Chapter II

REVIEW OF LITERATURE

2.1 Introduction

This Chapter presents a brief review of earlier studies related to textile industry Growth, Productivity, Technical progress, Efficiency and Productivity growth of manufacturing industries.

2.2 Studies related to Textile Industry

Subramanian M.S (1992) studied the partial and total factor productivity growth of labour and capital, nature of returns to scale and estimate of the elasticity of substitution between capital and labour in cotton textile industry in Tamil Nadu during the period 1975-86. It was found that partial factor productivity has increased at 2.42 per cent. The real wage of labour has also increased at the rate of 1.36 percent level and the capital intensity substantially declined by 24.50 percent per annum in the partial production of capital. The total factor productivity has also declined in the absence of technical progress in the cotton textile industry. The study suggested improvement in the quality of textile labour, massive investment in textile machinery, healthy industrial relations and use of appropriate technology for the better performance of textile industry in Tamil Nadu.

Balasubramnaiam and Salisu (1993) investigated the proximate reasons for the observed decline in employment in the UK textiles and clothing sectors during the period 1980-89. It provided estimates of important penetration, growth in demand and growth in labour productivity for the two industries groups. Utilizing the statistical techniques, the study analyzed and suggested that the growth in labour productivity rather than export penetration may be the principal reason for the observed loss of jobs in the industry groups.

Mohammad Jaforullah (1999) used Translog and Cobb-Douglas frontier production models to estimate production technology and technical efficiency for the Bangladesh handloom Textile industry. It was found that the technical efficiency of the industry in producing both was only 41 per cent. It was concluded that the industry might
improve its technical efficiency by increasing its male/female labour ratio and yarn/capital ratio and decreasing as hired/family labour ratio and labour/capital ratio. The production technology of the industry was found to be characterized by a linearly homogeneous Cobb-Douglas function. The elasticity of substitution between labour and capital for the industry was found to be unity.

Seshaiah et al., (2006) attempted to analyze the “Production Structure of the Indian Textile Industry” by estimating a translog production functions, in which capital, labour, energy materials and liberalization index are the input determinants. The study covered the period of 1979-2002 and a separate analysis carried out for the pre-(1979-1991) as well as post-liberalization (1991-2001) period. The results revealed that the post-liberalization growth in productivity was less than that of the pre-liberalization. The factors that influenced productivity are also identified and found the entrepreneurial skill ratios as negative and low throughout the period of study.

Bhandari and Maiti (2007) analyzed the efficiency of Indian textile manufacturing firms by using Translog Stochastic Frontier Production functions at firm-level on India’s textile firms and estimated technical efficiency of firms. They found that the average technical efficiency varied between 68-84 per cent across the select years and individual technical efficiencies vary with firm-specific characteristics such as size and age. Further, public sector firms are relatively less efficient during the post-liberalization period.

Kouliavstev et al analyzed the productivity, scale and efficiency in the US textile industry by using data for 23 sectors over 39 years (1958-1996). The study estimated Value Elasticity of Substitution (VES) production function. They found evidence in support of the use of a VES function and concluded that there were systematic differences among textile sectors’ productivity and performance.

Chaudhary et al (2008) examined the effects of Multi-Fiber Agreement (MFA) quota elimination on Indian fiber market. The partial equilibrium model was developed using a theoretically consistent framework and incorporate regional supply response, substitutability between cotton and man-made fibers and appropriate linkage between cotton and textile sectors. Baseline projections were developed for supply, demand and prices of cotton, man-made fibers and textiles under a set of
The effect of MFA textile quota eliminations were introduced into the model by conducting the scenarios, i.e. increasing textile exports by 10, 20, and 30 percent from the base line annually. The results suggested that, on an average, cotton imports rose by 4 to 8 percent annually, while the man-made fiber exports from India declined with opening of textile markets in the developed countries. The highest domestic cotton prices encouraged average expansion in cotton production in all the three regions in India, but not enough to meet rising demand under the condition of higher textile exports. The increase in cotton imports from India had little effect on world cotton prices.

Sasidaran and Shanmugam (2008) empirically investigated the implication of the global textile trade, following complete phasing out of the Multi-Fiber Agreement (MFA) in 2005, on the efficiency of the firms operating in the textile industry. By employing the Stochastic Frontier Approach, it estimated the overall and input specific efficiency values for 215 samples firms for the period from 1993-94 to 2005-06. The results of the study showed that the average efficiency declined over the years indicating the presence of inefficiency in inputs. They further argued that the Indian textile firms failed to utilize their inputs efficiency during the phase of liberalization which, if done, would have helped them to withstand and overcome the intense competition from other players like China.


2.3 Studies Related to Growth

Nagaraj (1989) studied the trends in compound annual growth rates of textile industry during 1986-87 and concluded that unregistered units recorded a better growth rate (5.8 percent) than the registered units (3.3 percent) and total growth manufacturing was (4.6 percent) during the period under review.
Porter (1992) made a strong case for India’s garment sector in the post-MFA regime and cautioned that in garments too, there is room for India to be complacent as there will be tough competition from countries like China which produces in a much larger scale using better technology.

Burange (1999) has made an attempt to analyse industrial structure and growth of the manufacturing sector in Maharashtra over the period from 1979-80 to 1994-95. The main data source is the Annual Surveys of Industries – Summary Results for factory sector (ASI), Economic Survey of Maharashtra and monthly Bulletin of Index numbers of wholesale prices in India. Using the Kinked Exponential Model (Boyce, 1986) the growth rate had been estimated for pre and post liberalization periods. His study revealed that the state was experiencing significant changes in industrial composition, where in capital and intermediate goods were becoming dominant. During the period from 1979-80 to 1994-95, the state realized a high growth rate in fixed capital resulting in decrease in employment. The rising capital intensity and thereby substitution of capital for labour, low growth rates of output and value added did not indicate a satisfactory performance of the state economy. He concluded that there was a revival in the manufacturing sector in the post reform period.

Thirthankar Ray (1999) studied the growth and recession in small scale industry with special reference to Tamil Nadu power looms, using the examples of an export oriented weaving region. This study described the origin and conditions of the power loom units, its major handicaps, how it tried to address its handicaps and what kind of policy initiative may be needed to deal with them. An export recession in 1996-98 showed that the growth had happened without basic changes in technological and organizational capability of the industry. The paper suggested that some change in organization and technology in the industry can be attempted to deal with the weakness of the industry.

Chandra (1999) recorded that the global textile trade regime is going to change drastically from the year 2005 with the phase-out of MFA. The Implications of the textile policies in the industry that have been improving their capabilities are the ones that are going to benefit the most.
This study discussed the nature of competition that Indian textile firms are going to face domestically and abroad. Some of the characteristics of competitive firms that will emerge in the ensuing period are also indicated.

**Uchikawa (1999)** observed that the growth rate of Gross Value Added (GVA) is a good indicator of market conditions. As rapid growth of GVA in an industry generates expectation that the industry will grow in the future, investment in the industry might increase. Gross value added and gross fixed capital formation of textile products including wearing apparel industry had grown throughout the 1980s and their growth rates of GVA and GFCF accelerated in the 1990s.

**Goldar (2000)** studied the growth rate of gross value added (at constant prices) for different two-digit industries and reported that the growth rate of GVA in Indian manufacturing sector was 8.67 per cent in 1980s and marginally declined to 7.43 per cent in 1990s. The growth of Indian textile products fell to 10.44 percent during 1990-97 as compared to 14.63 percent during 1980s.

**Uchikawa (2001)** has shown that there was a sharp acceleration in gross investment in the first half of the 1990s. The gross fixed capital stock in ASI industries increased at the rate of 10.1 per cent per annum at 1980-81 prices. A regression equation estimated for the time-series of capital stock showed that a multiplicative dummy for the post-1990 period was significant at the 5 per cent level, confirming the acceleration of investment after the economic reforms.

**Bernard Sinclair-Desgagne (2002)** examined “Endogenous Aspirations and Economic Growth”. The various “theories of endogenous growth” that were elaborated over the last fifteen years have considered some indisputable “engines of growth,” such as product and process innovation, market structure, human capital, and public infrastructure. This note submits that economic growth might depend also on somewhat less tangible socio-economic and psychological factors such as the way the “aspirations” of economic agents, which influence their inter temporal consumption, evolve over time. It is shown that capital accumulation can be sustained in a standard endogenous growth setting, where aspirations are exogenous and constant, while it may not, aspirations can instead change with the per capita stock of physical and human capital.
Unni et al., (2001) analyzed the trends in growth and efficiency in the utilization of resources in the Indian manufacturing industry before and after introduction of economic reforms. It used a comparative analysis of all India figures with Gujarat, one of the most industrial advanced states of the country. The study shows that both the organized and unorganized sectors in Gujarat seemed to be doing better than the all India average in terms of growth of value added. Growth in the manufacturing sector in Gujarat was also more efficient than average all-India growth after the reforms were introduced. Gujarat’s strategy of physical infrastructure development, leading to industrialization, had been the main reason for the growth of the state’s manufacturing sector.

Sahnmugam and Bhaduri (2002) analyzed size, age and firm growth in the Indian manufacturing sector using balanced panel of 392 manufacturing firms during the period from 1989-1990 to 1992-1993 to explore unobserved heterogeneity among the firms. The result of their study indicated that the age positively influences growth, which was in contradiction to the result obtained in previous studies. The findings of the study also indicated that the smaller and older firms grew faster than their counterparts. Size effect was found larger in food industry while the age effect was larger in non-metal industry.

Pulapre Balakrishnan and M. Suresh Babu (2003) discussed “Growth and Distribution in Indian Industry in the nineties”. In a study of the evolution of the Indian manufacturing sector over close to three decades, the annual average rate of growth in the nineties is found to have risen almost across the board at the two-digit level of industry. Nevertheless, the acceleration is not particularly impressive for what is often hailed as the most significant policy-regime shift since 1950. There is a hefty rise in investment, however, though without a corresponding increase in its efficiency. And distribution has shifted sharply with labour’s share declining. Their study attempts to link these developments in a coherent way.

Balakrishnan and Babu (2003) found that the annual average rate of growth in the nineties had risen almost across the board at two digit level of industry. Nevertheless, they argued that the acceleration is not particularly impressive for what is often hailed as the most significant policy regime shift since 1950.
Nagaraj (2003) found from his study that while the total manufacturing gross value added grew at over 8 percent per annum in real terms during 1981-87, the registered manufacturing segment recorded a growth over 10 per cent per annum with reference to National Account Statistics (NAS) data 1989.

Further, he observed that, since 1980-81 manufacturing sector output has grown at 7 per cent per year, with economic reforms making little difference to the trend in the 1990s and growth has decelerated over the last seven years after peaking in 1995-96.

Narayanan (2003) examined the determinants of the growth of firms in automobiles. It underwent rapid technological change and saw the entry of new firm in the liberalized era. His sample covered the period 1980-86. The study identified two policy changes during the period, namely, partial deregulations introduced in 1985 and liberalization measures launched since 1991. Consequently, three sets of regressions were presented for three periods – licensing from 1980-81 to 1984-85 deregulations from 1985-86 to 1990-91 and liberalization 1991-92 to 1995-96. Firms in the automobile industry witnessed a change in basic technology configuration of the production process during the sample period. The study used two-way fixed effect estimation of the growth function. The results of estimated model support the hypothesis that inter-firm differences in growth were determined mainly by variables capturing technology paradigm and trajectory shifts. Thus he concluded that the growth was mainly technology driven.

Arvind Panagariya (2004) in his paper “Growth and Reforms during 1980s and 1990s” argued that reforms in India cannot be credited with higher growth because growth rate had crossed the 5 per cent mark in the 1980s, well before the launch of the July 1991 reforms. This is a wrong reading of the Indian experience for two reasons. First, liberalisation was already under way during the 1980s and it played a crucial role in stimulating growth during that decade. Second, growth in the 1980s was fragile and unsustainable. The more systematic and systemic reforms of the 1990s discussed in detail, gave rise to more sustainable growth. The paper concludes with a discussion of why the growth rate in India nevertheless continues to trail that of China.
C. Veeramani (2004) in his study “Growing Intra-Industry Trade in Manufacturing Industry – Implications of Policy” presents disaggregated estimates of the level of intra-industry trade in the Indian manufacturing sector. In this study, the intensity of intra-industry is measured by the well known Grubel Lloyd index. The analysis in this study reveals significant growth of intra-industry in large number during the post liberalization period. The apprehension expressed by some researchers that trade liberalization would lead to the demise of India’s domestic industries is, for the most part untenable. Export promotion strategies should aim at the exploitation of comparative advantages at the finer industry level rather than targeting broad sectors.

Mazumdar and Sarkar (2004) showed that there was substantial increase in the Fixed Capital of manufacturing industries from Rs. 16.74 lakh crores in 1980-81 to Rs. 239.28 lakh crores in 1995-96 and investment rate from 15.57 percent to 54.92 percent respectively. The index of real capital growth had also zoomed to 280 in 1995-96 from 174 in 1980-81.

Rani and Unni (2004) reported that the growth rate in fixed capital of organized sector for the period 1989-95 was 13.56 percent and it marginally declined to 12.09 percent during 1994-2000. Whereas in unorganized sector it was 5.25 percent during 1989-95 and increased to 6.39 percent during 1994-2001. In particular, the fixed capital growth rate in organized textile industry was 14.75 percent during 1989-95 and declined to 13.29 percent during 1994-2001. The scenario was entirely different in the unorganized sector viz; 5.62 percent during 1989-95 and 4.28 percent during 1994-2001.

Landes et al., (2005) analyzed the growth prospects for India’s cotton and textile industries. They argued that the demand for cotton and manmade fibers India will strengthen, in response to rising consumer demand in India and increased exports of textiles and apparel, the removal of the Multi-fiber arrangement quotas.

Nagaraj (2005) compared the performance of the manufacturing sectors in China and India over the past half century at a disaggregated level. He found that China’s industrial growth rate is close to one and half times that of India’s over the entire period, with the gap widening gradually. But Indian growth has been more stable. China’s superior performance seems understandable in terms of its faster agricultural
and exports growth. China’s impressive industrial edifice seems to be built on somewhat shaky microeconomic and institutional foundations. In comparison, India’s relatively strong foundations and domestic entrepreneurial capital seem to have the potential to improve performance, with a sounder macroeconomic environment: a step up in fixed investment to augment infrastructure supply and agricultural productivity, revival of long-term finance to boost industrialization, and easier credit delivery to small and medium enterprises.

Ratan Kumar Ghosal (2006) in his study “Augmented Solow model of Growth and its Empirical Relevance” Solow model by incorporating human capital in the form of education and health and established its empirical validity in explaining cross-country differentials in the level and growth of real per capita income for two separate periods. It is found that physical capital; human capital and growth of population together explain a highly significant proportion of cross-country differentials in real per capita income. Further, we find a mixed result from the test of convergence in Solow model and its augmented form. It concludes that the endogenous growth models do not make Solow model redundant.

Fulvio Castellacci (2006) in his study “A Critical Realist Interpretation of Evolutionary Growth Theorizing” discusses a critical realistic interpretation of evolutionary growth theorizing by focusing on some of its basic characteristics. The evolutionary methods is complex, differentiated, and structured, systematic, open, ever-changing and radically uncertain. Its methodology tends to be increasingly based on ‘appreciative’ theorizing, reproductive explanations and interdisciplinary analysis. After discussing these features, the paper suggests that critical realism may indeed constitute an important philosophical and methodological foundation for the future development of evolutionary theories of economic growth.

L.G.Burange (2006) in his articles “Industrial Growth and Structure; Manufacturing Sector in Maharashtra” efforts are made to analyze industrial structure and growth of the manufacturing sector in Maharashtra with as much disaggregation as possible. The share of the state in the country’s industrial sector has declined. The share of the secondary sector in state domestic product is stagnating at around 33 percent to 34 percent, while the share of the tertiary sector increasing. The share of consumer goods
in value added declined to less than 20 per cent while the share of capital and intermediate goods industries increased to more than 80 per cent over the period of 36 years. The industrial recovery is clearly experienced by the state during the post-liberalization period.

Sampath Kumar (2007) in his commendatory on “Economic Reforms and Industrial Growth- A Regional Perspective” examines the changes in the structure of industrial sector in the four southern states of India viz, Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. The study attempts to analyze and compare the structural changes in the industrial sector in the southern states of the country in relation to the ongoing economic reforms of the country. The Divisia-Tornquist (D.T) approximation has been used for the calculation of total factor productivity growth. The increase in capital-labour ratio and a declining the output-labour ratio in the post reform period, at the aggregate and state level, indicate the availability of more capital and relative increase in the labour productivity.

Balakrishnan and Parameswaran (2007) studied the economic growth in India and by testing multiple structural breaks to identify phases of growth in India since 1950. The noteworthy feature of the methodology allows the data to parameterize the model, thus the results that are immune to the prior beliefs of the researcher. Their results revealed that there were two growth regimes in India since 1950. Further the study decomposed economic growth by sectors and the contributions to the change in the growth rate across these regimes were estimated. The results of the study indicated little role for a liberalized trade and industrial policy having been the trigger of a new growth dynamic in India via faster manufacturing growth, at least up to the mid-1990s.

Kaur (2007) argues that there is no denying the fact that reforms ushered in a new era of growth and development. The liberalized policies adopted since 1991-92 not only accelerated the overall growth rates but also develop the confidence of foreign investors in the Indian industry.

Sheila Devi (2008) in her study “A Disaggregated Estimation of Growth and Total Productivity in Traditional Industries in India 1973-74 to 1979-80” with reference to ASI data, she has taken into account seven manufacturing industries including basic
metal and alloys of three digit level classification. To examine the trends and pattern of growth by analyzing (i) number of industrial establishments, (ii) net fixed capital stock, (iii) employment, (iv) emoluments paid to workers and (v) value added. The conclusions are: the employment growth was about 50 per cent lesser than the growth in capital stock, a more consistent growth in capital stock, value added, emoluments and employment.

Nagaraj (2008) found in his study that there has been a turnaround in Indian manufacturing since 2002-03, ending the period of deceleration that lasted for seven years since 1995-96. The annual average growth rate in manufacturing between 2002-03 and 2006-07 was 8.8 percent, up from 5.6 percent during previous years. The study ascertained that there is no unanimity among the researchers regarding the impact of reforms on growth of Indian manufacturing.

Kannan and Raveendran (2009) pointed out that, in terms of output growth, all the manufacturing industries seem to have done quite well, many of them registering double digit growth rates during the post-reform period. Unlike, in the case of employment no polarization is discernible. The growth rate of GVA in Indian textile industry was 4.33 per cent during the period from 1981-82 to 1991-92 and increased to 5.34 per cent in the period between 1992-93 to 2004-05.

2.4 Studies Related to Liberalization and Productivity

Solow (1957) in his study on technical change and aggregate production function has estimated the rate of disembodied technical change for the US non-firm output by covering the period 1909 to 1949. The rate of disembodied technical change was found to be 0.05 representing a trend increase of the order of 1.5 percent per annum. On the whole study pointed out a labour deepening process characterizing the US non-firm and has exerted a great deal of influences in the process of output during the reference period.

Krueger and Tuncer (1982) estimated the growth rates of factor productivity for two-digit manufacturing industries in Turkey during the period 1963-1976. The estimates were presented separately for both public and private enterprises in each industry. The study hypothesized that Turkish manufacturing have experienced a
decreasing rate of TFP as import-substitution policies pulled resources into increasingly inefficient, high-cost industries and also that periods of highly restrictive exchange controls would have been periods of lower TFP than periods of relative liberalisation. The study found some support for the hypothesis that highly restrictive exchange control regimes may result in lower rates of increase in output per unit of input than more liberalised regimes. It was also found despite the fact that the rate of growth of TFP was about the same in the public and private sectors; absolute levels of inputs in the public sector enterprises are much higher than in their counterparts.

Deepak Gupta (1985) made an attempt to study the productivity trends and factor substitutability in manufacturing sector in Maharashtra during the period from 1968-69 to 1977-78 with reference to ASI data. He used the Kendrick’s measure of total factor productivity as well as the Cobb-Douglas production function. He concluded that the wage rate has fallen, though the rate of return has increased that is the price of labour has fallen relative to that of capital.

Rajalakshmi (1985) studied the production function analysis of public sector transport equipment- Industry in India. The study, analyzed the public sector transport equipment industry at aggregate level, comprises of nine individual industries which include road transport, rail transport, ocean transport and air transport equipments. The study concluded that the performance records of the public sector transport equipment industry seemed to be unsatisfactory and unimpressive during the recent years.

Goldar (1986) analyzed the productivity trends in the Indian manufacturing during 1951-78. The estimates of productivity for two periods showed that the total factor productivity in the Indian manufacturing sector was rather sluggish and relative contribution of TFP growth was quiet small. The average annual growth rate of TFP growth to output was about one quarter for the first period and one-sixth for the second period.

Ahluwalia (1991) made a detailed study of the trends in productivity growth in the Indian manufacturing sector. Her study covers the period from 1959-60 till 1985-86. She computed the Chenery measures of the contribution of import substitution to growth for 62 industry groups of manufacturing. Using this measure as an
explanatory variable in an equation explaining growth in productivity, she addresses the question of whether total factor productivity growth across the industry groups is systematically related to the degree of import substitution of these industries. The study established a negative relationship between total factor productivity growth and a Chenery measure of import substitution. She concluded that the protective impact of import substitution dominates any market expanding impact on productivity growth.

**Mona Haddad (1993)** estimated the effects of trade liberalization on firm level total factor productivity in Morocco industry using panel data for the period 1984-89. The effects of trade liberalization on TFP were estimated using various measures of firm-level productivity. The results of the regressions linking trade and market structure variables to productivity showed little variation across different TFP measures. In all cases, the study found a strong positive correlation between trade openness, as measured by export share in sales and import penetration, and firm level TFP. Moreover, by separating the samples into protected and unprotected sectors using the average tariff criterion, the results remained unchanged in terms of the signs of the coefficients of trade variables; although a difference in the magnitude of these coefficient was noticeable across the two categories. The study concluded with reasonable confidence that trade openness has had a significant positive impact on firm efficiency in the Moroccan manufacturing sector, the effect being present in all the models in a robust manner.

**Fujita’s (1994)** main objective was to evaluate the effectiveness of liberalization policies in Indian manufacturing industries. Productivity growth rates of manufacturing industries in India were computed for the period from 1981-82 to 1987-88. The study found that the liberalization policies had improved the productivity of the manufacturing industries, and the improvement of the productivity led to the expansion of export of new products. It was also observed that productivity growth rates of most labor-intensive industries were higher than those of capital-intensive ones. Since the TFP growth appeared to be affected by liberalization policies, an attempt was made to test the hypothesis of association between liberalization policies and TFP growth. The share of public sector in value added was used as a proxy for trade policy, as the increase in the share usually reflects
restrictions on attempts at liberalization. A negative relationship was obtained and the conclusion drawn was that TFP growth decreased.

**Tarlok Singh (1996)** analyzed Total Factor Productivity in the Manufacturing Industries in India for the period from 1973-74 to 1993-94. The data were collected from various issues of the Central Statistical Organization (CSO) publications viz. National Account Statistics and Annual Survey of Industries, the Reserve Bank of India (RBI) publications viz. Economic Survey and Index Numbers of Wholesale Prices. The total factor productivity was computed in levels using the Solow’s residual for different industries in the manufacturing sector in India. He concluded that the TFP in the Food product industry recorded trend growth rate of 2.68 per cent during the overall period 1973-94. TFP recorded improvement in all the sample industries, except for the basic metals industries. The highest growth in TFP was observed in the case of the Food product industry.

**Salim and Kalirajan (1997)** studied capacity realization and productivity growth for Bangladesh food processing industries for the period 1981-1991. Data were derived from the Census of Manufacturing Industries (CMI) conducted yearly by the Bangladesh Bureau of statistics (BBS). Random coefficient production function was used to estimate firm-specific capacity realization indices. They concluded that there was wide variation in capacity realization among firms, though some experienced significant improvement over the sample period.

**Deb Kusum Das (1998)** made an attempt to examine the view, whether changes in trade policy orientation enhanced TFP growth for 76 three digit industries in Indian manufacturing covering the period from 1980-81 to 1993-94. The TFP growth rates for the sample industries are documented for two different phases of trade reforms, viz.(i) a slow trade liberalisation period ranging from 1980-81 to 1985-86 and (ii) rapid liberalisation period from 1985-86 to 1993-94. The study has dealt with two aspects- first, what was the position regarding TFP growth in the two trade reform regimes and second, did the trade policy reforms captured in terms of the import penetration rate and export-output ratios, contribute to TFP improvements. To measure the productivity growth at industry level, the study used a methodology proposed by Jorgenson et al (1987). The study found that a number of industries
recording positive growth in both periods. In terms of improvements or decline over the phases, the study found that around 35 industries has a beneficial impact and in other 27 industries the performance has worsened. It is evident that the impact of trade liberalisation was mixed.

**Mitra (1999)** explored the factors explaining the inter-state variations in the TFP growth in Indian manufacturing sector by utilizing various socio-economic variables. He used ‘Within’ estimation procedure for capturing TFP growth. Both value added and gross output specifications of production for each of the 17 industry groups using both Cobb-Douglas and Translog specification have been estimated. He concluded that TFP growth in a large number of industries had improved across most states during the period from 1985-86 to 1992-93 as compared with the rates estimated for the period 1976-77 -1984-85.

**Nambiar R.G, ET al (1999)** have tried to assess the impact of import liberalization on domestic industry and employment. They say that free trade encourages economic activity and hence raises production and employment. They made an attempt to examine this with the statistical evidence. This study is based on secondary data collected from Annual survey of Industries, published by CSO and Economic Survey. The study found that trade liberalization has since shrunk India’s manufacturing base both in terms of value addition and employment. The adverse impact of import liberalization is more pronounced in intermediate and capital goods industries and their erosion had a direct negative effect on value added and employment.

**Ramaswamy (1999)** studied the comparative performance of Indian manufacturing industries during relatively recent periods of domestic regulation and de-regulation of plant entry. The growth of labour and Total Factor Productivity Growth (TFPG) was observed to be higher during the deregulation period. He found that increasing effective rates of protection was not associated with lower TFPG. The econometric estimates found a positive association between Net entry and TFPG, after controlling for inter-industry differences in effective protection, asset size of plants and demand growth. The results supported the proposition that competition positively contributes to TFPG during deregulation.
Saurabh Bandyopadhyay (2000) provided an explanation for inter-temporal changes in the level of TFP growth in India during 1973-74 and 1995-96, based on ASI data. Multiple regression equations have been estimated separately for each of the industries using time series data. The empirical estimations have been done on the basis of two regression models, where TFP indices of Solow, Translog and Kendrick were taken as the dependent variables and value added, capital-labor ratio, skill composition factor, import substitution, export intensity and industrial concentration were used as independent variables. For further analysis of the sources of productivity growth, production functions have been estimated for different industries. The study found that different industries showed a common pattern, which is very much in line with the standard H-O-S model, where relative factor abundance played a crucial role in determining gains from trade and productivity growth. A strong positive relationship was found between total factor productivity growth and output growth. Import substitution variables were found to have a significant positive effect on TFP growth in a number of industries.

Wu Yanrui (2000) made an attempt to study the all expand APEC countries using the stochastic production frontier approach showed that TFP growth was positive for all countries. This study reveals that APEC developed countries performed better in terms of TFP growth contribution. In all countries, the study found that technical progress was a dominant contribution to TFPG, while the technical change was very small though positive.

Bee-Yan Aw (2002) examined the link between firm size, growth and productivity. It showed that firms grow because they are more productive and not because they are larger in size. Indeed, the statistical analysis shows that while employment growth among Taiwanese firms was positively related to initial levels of total factor productivity, it was negatively related to initial size. The study also showed that the productivity-size relationship has a virtuous cycle built in. More productive firms get larger and, in the process, obtain access to resources and information which enables them to become more productive. One implication of these results was that public policies should target productivity rather than size and should support reforms that make it possible for market mechanisms to weed out low productivity firms while
facilitating the entry or growth of high productivity firms. Taiwan’s ability to keep entry and exit costs low is one of the reason for productivity gains.

Mahadevan (2002) analyzed the TFP growth using data envelopment analysis (DEA) technique. His study found that of all the 28 industries at three digit level the petroleum industry enjoyed a positive TFP growth. Most TFP growth came from technical efficiency changes, i.e the catching effect rather than technical change/progress or frontier effect. This means that the learning-by-doing benefits or the actual diffusion in the knowledge of technology use outweighed the gains from the use of better technology and capital equipments.

Deb Kusum Das (2003) examined the productivity performance of Indian manufacturing sector under different trade regimes during 1980-2000. The analysis focused on the overall period and four sub-periods to reflect the shifts in trade policy regime. The study used a set of 74- three digit manufacturing industries for the analysis and the basic data source was the Annual Survey of Industries. TFP was calculated by the standard growth accounting method and Solow index. The study indicates TFP growth of 0.08 per cent per annum over 75 three-digit industries for the entire period. The standard deviation and coefficient of variation showed considerable variations in TFP growth. The TFP growth rates for individual industries are either negative or in the 0-2 percent range. The capital goods sector was the only one to register a positive growth 1.39 per cent per annum throughout the period, the intermediate and consumer goods sectors recorded negative growths. The study also documented the magnitude and direction of productivity growth across different industries and use based sectors for the four phases of trade reforms. TFP growth in the 1990s is found to be lower than the 1980s. In addition, for all three use based sectors, TFP growth in the second half of the 1990s (1996-2000) is lower than in the first half (1991-1995). The results indicate that productivity performance seemed to be worsen as the pace of trade reform gathered momentum.

Goldar and Anita Kumari (2003) studied the Total factor productivity growth in Indian manufacturing industries. Econometric analysis presented in the paper indicates that the lowering of effective protection to industries favorably affected productivity growth. The results suggested that gestation lags in investment projects
and slower agricultural growth in the 1990s had an adverse effect on productivity growth. The analysis revealed that underutilization of industrial capacity was an important cause of the productivity slowdown. With corrections for capacity utilization, the estimated productivity growth in the 1990s is found to be about the same as in the 1980s.

**Ruhul Salim (2003)** estimated the productivity growth of Bangladesh food manufacturing using firm level data before and after reform. Empirical results showed that the share of output growth was accounted for by input growth in most sectors of this industry. In some sectors, the estimated rate of total factor productivity (TFP) growth is negligible or even negative. Decomposition of the TFP growth shows that technological progress plays a significant role in TFP growth across firms within the sub-sectors of this industry. Empirical results also showed that the relative contribution of capacity realization to TFP growth is not substantial in inhibiting the industry’s high and sustained growth. These dismal performances indicated that the industries responded a little to the implementation of economic reforms.

**Bulent Unel (2003)** examined the impact of reforms of the 1980s and the 1990s on the manufacturing sectors in India by analyzing the productivity performance of 13 manufacturing sector over the period from 1979-80 to 1997-98. The main data source was Annual Survey of Industries (ASI). He concluded that over the period from 1978-80 to 1997-98, the capital-output ratio has been virtually constant. Output-Labour ratio and Capital-Labour ratio had growth rate of 6 per cent and 7 per cent respectively. The average annual growth rate of TFP was 1.8 per cent, which was about 30 per cent of overall labour productivity growth; under the assumption of a constant elasticity of 0.6, the average annual growth rate of TFP was 3.1 per cent, which is about 50 per cent of overall labour productivity.

**Chattopadhyay (2004)** examined the overall industrial scenario of West Bengal for the past three decades. The paper studied the productivity of capital and labour for the two-digit industry groups and the total factor productivity (TFP) of the manufacturing sector of West Bengal as a whole vis-à-vis all-India and also for some selected groups of industries for West Bengal. Productivity of capital of the manufacturing sector has declined, while labour productivity has increased. However, the latter has increased
mainly in few industry groups, which are highly capital intensive and have contributed around 85 per cent of the profit of the total manufacturing sector. TFP of the West Bengal manufacturing sector as a whole has declined, while it has been increasing in case of India. TFP of six industry groups which played a dominant role during the early 1960s has gone down except Jute industry, which itself is a sunset industry. That means no new industry groups have come up to take up the position of these industries, which have been performing badly. Therefore, while the State of West Bengal has shown an impressive improvement in case of rural sector, industrial slowdown has not been arrested as yet in the State.

Pushpa Trivedi (2004) made an attempt to analyze the growth rates of output, employment and productivity of organized manufacturing industries, including machinery industry. The study used time-series data collected from ASI for the period from 1980-81 to 2000-01 and it encompasses 10 major states of India. TFPG was estimated by both. Growth accounting framework and production function approach. It found that the productivity response of various industries and states to liberalization process has been varied. The policy reforms do not seem to have impacted positively most of the industries, except metal industry. In case of machinery industry the TFPG found to be 1.5 percent per annum. It ranged between 1.2 (Gujarat) and 1.8 percent per annum (Rajasthan) for the various states. During the pre-reform period, TFPG of machinery industry at all India level was 2.0 percent per annum and it declined to 1.1 percent per annum in the post-reform period. This has brought about deceleration in TFPG in all the states, barring Andhra Pradesh and West Bengal. The CV for this industry registered an increase from 0.2 during the pre-reform to 0.9 the post reform period. The study empirically confirms the existence of inter – state differences in productivity levels and growth rates. It points out that states, such as, Bihar and West Bengal are diverging away rather than converging to the growth rates of output of organized manufacturing sector at the national level. Though productivity growth in Bihar appears to be high, it has been mainly achieved by joblessness. Madhya Pradesh and Rajasthan, which have been considered as BIMARU States, seem to be good performers from a wider perspective and show the promise to get them rid of their economically backward status.
Renuka Mahadevan and John Asafu-Adjaye (2004) studied the causal links between productivity growth and two price series given by domestic inflation and the price of mineral products in Australia’s mining sector for the period from 1968-1969 to 1997-1998. The study also used a stochastic translog cost frontier to generate improved estimates of total factor productivity (TFP) growth. The results indicated negative unidirectional causality running from both price series to mining productivity growth. Regression analysis further showed that domestic inflation has a small but adverse effect on mining productivity growth, thus providing some empirical support for Australia’s inflation monetary policy, at least with respect to the mining sector. Inflation in mineral price, on the other hand, has a greater negative effect on mining productivity growth via mineral export growth.

Gounder and Xayavong (2004) analyzed the sources of TFP growth in New Zealand’s manufacturing industry for the period 1978 - 1998 utilizing the stochastic frontier approach. This methodology involves decomposition of the sources of TFP growth into four components, i.e. technical progress, technical efficiency, scale effect, and allocative efficiency. The main findings of the decomposition analysis showed that TFP growth was largely due to changes in technical progress and technical change. The change in technical progress has increased in the post-reform period, i.e. 1984-98. On the other hand, technical efficiency has declined in the post-reform period. With respect to scale effect its contribution to total factor productivity growth is very small. Overall it can be said that the industries have benefited from scale economies. The allocative efficiency component indicated that resource allocation has improved in the post-reform period. This implies that deregulation in the post-reform period has reduced price distortion. The study found that technical progress and technical efficiency components are the major sources of total factor productivity growth, further examination is needed to understand what drives economic growth at the micro-level.

Sun (2004) identified the sources of output growth using a varying coefficients frontier model in which total factor productivity (TFP) growth can be decomposed into change in technical efficiency and technological progress, taking an account of industry specific characteristics. He also compared high-tech industries on the basis of two proposed hypotheses and analysed the components of TFP growth using long
term trend in technological progress and change in technical efficiency. The empirical result showed that the level of TFP in Taiwan’s manufacturing sector increased by 0.2 percent a year during the period 1981-1999, stemming from 0.4 percent technological progress and -0.2 percent declining technical efficiency. The insignificant TFP growth of 0.2 percent over the past two decades was mostly driven by slowdown in the 1990s.

Sarma (2005) assessed the productivity performance of Indian automobile industry using growth accounting approach. Divisia-Tornquist index has been used to obtain estimates of total factor productivity index in this industry. Results on TFP revealed that Indian automobile industry could not experience positive productivity growth in the post liberalisation era. Trend growth rate in TFP came out to be -0.015, which is significant at 5 percent level of significance. The results on partial factor productivity indices also corroborate the TFP deterioration in this industry.

Mononmani and Geetha (2007) examined “Productivity trends in Agro-based consumer goods industries of Tamil Nadu”. The outline of this paper contains the trends in productivity of proposed industries. The specific objective of the study is to examine the trends in productivity of the proposed industries in terms of partial factor productivity, total factor productivity and technical progress. The basic data source of the study was Annual Survey of Industries (ASI).

2.5 Studies Related to Technology and Technical Progress

Mehta and Madnani (1973) made an attempt to analyze the effects of range and technological developments on productivity of the cement industry in India. The study was based on the returns furnished by the 12 Companies controlling 28 units, in reply to questionnaires sent to all companies operating in the Cement industry. Two alternative concepts of technology had been used one is degree of mechanization and another is capital intensity. The analysis reveals that size and technology are negatively associated; in other words small sized units use improved and advanced technology.
Uri (1984) made an attempt to study the impact of technical change on the aggregate production. He examined disembodied technical progress and embodied technical progress of capital stock in United States manufacturing over the period from 1947 to 1980. The results suggest that disembodied technical progress had been about 3 per cent per year, embodied technical progress in the capital stock was approximately 3-4 per cent per year and attainment of education significantly enhances labour productivity.

Kopp and Diewart (1982) have analyzed the decomposition of frontier cost function deviations and measures of technical and allocative efficiency. In this study they analyzed a method for decomposing the deviations from a full frontier cost function into Farrell (1957) measures of technical and allocative efficiency. The method draws heavily on duality theory and requires no direct knowledge of the primal production frontier specification or its parameters. Thus the method is applicable to a broad class of cost functions, including flexible functions such as the translog, which do not possess analytically deviable underlying production functions. The method easily generalizes joint output production technologies where the decomposition or deviation from frontier profit functions would provide measures of technical, allocative, output mix and scale efficiency.

Keith et al (1984) studied the estimates of an aggregate Cobb-Douglas production Function for Nepalese industry. This paper made an initial analysis of the issue related to modern and cottage industries, by estimating the production characteristics inherent in a simple specification for an aggregate technology for Nepalese manufacturing industry for the year 1965, 1972-73 and 1976-77. He concluded that, as industrialization advances, the various factors in industries may change in more appropriate directions. Public policy might well be redesigned to promote such adjustments rather than hide them.

Grosskopf (1986) measured efficiency with a focus of the theory developed by Farrell. In the Farrell framework, overall efficiency (OE) can be decomposed into two multiplicative components, allocative efficiency (AE) and technical efficiency (TE); OE=AE.TE . The results from the paper showed that relatively restrictive reference technologies will, in general, yield relatively low values of overall technical efficiency.
Those values would, in general, be higher (more efficient) if calculated relative to a less restrictive reference technology by choice of functional form, will in general, affect the magnitude of the resulting efficiency measures.

_Tain-Jy Chen and De-Piao Tang (1987)_ investigated the relative technical efficiency between import substitution oriented and export oriented foreign firms in Taiwan’s electronics industry in 1980. Data for 184 electronic firms were obtained from the annual survey of foreign firms conducted by Taiwanese government. The study used two models viz, the Deterministic Frontier model developed by Farrell (1957), Aigner and Chu (1968), Richmond and others (1974) and a Stochastic Frontier model developed by Aigner et al (1977) and Meeusen and Van Den Broeck (1977) for estimating frontiers and measuring technical efficiency.

The study found that firms that are constrained to export all their products and thus to compete in the world markets (export-oriented) tend to be more efficient than those allowed to sell their products in the protected local markets (import-substitution-oriented). Depending on the model specified, the export-oriented firms were found to be 6 to 11 percent closer to the production frontier than the import substitution oriented firms. Results obtained from both the models indicate that the export-oriented group was more efficient than the import substitution group. In case of deterministic frontier model, the export oriented group implied 61.09 percent efficiency and the import substitution group shared 54.91 percent efficiency. Similarly incase of stochastic frontier model, the export-oriented group indicate 71.95 per cent efficiency than the import substitution group, which shares 60.40 per cent efficiency. The study found no evidence to support the view that superior performance results from larger firm size or local participation. However, the study found that older firms tend to be more efficient.

_Abdulkadhim and Pickles (1988)_ attempted to quantify technology transfer through its agent, technical change, in Iraq’s manufacturing sector during the period between 1960 and 1978. The data used in this study were time series of value added, labour and net capital stock. Value added data for Iraq’s manufacturing sector were available in Annual Abstract of Statistics published by the Ministry of Planning for the period 1960-74 and 1977-78.
The principal findings of the analysis were: Production technology changed at an increasing rate; output elasticity with respect to capital was high relative to that of labour. The implication of the finding is that as long as output elasticity with respect to capital (the faster growing output) is high and technical change growing at a variable rate, output continues to grow at even higher rates. Moreover, technical change plays a more important role in the long-run development of the country.

**Erkin Bairam (1990)** studied the Aggregate and Disaggregate Production function estimates for the Indian Economy using Annual time – series and Cross – Regional data. In this study appropriate production function for forty-six major industries branches of India and for the total Indian Economy were estimated. These data are the most comprehensive disaggregate statistics available in the Indian Industry. He concluded that the Cobb-Douglas production function can be accepted as underlying production model of the Indian Economy. The estimation of the rate of technical progress from constrained Cobb-Douglas production function suggested that the future growth potential of the economy as a whole is less than 4.0 percent per annum.

**Subramaniam (1992)** analyzed the Growth, Factor Productivities and Technical Change in South India Viscose Limited (1980-81 to 1990-91). The data for the study were collected from Manmade Fibre Industry Survey Reports and Annual Reports of the South India Viscose Limited. He concluded that Brown’s model of technical progress based on first order differences indicated that the changes in factor inputs have substantial influence over the changes in output. In other words the ‘flow’ concept had a greater relevance rather than ‘stock’ in output creation in the S.I.V. Ltd. Since the technology parameter was significant, technical change had a tremendous influence over the changes in output.

**Amuthavalli (1992)** analyzed the Growth, Factor Productivities and Technical Change in Chettinad Cement Corporation Ltd., during the period 1979-80 to 1990-91. For the study, data was collected from the Annual reports of the Company for the relevant period. She concluded that though there was heavy accumulation of fixed assets they were not put into effective use. She suggested that recruitment of skilled manpower could solve the problem.
Role Fare *et al.* (1994) analyzed Productivity Growth, Technical Progress and Efficiency Change in 17 OECD countries over the period from 1979 to 98. The data was obtained from the Penn World Tables. These data built from the benchmark studies of International Comparison Programs of United Nations National Accounting data. A non-parametric method (activity analysis) was used to compute productivity growth. They concluded that US productivity growth is slightly higher than the average of OECD counties’ average, all of which is due to technical change. Japan’s productivity growth is the highest in the sample, with almost half due to efficiency change.

Shenggan Fan *et al.* (1999) developed a frontier cost function approach to estimate empirically the effects of technological change, technical and allocative efficiency improvement in Chinese agriculture during the reform period (1980-93). Time series data were used in this study.

The results reveal that the first phase of rural reforms (1979-84), which focused on the decentralization of the production system, had significant impact on technical efficiency but not allocative efficiency. Technical efficiency improved substantially in the early stage of the reforms, while improvement of both technical and allocative efficiency stagnated during the second phase of reforms. Overall economic efficiency has improved substantially, but the rate has declined since 1984. The rate of technological change continued to increase over the whole study period.

Mallikarjun and Kasyap Thakar (2001) made an attempt to examine the impact of economic reforms on the technical efficiency of three major industrial segments in Gujarat over the period 1980-81 to 1997-98. The study used Data Envelopment Analysis and the frontiers were estimated with two types of models (i) Constant Returns to Scale and (ii) Variable Return to Scales. Malmquist Index was also applied to calculate indices of TFP change, technical efficiency change and scale efficiency change. The overall picture as per the Technical Efficiency (VRS) analysis showed that all the three industries were using their inputs efficiently and there were no significant shifts in the figures while comparing pre and post reform period. The Malmquist analysis found that no industry had registered a notable improvement in TFP over the study period. The study found that the major reason for this was that the
industries have not been shifting to the improved technology fast. The highest average pure technical efficiency change scored by the industries was 1.104 only. This indicates that the industries have not been going for better technologies during last eighteen years. Hence the study found no clear evidence that reforms can really improve the technical efficiency levels in the traditional industries, and increased competition may enhance the number of players in the market but it may not really lead to the best utilization of scarce resources.

Neil Dias Karunaratne (2001) studied Trade reform and Technical Efficiency in Australian manufacturing industries. The technical efficiency scores had been estimated by using a combined stochastic production frontier inefficiency model that is free of simultaneity bias. The model parameters had been estimated through maximum likelihood technique using panel data set covering a cross-section of eight industries spanning a time series of 26 years (1969-1995).

Generalised likelihood ratio tests reject the null hypotheses that trade liberalisation and technology transfer had no significant impact on the reduction of technical inefficiency. The reduction of effective rate of assistance and technical efficiency and technology proxies such as intra-industry trade and capital deepening are negatively correlated during the study period. These findings gave credence to the predictions of endogenous growth theories that openness of the economy provides a conduit for accessing new technology that promotes innovation and technical efficiency. The increase in technical efficiency of manufacturing industries was the unsung hero behind the emergence of the ‘new economy’ or the spectacular pick-up of productivity growth observed for Australia during the 1990s.

Bhavani (2002) has studied the problems and prospects of small scale units in the era of globalization. The study focused on the ongoing changes in the business environment and analyze their implications for small-scale units. Specifically, it looked at possible ways of improving the competitive strength and commercial viability of small-scale units in the changing context. Apart from general purpose analysis meant for the small-scale sector at large, he examined the implications of the changing context with reference to the small-scale units in three industries, namely, garments, electronics and auto components.
The author found that liberalization has exposed all industrial units including small units to market competition to a greater extent. Indian industrial units especially the smaller ones need to improve their productivity and quality, to reduce costs and to go for higher performance of products and better services. This means substantial improvement in various dimensions of technology, namely, transformation (mechanization), organization and information. The author concluded that small units not only need to upgrade their technologies immediately but should also keep track of the changes in technologies.

**Balasubramanya (2004)** studied the impact of globalization and domestic economic reforms on small industry in India in the 1990s compared to that of 1980s. As a result of the reforms, small industry has suffered in terms of growth of units, employment, output and exports. This has resulted in a less impressive growth in its contribution to nations’ income and exports, though not in terms of employment in the 1990s. Lack of reliable and stable economic infrastructure, reduced growth of credit inflow and technological obsolescence, which together have led to inferior quality and low productivity are the major bans of small industry in India. But the policy changes have also thrown open new opportunities and markets for the sector.

**Kim and Park (2006)** studied the productivity gains in Korean manufacturing and found it was efficiency improvement rather than technical progress which led to the productivity growth. These findings are contrary to those of previous sectoral studies Korean and Taiwanese manufacturing, but are consistent with those cross-country studies. Regression results estimated by this study showed that both domestic and foreign R&D has more effect on technical progress, while foreign R&D has played a relatively stronger role in efficiency improvement.

### 2.6 Conclusion

This chapter, on a review of related literature attempted to make an overview of studies on the growth and production functions of manufacturing and Textile industries. The studies used various determinants like productivity growth, FDI and Exports in medium and large scale industries in regional and national levels. The studies related to economic reforms and productivity growth used various measures like Growth of various fragment and industries, total factor productivity, technical
progress technical efficiency, export promotion and import-substitution, effective rate of protection, import penetration etc. to analyze the link between economic reforms and productivity. Similarly the issue has been investigated at different levels: plants, firms and industry, national and regional wise analysis with different model specifications.

The results derived from the reviews indicate that the impact of trade liberalization on productivity growth has however been mixed. In some studies, the impact is found to be positive, in others it is otherwise. In other words, it is evident that the available empirical evidence on this issue is inconclusive. Studies for developing countries that use firm/industry-level data do not find an unequivocal positive relationship between economic reforms and productivity growth. Further, studies undertaken at the national and regional level did derive contradictory results and the emerging scenario was not categorical to formulate future development strategies. Most of the studies reviewed had analyzed the concept of productivity and technical progress with reference to firm’s characteristics such as firm size, age and ownership. Research work pertaining to the impact of economic reforms on Growth, factor Productivities and technical progress exclusively for Textile Manufacturing Industries were very few and scanty. In order to fill these gaps the present study has been undertaken.