it is observed from the literature that Divisia index of total factor productivity is the best among all other indices in terms of quality and efficiency to measure total factor productivity. Total factor productivity indices based on other methods viz., Kendrick and Solow have also been computed for the sake of comparison. The growth rates of total factor productivity indices have also been computed and tested for their significance. We have also analysed the causes affecting productivity using regression analysis.

The partial productivities of capital and labour and capital intensity have been computed for all the industries. The growth rates of the partial productivity ratios and capital intensity have also been computed and tested for their significance. Further, the relationship between labour productivity and capital intensity has been examined to assess the changes in labour productivity consequent upon unit changes in capital intensity.
6.2 CONCLUSIONS:

1. The Kendrick indices of total factor productivity have showed technical progress in most of the industries except Leather and Cotton Textile industries.

2. The Solow indices of total factor productivity indicates significant progress only in Tobacco, Food and Food products and Chemical products industries. Negative growth is observed in Cotton Textiles industry and neutrality in the remaining industries.

3. The Divisia indices of total factor productivity reveal significant technical progress only in Food and Food products, Leather products and Chemical products. Technical retrogression is observed in Paper and Paper products, Wood and Wood products, Cotton Textiles and Basic Metal industries. In the remaining industries neutrality is observed.

4. The contribution of technical change to productivity is found to be positive in Beverages, Tobacco and Tobacco products (18%), Jute (90%), Food and Food products (37%), Leather products (90%), Chemical products (27%) and Rubber industry (90%). In other industries, viz., Paper and Paper products, Wood and Wood products, Cotton Textiles, Basic Metal, Transport and Electricity, the
contributions of technical change to productivity is negative

5 Significant rates of growth in labour productivity is observed in eight out of twelve industries. In the Indian manufacturing sector as a whole, a significant growth in labour productivity is observed and it has increased by 77 percent over the period 1970-71 to 1985-86.

6 The capital productivity series exhibit significant rates of growth only in four out of twelve industries. The significant negative growth rates are observed in five industries, viz., Food, Paper, Wood, Leather and Cotton textiles. The decline in capital productivity may be an indicator to diminishing returns to capital which may be due to inefficient use of capital. In the aggregate analysis, the rate of growth in capital productivity is only 0.45% and is insignificant at 5 percent level.

7 Significant association between capital intensity and labour productivity has been observed in most of the industries except Jute, Rubber products, Leather and Basic Metal industries. Similar observation is also noted in the Indian manufacturing sector as a whole. This indicates that technical change has affected labour productivity favourably.
8 In an attempt to identify factors influencing the total productivity, it is noticed that the low productivity in most of the industries may be due to (1) the poor quality of skills of the managerial staff engaged as a result of modernisation of industry and (11) the low level of average skill of workers, especially the productive workers.

9 All the industries under study satisfy symmetry-constant returns to scale (CRS) conditions.

10 The existence of Hicks Neutral Technical Change (HNTC) is accepted in all the industries. Similar observation is also noted in the Indian manufacturing sector as a whole.

11 Capital and labour tend to be quite substitutable in eight out of the twelve industries. The industries showing complementarity in capital and labour are Jute, Rubber, and Leather products.

12 Elasticity of substitution between capital and energy is positive but low in Jute, Paper, Wood, Rubber and Leather industries, whereas in all other industries these display complementarity.

13 Substitutability in capital and material inputs is observed in six out of twelve industries.
14 Labour and energy display considerable complementarity in eight out of twelve industries which are under study.

15 Complementarity between labour and material inputs is observed in most of the industries.

16 Energy and material inputs are substitutable only in fifty percent of the industries.

17 The own price elasticities shows that all the inputs are responsive to a change in its own price in most of the industries.

18 All the own price elasticities of demand for energy are negative in most of the industries, indicating that the demand curve for energy is downward sloping and further, the price elasticities of demand are inelastic in most of the industries.

19 The overall impression is that the possibility of substitution among the inputs - capital, labour, energy and material inputs is not uniform in all the industries. The results vary from industry to industry.

20 The restrictions for complete global separability or Cobb-Douglas technology is not accepted in all the industries except in Paper and Paper products. Similar is
the observation for Indian manufacturing sector as a whole.

21 The linear separability of primary inputs capital and labour from energy and material inputs is not accepted in most of the industries except Food and Food products, and Paper and Paper products. This implies that the conditions for the existence of a consistent aggregate index of capital and labour is rejected in most of the industries.

22 The KE-LM separability is accepted in most of the industries except Tobacco, Wood and Wood products, Basic Metal industry and Electricity and EY-LE separability is accepted in only eight out of twelve industries.

23 The existence of L-YEM and E-YLM separability is accepted in most of the industries. This implies that a consistent aggregate index of \(Y, E, M\) and \(Y, L, M\) can be constructed.

24 In the Indian manufacturing sector as a whole no type of separability is rejected.