8.1. Summary

The analysis of productivity growth in manufacturing sector has been considered as the most significant policy variable in the formation of growth oriented industrial strategy in developing countries. The growth of productivity also provides an important tool for accessing how individual activities contribute to the changing structure of entire economy. The trends of productivity growth guide the planners to formulate a rational policy of resource allocation at both national and regional level. On the other hand, wages can play an important role for policy makers. The developing countries can pursue both higher productivity and rapid industrialization by increasing the wages of the workers.

The present study has concentrated on productivity growth and its linkage with wage structure and employment in case of Indian manufacturing sector both at inter-industry and inter-state levels. In order to present the discussion in a coherent way, the whole thesis has been divided into eight chapters. Chapter one is introductory in nature and focuses on the importance of productivity in economic development.

Chapter two mainly focuses on review of literature pertaining to the various objectives of the study. This chapter summarizes a very substantial literature is available dealing with the trends of productivity growth, output growth and employment growth in Indian manufacturing sector in general and vast number of studies relating to measurement of Total Factor Productivity in particular. It has been noticed that different studies provide divergent results relating to the productivity growth in Indian manufacturing sector even though the study periods are exactly equal. The main reason for divergence in the results of different studies is the difference in methods used for the measurement of variables especially capital input and value added. After identifying the research gaps from the review literature, the study has formulated and analyzed the objectives. The results of these analyses have been discussed in the subsequent chapters. So, the main findings of the present study could be summarized in the following ways.
8.1.1. Productivity and Wage Structure: An Inter-industry Comparison

In chapter three, an attempt has been made to analyze the inter-industry wage differentials and labour productivity at aggregate and disaggregate level of Indian manufacturing sector. The results are broadly divided into three parts. The first part of the results and discussion is devoted to an analysis of labour productivity index, real wage index, product wage index and their respective growth rates in the context of manufacturing industry as a whole. The second part of the results and discussion is devoted to a detailed inter-industry analysis of the relationship between wage and productivity. In the final part, the wage determination results are discussed. A snapshot of these results is presented below.

- The indices for labour productivity in the aggregate manufacturing show three categories, viz. unskilled workers, skilled workers and employees. It may be easily noted that the labour productivity index for employee has increased by about 153.53 over the entire period 1973-74 to 2001-02. The trend shows fluctuation in labour productivity from 1973-74 to 1980-81, and thereafter a steady increase till 1999-2000. But in the last two years, i.e. 2000 to 2002, it again shows a declining trend. The labour productivity index for unskilled workers is increased by about 524.14 over the entire period. Similarly, the labour productivity index of the skilled workers does not show a marked rise over the period.

- The trends in money wage show that skilled workers are getting higher earnings as compared to the unskilled workers. The earnings per employee are Rs. 65,883 in the year 2001-02, whereas in case of unskilled worker, it is Rs. 48,689. Significant improvement in the position of the unskilled workers is brought out from the trends on real earnings during the period 1973-74 to 1994-95. But from 1995-96 to 2001-02, the real earning of the unskilled workers has declined by about 19 per cent, whereas the skilled workers' earning has increased.

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1 Unskilled workers are those who engaged in production process; skilled workers include all the managerial staff and clerks in the industry; Total employees constitute both skilled and unskilled workers as mentioned here.
The movements of money wage and real wage of the unskilled workers are not in the same direction. The trend in money wage index shows an upward direction from initial period to the end period. Real wage and product wage indices are exactly moving in the same direction. The increase in real wage index implies higher purchasing power of unskilled workers. As far as unskilled workers' product wage is concerned, it is clear that the real wage burden on the industry is less.

The story is somewhat different when we focus on the wage structure of skilled workers in aggregate manufacturing sector. The money wage index shows a stochastic trend line, which fluctuates over the entire time horizon. From 1973-74 to 1979-80, the trend is downward sloping, and then it is upward sloping up to 1989-90.

Comparison between labour productivity and inter-industry wage differentials brings out the following observations. First, the comparative analysis of the trend growth pattern between labour productivity and wages highlights that labour productivity growth is higher than the real wage growth. Second, the effect of industrial liberalization on growth process has been captured by computing growth rates for two sub periods. The results of the sub-periods show that the growth of labour productivity for the employees is high during post-reform period, i.e. 13.07 per cent as against 5.54 per cent in the pre-reform period. In contrast, the growth rate of real wage for employees during pre-reform period is high (2.68 per cent) as compared to post-reform period (1.75 per cent). Third, the growth of money earnings of the unskilled workers exhibits a rise of 10.79 per cent during 1973-74 to 2001-02, whereas, increase in money wage has not helped the real wage to improve because of higher price level. This implies increase in money earnings is inadequate to neutralize the hike in cost of living.

At disaggregate level of manufacturing sector, it is observed that the labour productivity growth of most of the industries is quite high over the period of time. But the growth rates vary widely across the different two-digit industries. The growth rates of woolen textiles, other manufacturing and transport and
parts are having the higher rank ordering during the period 1974-75 to 1999-2000 in terms of per employee as well as per worker. On the other hand, industries like chemical products and basic metals show a moderate labour productivity growth with high value added and employment share.

Coming to the results of inter-industry wage rate, two important points have to be noted. First, there is a variation in real earnings across the industries both in pre-reform period as well as in post-reform period. During the overall period, the labour-intensive industries like wood, food products, beverage and woolen textiles are gaining more in terms of real consumption as compared to capital-intensive industries like chemical, mineral and basic metal. But in the post-reform period, the result shows a reverse case. Most of the capital-intensive industries are gaining more in terms of real earnings except two labour-intensive industries (i.e. wood products and woolen textiles). Second, during the pre-reform period, the real earnings of the workers are high as compared to the employees.

The major conclusion from the wage determination is that except skilled manpower (SKILL), the other four factors like labour productivity (LP), firm size (FSIZE), capital intensity (CI) and consumer price index (CPI) are statistically significant and in favour of signs of a priori expectations.

8.1.2. Total Factor Productivity Growth: An Inter-industry Analysis

Chapter four made an effort to measure the Total Factor Productivity Growth at two-digit disaggregates level of Indian manufacturing sector. In particular, this chapter focuses on explaining a method to decompose the TFP growth into technological progress (TP) and changes in Technical Efficiency (TEC) within the framework of the time varying coefficients frontier production function. The major findings are as follows:

The estimation of parameters in the stochastic frontier model is significant at 1 per cent level. The non-fulfillment of Hicks-neutrality test indicates that technical change in Indian industries involves a technical bias. The coefficient of \((\ln L)\) is negative while that of \((\ln K)\) is positive, which suggest a labour saving bias of technological progress. The conditions for constant returns to scale are \(\alpha_L+\alpha_K=1\);
PLL + PLK = 0; PKK + PLK = 0 and PLI + PKI = 0. Thus, from the result, the returns to scale are found to be non-constant.

The TFP growth rate trend has increased in most of the industries in the period 1997-98 as compared to 1980-81. Sub sectors like chemical products, basic metals, rubber and petroleum products, transport, and other manufacturing are having higher growth rate than industries like jute textiles, beverages, leather products, and metal products. The highest growth rate is observed for “chemical products” and the lowest growth rate for “jute textiles”. From this result, it can be pointed out that investment in social overheads, learning by doing and changes in skill composition (human capital) must have a significant favourable influence on TFP.

The rate of technical progress starts at a fairly low level in the initial period, however, it increases quite rapidly from 1985-86. Industries like chemical products, basic metals, and rubber, petroleum and coal products are having better technological progress as compared to industries like jute textiles, beverages, and wood products. The new industrial policy and the process of economic reforms in Indian economy, which were initiated in 1985, may be cited as the most probable reason for this very impressive technological progress.

The technical efficiency results show that there are negative trend in change in technical efficiency in all the industries of Indian economy. Technical efficiency is directly related to technical know-how and socio economic characteristics of the industrial workers. Any variation in these attributes tends to cause differences in technical efficiency amongst workers, which in turn lead to variations in total productivity achieved by them. The negative sign for technical efficiency change indicates that the capacity realization has declined. Within the manufacturing sector, there is heterogeneity among the industries on the basis of technical efficiency change. Industries such as chemical products, basic metals, and other manufacturing are little efficient when compared to traditional sectors like jute, beverage, cotton, and wool.
8.1.3. Nexus between Labour Productivity, Wages and Employment

Two main issues have been addressed in Chapter five of this study. First, it investigates the long run causal relationship between labour productivity, employment, real wages and price in case of aggregate manufacturing sector. Secondly, it addresses the trade-offs between labour productivity and wages, and between labour productivity and employment in case of two-digit disaggregated manufacturing sector. The main findings of these exercises can be summarized as:

- Labour productivity of the aggregate manufacturing sector has shown an upward trend during the period 1960-61 to 2001-02, although there was decline in the year 1982-83. The real wages in the manufacturing sector have also shown an upward trend, but with fairly high degree of volatility over the past four decades. Maximum volatility has been observed in the employment series during 1960-61 to 2000-02. Finally, the wholesale price index for manufacturing series has demonstrated an upward smooth curve. The preliminary data analysis shows that the correlation coefficients among these variables are positive, which indicates the relationship between the variables.

- The cointegration test produced evidence in favour of a long run equilibrium relationship among labour productivity, real wages, employment and prices, confirming the existence of causal link among these variables in case of aggregate manufacturing sector. The Granger causality test shows that there is unidirectional causality from real wages to labour productivity and from real wages to price. Similarly, labour productivity causes price level while employment neither Granger causes labour productivity, real wages and price level nor Granger caused by these three variables.

- The Wald test indicates that real wages, employment and price level are to be included in the labour productivity equation and labour productivity, employment and real wages are to be included in price equation. However, block exogeneity test rejects the inclusion of lags of labour productivity, real wages and price in the labour employment equation. Similarly, the block exogeneity test also rejects the inclusion of lags labour productivity, employment and price in the real wage equation.
The impact of employment and wages on labour productivity has been examined through panel cointegration test. We find that both the labour productivity-employment and labour productivity-real wage models, support evidence for cointegration. But in short run, employment has negative impact on productivity. This is not a surprising result and it corroborates with our a priori expectation. The theory says that any given level of output can be achieved with high productivity and low employment. In 1980s, even though there was accelerated growth in output and productivity, the employment growth was declining.

8.1.4. Productivity and Wage Structure: An Inter-state Comparison

In chapter six we examine the inequality in the manufacturing sector in terms of output and employment and thus the relationship between wages and labour productivity across states. Moreover, this chapter also attempts to determine the factors affecting the labour productivity across the states. Let us have a glance at the main results of this chapter.

- Four states, viz., Maharashtra, Gujarat, Tamil Nadu and West Bengal have larger shares in gross value added and employment, but the shares of value added and employment in Maharashtra and West Bengal have fallen in 2000-01 in comparison to 1979-80. The main reason for declining employment in Maharashtra and Gujarat is possibly the capital-intensive technique of production. These two states basically encompass heavy industries. The liberalization process and the open economy have helped the heavy industries like chemical, basic metals, machinery and transport equipment industries to produce more output by using more capital and sophisticated technology. In case of West Bengal, the decline in employment is due to closing of factories. In 1979-80, the total number of factories in West Bengal was 5990, whereas, in 2000-01 it reduced to 5757.

- The Hirschman-Herifindahl index indicate a marginal increase in state-wise concentration - especially in manufactured value added in the post reform period as against pre reform period. This implies that the inter state disparities in manufacturing output has increased after the liberalization. On the other hand, the
Herfindahl index for employment remains almost stagnant over the period of time. Comparison of Herfindahl index between output and employment reveals that disparities in manufacturing output are more than the employment across the states.

- Theil’s inequality index exhibits a rise in disparities in terms of output across the states during the post liberalization period. This measure also shows that the disparities are more in output as compared to employment. So, the findings of Theil’s inequality index corroborate with Herfindahl index.

- Magnitude Ratings between 1979-80 and 2000-01 demonstrate a decline in industrial concentration in Maharashtra, West Bengal and Orissa in terms of output, employment and productive capital. However, in Haryana, Uttar Pradesh and Tamil Nadu, there has been an increase in industrial concentration with respect to per capita value of output and per capita productive capital.

- The inter-state wage structure and labour productivity analysis reveals that labour productivity growth has slowed down during 1991-2002 as compared to period 1981-91 for all the states except Bihar and Gujarat. The rate of growth of output shows a decline in twelve states since 1991. In other words, Verdoorn’s law seems to hold in case of Indian manufacturing especially during post-liberalization period. However, it is clear from the analysis that inter-state disparities do exist in the rate of growth of labour productivity and growth of output.

- Most of the states have achieved high growth rates of employment during post-liberalization as compared to pre-liberalization period. But these growth rates do not commensurate with the increase in the rate of growth of output and productivity. The employment growth is higher in case of the southern states Kerala, Tamil Nadu, Karnataka, and Andhra Pradesh during the post-liberalization period.

- The annual average growth rate of labour cost has been increasing from pre-liberalization period to post-liberalization and it shows the positive growth in most of the states. The rise in Incremental Capital Output Ratio (ICOR) has nullified the output increase that could otherwise have come from the increase in
share of investment to income. Other indicators like; profit share, money wage, real wage, and share of wages follow an upward and downward growth pattern at the state level between pre-liberalization and post liberalization period.

The determinants of labour productivity across the states have been specified and the functional equation is estimated through panel data model. The results indicate that all the variables are statistically significant and the signs corroborate with our \textit{a priori} expectations. This result implies that three variables, skilled manpower, firm size and wage are the major factors influencing the labour productivity.

8.1.5. Productivity Convergence in Manufacturing Sector across Indian States

The seventh chapter addresses a key issue in understanding long run productivity performance. This chapter tries to examine whether the process of economic growth tends to induce reductions in productivity differences among states, for example, due to capital accumulation or technology transfers. In other words, this chapter has examined the productivity convergence of manufacturing sector across the Indian states. We have measured the labour productivity convergence by using both cross-section and time-series techniques. The salient findings of this exercise are:

- Absolute $\beta$ convergence does not exist in case of labour productivity during 1979-80 to 2000-01, whereas, there is convergence in case of aggregate manufacturing during pre-reform period. This implies that, across the states, there exists an inverse relationship between growth rates of labour productivity over the period of time with respect to its initial level of productivity. It may be noted that this negative correlation has been interpreted as evidence of convergence. So in the pre-reform period, the states, which were poor in labour productivity “catch up” with the rich states by initially growing faster, and then their growth rates slowed down to the common technological progress. In case of disaggregate manufacturing, three industries, viz., Food products, Textiles and Transport show convergence.

- During pre-reform period, the speed of convergence in labour productivity across 15 major states is found to be only 2.25 per cent. The backward states of
India, which are poor in per capita income like Bihar, Orissa and Rajasthan’s labour productivity is higher as compared to some of the industrial states like Gujarat, Punjab and Tamil Nadu. Other states like Andhra Pradesh, Uttar Pradesh and Kerala, which are low in labour productivity, are growing faster than Maharashtra.

- The conditional convergence has been measured through pooled regression analysis and dynamic panel model. Results of both the models show that there is a divergence in labour productivity in case of aggregate manufacturing across the states. This divergence clearly indicates that there is a regional disparity within manufacturing sector. The productivity gap became wider between rich states and poor states. Apart from the individual state specific characteristics, capital intensity, wage rate and skill factor are the main cause for labour productivity convergence.

- In case of time-series techniques, we have performed the convergence analysis by using panel unit root test. The calculated Levin-Lin rho-statistic, Levin-Lin ADF t-statistic and the IPS individual unit root process for labour productivity is significant at 1%, 5% and 1% level respectively, providing evidence against the unit root null of no convergence. This implies in the long run all the states have the same underlying average growth rates. The states, which scores low in labour productivity, are reaching the steady state equilibrium after a period of time. The time-series evidence is showing reverse results with cross-section analysis. For this reason, we conclude that the estimated cross-sectional correlation should not be interpreted as a dynamic speed of convergence.

8.2. Policy Suggestions and Concluding Observation

In the light of the above-affirmed empirical results, the study puts forward the following suggestions on the basis of derived policy implications.

- A restructuring of recently introduced liberalization programme becomes requisite in the light of monotonous performance of Indian manufacturing sector on the front of productivity growth, output growth, employment growth and growth of unit labour cost both at national and state level during post reform period. In order
to evaluate these growths in manufacturing sector in backward states, it is essential to speed up the flow of incentives and resources towards these states.

➢ The inter-industry wage determination results show that capital intensity and prices are the most significant factors affecting the wage rate. This implies larger increase in wage rates relative to labour productivity may be granted consistent with stable rates, if capital-labour ratio and price show a simultaneous rise.

➢ At the two-digit disaggregate industry level, the study finds that industries like chemicals and chemical products, basic metals, machinery and transport are having higher productivity growth along with high share of value added. But in terms of employment generation, textiles and food products remain the leaders. So, the government has to give more importance to these industries. The government should provide institutional support for fast clearance and low regulatory intervention, policy supporting easy technology transfer and adoption and quality infrastructure to textiles and food products industries.

➢ The decomposition results of TFP growth show that TFP are not mainly driven by efficiency change but by technological progress. The results also show that Indian manufacturing sector is labour saving and capital using. This is because the liberalization programme promoted the process of capital deepening which in turn brought the inefficiency in labour inputs. For example, policy action intended to improve TFP growth rate might be misdirected if they focus on accelerating the rate of innovation in circumstances where the cause of total factor productivity is low rate of technology diffusion (technical inefficiency), which really happened in the case of Indian manufacturing sector. A thorough examination of industrial policy resolutions and five-year plans reveal that the importance and contribution of efficiency in industrial growth has been neglected or given second priority in the framework of industrial development strategy. In this direction, the greater use of appropriate indigenous labour-intensive techniques of production becomes a requisite to enhance efficiency of factor inputs. It is necessary to remove the
existing deformation in labour market. The removal of labour market distortions will encourage the use of appropriate inputs through greater substitution of labour for capital. Thus, more use of labour will enhance the employment in the manufacturing sector.

➢ The trade-offs between labour productivity and employment and between labour productivity and wages exist in the long run in the case of Indian manufacturing, and the results also corroborate with the developed country's findings that 'in the longer term, productivity and employment growth go hand in hand'. A policy strategy for increasing productivity and employment over the long run should therefore need to be the focus of investment in dynamically growing industries like chemicals, basic metals and machinery and also building capacity in case of industries like food products and textiles, where the majority of labour is employed.

➢ Focusing on the industries where the majority of labour is employed is one-way to bridge the gap between trade-offs in the interim and long run growth in both. In case of developing economies like India, the rise in level of employment in service sector, which may offset the drop in manufacturing employment and can not avert an increase in unemployment. If the country wants to avoid high rate of structural unemployment, it will have to adopt major reforms in its labour policy to boost incentives to the industries and training for the workers.

➢ Inter-state inequality in the manufacturing sector shows that there has been an increase in inter-state industrial disparities in output and employment over the period. So, the government should reduce the inequality by giving more importance to the industries, which are located in backward states. Industries with higher linkage effects should be identified and developed in backward states. Flow of foreign investment, better infrastructure and transport are crucial factors in the process of industrialization. So the government should change the foreign investment policy in such a manner, that the foreign investors also give attention
to invest in backward states. Once the industries in backward states grow, it will have a positive impact on the economy and a greater integration of a particular state with the rest of the states is unavoidable. So, it is important for the states to become forward looking and well organized to compete with the rest of the world.

➢ The issue of convergence in manufacturing sector has two implications. First, our analysis found that an inter-regional wage differential within the manufacturing is one of the causes of the productivity divergence. Even though, our government brought the reforms and integrated our economy with global economy, still there are lot of restrictions with respect to privatization, liberalization and investment policy. Most importantly these policies also differ across the states because some of the industries within manufacturing are owned by the public sector. This may be one of the reasons for low foreign direct investment flows into poor states. So, the government should remove the barriers like wage rigidity, state interference and rigidity in labour market and make the economy more open with special attention to the poor states.

➢ Second, this study also observed that labour productivity in manufacturing sector shows divergence especially after the 1991 economic reforms. The capital and labour mobility are the main causes for divergence. In case of southern and western regions, the manufacturing sector is producing more output by using more capital and skilled manpower. As a result, the manufacturing sector is performing better in this group as compared to other group (i.e. north and east regions). So, the government should enhance the productivity in poorer states by bringing more capital inflows, generating employment in the manufacturing sector and set up IT sector in poor regions.

To sum up, it can be concluded that the productivity growth has the potential to boost the manufacturing, which can give growth rate of around 10-15 % continuously for the next decade or so. Thus, the manufacturing sector has crucial role for overall growth of the country. In the recent decade, even if the service sector provided the
impetus to economic growth, it cannot grow the economy by itself and provide enough job opportunities for millions of people in the employment market. It is the manufacturing sector, which holds the promise of creating jobs for the millions and meeting the needs of a developing country like India. Considering that manufacturing exports account for over 75% of total world exports of goods and services, India's export performance also reflects lack of competitiveness in manufacturing. So, we can compete in the global market through higher productivity. Being a labour abundant economy, we can substitute our labour resource in place of capital and produce more output. More use of labour will create the employment opportunities in the manufacturing sector. Thus, to produce more output through labour-intensive technique requires the wage policy reforms in the country. There is necessity to provide wage incentives to the workers. Of course, Indian industries are following several incentive systems like piece-rate system, payment of production bonus, etc. But all the systems have several pitfalls. So, there is need to reform the wage policy of the country. Once the reform in wage policy is initiated especially towards higher wages, the labour productivity will also rise in the long run. Again, this increase in productivity in the long run will boost the wages, which in turn will lead to improvements in the standard of living of a country.