Chapter 6

Summary and Overall Conclusion

The present thesis deals with the Indian Textile Industry (ITI) which is an important industry as it plays a deliberate role in addressing various developmental challenges of the nation, creating opportunities for employment and providing clothing at an affordable price which is a basic necessity of human life. Given the importance of ITI, the thesis focuses on the growth of employment, efficiency and productivity aspect of Yarn and Fabrics producing Sector of ITI. This gives us a detailed analysis of the performance of these two sectors and helps to prescribe appropriate policies which are needed for these sectors of ITI to improve their performance.

All the essential data required for the present thesis have been collected from Centre for Monitoring Indian Economy (CMIE) Prowess data base as well as Office of the economic adviser, Government of India and also from the Hand Book of Statistics on Indian Economy, Reserve Bank of India. Those firms are selected for which all the data of inputs and outputs and the determinants are available throughout the sample period. On the basis of this fact, a sample of 22 firms for Yarn producing sector and 21 firms for Fabrics producing sector have been selected.

The period of analysis is from 1991 to 2015.

The present thesis explores three different aspects of Yarn producing Sector and Fabrics producing Sector.

First of all, the present study is interested in the growth of employment of Yarn producing Sector and Fabrics producing Sector, after (i) examining the true nature of the time series data, (ii) testing whether the growth of employment

process converges to a path having trend preserving properties and also (iii) checking the presence of structural break in the employment series and its persistence level using the endogenous structural break model of Zivot and Andrews (1992) as well as Sen (2003). Along with these, the reasons behind the variation in growth of employment have been found out.

The study is based on two stage methodology-

In the first stage, growth of employment is studied for the Yarn and Fabrics producing sector of ITI using both Zivot and Andrews (1992) as well as Sen (2003) approach of one-time endogenous structural break.

In the second stage, factors influencing the growth of employment (E) are determined.

The following factors are considered as possible determinants of growth of employment for both the sectors: Output Growth (Y), Net Export Intensity (NXI), Firm Size (FS), Capital-Sales Ratio (C/S) and Raw material Intensity (RI). For the Yarn producing sector in addition to these variables, Profitability Ratio (PR) is considered as possible determinants of Growth of employment. All the variables have been taken in growth term.

Also a time dummy is introduced taking value 1 from the period 2005 onwards (i.e. period of dismantling of Multi-Fibre Agreement (MFA) and 0 for the rest of the years (i.e. MFA period) for both the sectors to capture the effect of dismantling of MFA on the growth of employment.

The reasons behind the inclusion of above mentioned variables as determinants are as follows:

A positive relationship may exist between output growth and employment growth as increase in output growth requires more of inputs and since employment is one of the indispensable inputs of production, output growth may lead to employment growth. Increase in firm size occurs mainly due to increase in share of output and this expansion of output may be a cause of increase in employment. Thus a positive relation between Firm Size and employment growth may exist. The role of capital-sales ratio (C/S) is important in explaining growth of employment of Indian Textile industry. Employment creation in small regional entrepreneurial firms depends upon capital of the firm and volume of sales due to Papanikos (2004). There is a counter argument that Technological modernisation led to a significant amount of retrenchment of workers in the organised textile mills (Dutta, 1996). So degree of Capital Intensity captured by C/S ratio may deter or promote growth of employment of an industry by using advanced and sophisticated technology into the production process. The relationship between profitability ratio and employment growth may be positive or negative (Baliyan (2019), Ton (2009), Becker-Blease et al. (2010) among others). With rise in profit per unit of sales, employment may increase with increased production. Also increase in profit per unit of sales may lead to use of modern technology which may lead to fall in employment. Increase in Raw material intensity may increase output which may require increased growth of employment. So RI is an important determinant of growth of employment and a positive relation may exist.

An important aspect of ITI is that Indian textile firms re-engineer the imported items and then re-export the product (De and Ghose, 2020). So trade related variables

are important in explaining growth of employment. The relationship between growth of employment and Export intensity is not clear in the literature. Nguyen (2015), Vu, Lim, Holmes, and Doan (2012), Aydiner-Avsar and Onaran(2010),Hong (1981),Watanabe (1972) got a positive relationship between employment growth and export-output ratio whereas Aydiner-Avsar and Onaran (2010) got a negative relation between employment growth and import-output ratio. Since both export and import may contribute to the growth of employment, it may be interesting to find out the relative role of exports vis á vis imports in fostering growth of employment. Thus the present thesis uses (export minus import) to find the net effect of exports over imports in tune with Zhang, Ondrich and Richardson (2003).

Different alternative forms of structural equations are tried out while estimating the model for each sector and model with better result are taken.

The specified equation for growth of employment of Yarn producing sector is nonlinear in PR and linear in $Y_{(t-1)}$, NXI, FS, $\left(\frac{C}{S}\right)_{(t-1)}$ and RI. The specified equation for growth of employment of Fabrics producing sector is nonlinear in RI and linear in Y, FS, NXI and $\left(\frac{C}{S}\right)_{(t-1)}$.

The justification for inclusion of the above explanatory variables in growth of employment equation have already been discussed.

One possibility may be that growth of employment and NXI may be dependent on each other i.e. high growth of employment may be due to high NXI. On the other hand, high NXI may be due to high growth of employment. Thus a problem of simultaneity is involved. Therefore, to take care of this problem, panel model has been framed under simultaneous framework for each sector. For the Yarn producing

sector, two equations have been considered taking E and NXI as dependent variables. For the Fabrics producing sector, also two equations have been considered taking E and NXI as dependent variables.

The NXI equation of Yarn producing sector is nonlinear in $\left(\frac{C}{S}\right)$ and REER and linear in E, FS and $RDI_{(t-1)}$. The NXI equation of Fabrics producing sector is nonlinear in REER and linear in E, FS, RDI, $\left(\frac{C}{S}\right)$ and FA.

The relation between NXI of Yarn producing sector and the explanatory variables can be justified as follows:

Both kind of relation i.e. positive and negative relation may exist between growth of employment and growth of NXI. With rise in growth of employment, growth of NXI may increase. Increase in employment may be due to firms' increase in production which may be due to more export thereby increasing net export. In contrary a negative relationship may be found between growth of employment and NXI may be due to increase in growth of employment, output can be produced more through use of quality raw material, technology and machineries which requires more import from the foreign market, thereby importing more than export and thus NXI may fall. A positive relation may exist between FS and NXI due to the advantages of big size, better quality inputs and secured market, export increases and thus net export intensity also rises. Also FS may have a negative relation with NXI, may be a problem of inadequate management which may lead to reduction in production and thereby fall in net export. A positive relation may exist between RDI of the previous period and NXI may be due to firms engaged in Research and Development (R&D) can invent superior processes technology or can produce better products employing the same

level of input (Aghion and Howitt, 1992; Grossman and Helpman, 1991) which may increase output and thus net export. Capital-sales ratio is taken as a proxy for capital intensity, which may have a positive relation with NXI may be due to the fact that with increase in capital input in production there may be increase in amount of output which may increase net export. Also a positive relation may exist between REER and NXI which may be due to the reason that an appreciation of REER leads to an increase in export and imports decline leading to an increase in net export intensity.

The relation between NXI of Fabrics producing sector and the explanatory variables can be justified as follows:

Relationship between NXI and E, FS, C/S and REER has been already justified above while explaining the NXI equation of yarn producing sector. The new variables in NXI equation of fabrics producing sector are RDI and FA. A positive relation may exist between RDI and NXI may be due to firms engaged in R&D can invent superior processes technology or can produce better products employing the same level of input (Aghion and Howitt, 1992; Grossman and Helpman, 1991) which may increase net export. Also there may exists a positive relationship between FA and NXI may be due to the fact that older firms may have more experience, knowledge about perfect market strategy and may have easier access to finance and smooth buyer-supplier linkage which may result in more production and thus more export thereby may increase net export intensity.

Before going to estimation of the model, one need to ensure that these two equations of the two models are identified or not. The identification of the models is tested in the presence of exclusion restriction and the models are over identified.

Two step estimation method has been employed. Estimation is done first by getting the reduced form of the model. Obtaining the estimated value of the dependent variable from the reduced form and then plugging the estimated value of the dependent variable in the structural form and then applying the method of estimation of panel model.

While estimating both the models of yarn and fabrics producing sector, the problem of heterogeneity is tackled by considering a seemingly unrelated regression (SUR) framework, where each regression was adjusted for contemporaneous correlation (across units) and also cross-section heteroscedasticity is adjusted by White Cross-Section. The seemingly unrelated regression (SUR) framework and the problem of adjusting heteroscedasticity using White Cross-Section are explained in **Appendix. The whole study is presented in Chapter 3.**

Secondly, the present study estimates Output Oriented Technical Efficiency of the Yarn and Fabrics producing Sector of ITI as well as determines the factors influencing such technical efficiency using the Data Envelopment Analysis (DEA) following Banker, Charnes, and Cooper (1984) under variable returns to scale.

TE scores are estimated separately for the two sectors using DEA approach. Then the factors influencing TE are found out. The inputs taken are employment, capital, Raw material and power and fuel.

The following are the common factors considered as possible determinants of Technical efficiency for both the sectors: Firm Size (FS), Research and Development intensity (RDI), Net export Intensity (NXI) and Advertising Intensity (ADV). Along

with these variables, Firm Age (FA) for Yarn producing sector and Marketing Intensity (MEI) for Fabrics producing sector are also considered as possible determinants of Technical efficiency. Also a time dummy is introduced to capture the effect of dismantling of MFA on technical efficiency of ITI.

The reasons for inclusion of the above mentioned determinants are as follows:

It can be hypothesized that large size firms will be more efficient because of the presence of threshold limit in production, scale economies, imperfection in capital market (Kumar, 2003). However, beyond a certain limit higher market power may also plague the firm with X-inefficiency (Leibenstein, 1976) which may lead to lower efficiency. There exists a debate between firm age and efficiency of the firm in the existing literature due to Bhandari and Maiti (2007, 2012), Berghäll (2006), Walujadi (2004), Lundvall and Battese (2000), among others. A positive relationship can be found as older firms become more experienced and display superior performance and may benefit of learning earlier and do not face hazards that the newcomers generally face (Stinchcombe, 1965). Counter argument may be that older firms are unable to adapt changing economic circumstances rapidly which the younger firms can do much more quickly and efficiently (Marshall, 1920). Research and Development intensity may affect TE positively. R&D on one hand generates new technologies and, on the other hand, it enhances a firm's ability to exploit existing technology. Advertisement may play a crucial role in explaining technical efficiency. Advertisement helps to introduce a new product in the market easily, increases sales, fights market competition, enhances good-will with consumer and educates the consumers (Shashikanth, Mamatha and Rao(2018), Samad and Sabeerdeen (2016),Mohan (1989)). Linkages between advertising intensity and technical

efficiency for the Spanish manufacturing firms and Indian Engineering goods industries respectively are due to Carod and Blasco (2005) and Goldar et al. (2004), whereas Ray (2006) did not find any impact of advertising on TE in the Indian Manufacturing sector. Marketing intensity may serve as a proxy for product differentiation due to Pal, Chakraborty and Ghose (2018), Ghose and Chakraborti (2013) among others. Kao et al. (2006),Mark and Caves (1988), Leffler (1981) among others got positive relationship between Marketing intensity and technical efficiency. Whereas Sheth and Sisodia (2002) claimed that low efficiency is due to the sliding of marketing effectiveness.

One important aspect of ITI is that Indian textile firms re-engineer the imported items and then re-export the product (De and Ghose, 2020). Vast amount of literature is available supporting the role of exports in promoting efficiency both at the theoretical as well as empirical level. From theoretical front, there is a common opinion that international trade in general and export in particular improves the efficiency of involved firms (Balassa, 1988). Endogenous growth theory believes that export plays a crucial role by improving efficiency through innovation (Grossman and Helpman, 1991) and technology transfer (Barro and Sala-i-Martin, 1995). Also World Bank Report (1993, 1997) reported that firm's import of foreign technology has a positive impact on efficiency. Mazumder et al. (2010) and Goldar et al. (2004) reported a positive relationship between technical efficiency and imports in the Indian context. As both export and import may affect TE, it may be interesting to find out the relative role of exports vis á vis imports in fostering TE. Thus the present thesis uses (export minus import) to capture the net effect of exports over imports in tune with Zhang, Ondrich and Richardson (2003).

It is also possible that there may exist simultaneity between TE and FS as well as TE and RDI. Therefore, to take care of this problem, simultaneous panel model has been framed with three equations considering TE, FS and RDI as dependent variables for each of the sectors i.e. Yarn and Fabrics.

Different alternative forms of structural equations are tried out while estimating the model and model with better result are taken.

The specified equation of TE of Yarn producing sector is nonlinear in $ADV_{(t-1)}$ and linear in FS, RDI, FA and NXI.

The specified equation of TE of Fabrics producing sector is nonlinear in $ADV_{(t-1)}$ and linear in FS, RDI, $NXI_{(t-1)}$ and $MEI_{(t-1)}$.

The justification for inclusion of the above explanatory variables in TE equation have already been discussed.

The specified equation for FS of Yarn producing sector is nonlinear in TE and RDI and linear in FA and ADV. The specified equation for FS of Fabrics is nonlinear in TE and linear in RDI, FA, MEI and NXI.

The relation between FS and the explanatory variables in Yarn producing sector can be justified as follows:

A positive relation between TE and FS may occur because with increase in TE firms may produce more output, so there can be increase in firm size. RDI may affect FS positively possibly due to firms engaged in R&D can invent superior processes technology or can produce better products employing the same level of input (Aghion and Howitt, 1992; Grossman and Helpman, 1991). Thus firms may produce better and more products thereby increasing firm size. A positive relation may exist between Firm age and Firm Size as well as Advertising intensity and FS. It may be due to the

fact that firm staying in the market for long period, is capable of acquiring perfect market strategy and consumer faith and thus producing more which may lead to firm size increase. Also firms spending more on advertisement are more prone to introduce a new product in the market easily, increases sales, fights market competition which may insist firms to produce more to meet up the extra demand created by advertising, thereby increasing firm size.

The relation between FS and the explanatory variables in Fabrics producing sector can be justified as follows:

Relationship between FS and TE, RDI and FA have been already justified above while explaining the FS equation of yarn producing sector. The new variables of FS in fabrics producing sector are MEI and NXI. More marketing activities may indicate strong firm's brand and product image which may lead to higher revenue and in turn enhance output efficiency (Mark and Caves, 1988; Leffler,1981) which may promote FS. Net export intensity may affect Firm Size positively. With rise in net export intensity, demand of domestic goods in foreign markets increases which can boost firm size.

The specified equation for RDI of Yarn producing sector is nonlinear in $(\frac{K}{L})$ and PR and linear in TE, FS and $NXI_{(t-1)}$. The specified equation for RDI of Fabrics producing sector is nonlinear in TE and NXI and linear in FS, PR and$(\frac{K}{L})$.

The relation between RDI and the explanatory variables of Yarn producing sector can be justified as follows:

TE may affect RDI positively or negatively. A positive relation may prevail between these two may be due to increase in TE, the capability of firms through using its input

efficiently may rise and produce more output which can promote RDI. Also there can be a possibility of negative relation possibly due to several reasons such as improvement in the ability of the workers, better management decisions, adequate monitoring efforts, etc which may lead to more and more production thereby making firms more reluctant to invest in R&D and so RDI may fall. Positive relationship is expected between Firm size and RDI may be due to the fact that a larger firm can be able to exploit economies of scale which influence firms to increase RDI and further maintain economies of scale. A positive association between NXI in the previous period and RDI may exists possibly due to the fact that with increase in net export in the previous period the firm may generate extra profit from foreign market and increase RDI in the current period. It is hypothesized that higher the degree of mechanization in the production system, higher will be the R&D expense of the firm. On the other hand, K/L may affect the R&D expense of the firm negatively due to underutilization of capital. Firm's profits are an important stimulus to, and source of funding for, R&D which in turn may lead to a positive relationship between profit and RDI.

The relation between RDI and the explanatory variables of Fabrics producing sector can be justified as follows:

The relation between RDI and the explanatory variables have already been discussed above while explaining the RDI equation of yarn producing sector. The only new variable of RDI equation in fabrics producing sector is NXI. A positive association between NXI and RDI may be due to the fact that with increase in net export the firm may make additional profit from foreign market and increase RDI.

The model is over identified under the presence of exclusion restriction. The method of estimation of the model is the same as in the case of the model explaining growth of employment.

Both these models are estimated using simultaneous panel approach taking into account, the problem of identification. Also the problem of heterogeneity has been taken care of as in the case of explaining the factors influencing the growth of employment. **Chapter 4 carries out the whole study.**

Thirdly, the present study estimates Total factor productivity growth of Yarn producing Sector and Fabrics producing Sector using nonparametric DEA approach, as well as determines the factors influencing such TFPG.

For calculating TFPG, the inputs taken are Raw material, power and fuel, employment and capital.

TFPG values are estimated from MPI separately for the two sectors using nonparametric DEA approach. Then the factors influencing the Total factor productivity growth (TFPG) are determined.

The following factors are considered as possible determinants of TFPG for both the sectors: Firm Size (FS), Firm Age (FA), Net export Intensity (NXI), Research and Development intensity (RDI) and Advertising Intensity (ADV). For the Fabrics producing sector in addition to these variables Marketing Intensity (MEI) is considered as possible determinants of TFPG. All the variables have been taken in growth term. To capture the effect of dismantling of MFA on TFPG of ITI, a time dummy, D is introduced.

The causes behind inclusion of the above mentioned variables are as under:

A negative relation between FS and TFPG may occur because as FS falls, competition increases which may lead to cost-consciousness and drive for technological advancement. Others may point out the advantages of big size, secured market and expect a positive association between FS and TFPG. The relationship between firm age and productivity growth is not clear in the literature (Ghose and Chakraborti (2013), Ayyagari et al. (2011), Brouwer et al. (2005), Huergo and Jaumandreu (2004)). A positive relationship between firm age and productivity may be found as older firms become more experienced and display superior performance. These firms have benefits of learning earlier and do not face hazards that the newcomers generally face (Stinchcombe, 1965).Counter argument may be that older firms are unable to adapt changing economic circumstances rapidly which the younger firms can do much more quickly and efficiently (Marshall, 1920). The relationship between Research and Development intensity and TFPG may be positive or negative. It may be positive as Research and Development basically includes the search for various novel pathways and development of expertise which facilitate faster product development. It may be negative due to the inability to operate new technology and reap its potentiality instantaneously. There may exist a positive relationship between advertising intensity and TFPG may be due to Advertisement helps to introduce a new product in the market easily, increases sales, fights market competition, enhances good-will with consumer and educates the consumers thereby increasing production and hence productivity (Shashikanth, Mamatha and Rao (2018), Ghose and Chakraborti (2013), Luo and Donthu (2005)) among others. Some literature is available supporting the role of marketing expense in promoting productivity. Pal,

Chakraborty and Ghose (2018), Lukas et al. (2005), Rust et al. (2004), among others got positive relationship between Marketing intensity and Productivity.

A vast literature is available supporting the role of exports in promoting productivity both at the theoretical as well as empirical level for different Indian manufacturing Industries. Some empirical study showed that exporting firms have some prior advantage in productivity are due to Pal, Chakraborty and Ghose (2018), Clerides et al.(1998), Roberts and Tybout (1997) among others. For the textile firms import is also important. Some studies on different industries showed that importing firms have some added advantages on productivity (Pal, Chakraborty and Ghose (2018), Halpern et al. (2005), Lawrence and Weinstein (2001), World Bank Report (1993, 1997) among others). In order to find out the relative role of export viz import on productivity, the present thesis uses (export minus import) to find the net effect of exports over imports in tune with Zhang, Ondrich and Richardson (2003).

A common problem may be that there may exist simultaneity between TFPG and FS as well as TFPG and RDI. Therefore, to take care of this problem, simultaneous panel model has been framed with three equations (equation for TFPG, FS and RDI) for both the sectors.

While estimating the model for each sector various alternatives of the structural equations are tried out and model with better result are taken.

The specified equation of TFPG of Yarn producing sector is nonlinear in $ADV_{(t-1)}$ and linear in FS, RDI, $NXI_{(t-1)}$ and FA.

The justification for inclusion of the above explanatory variables in TFPG equation have already been discussed.

The specified equation of TFPG of Fabrics producing sector is nonlinear in $ADV_{(t-1)}$ and linear in FS, RDI, $NXI_{(t-1)}$,FA and $MEI_{(t-1)}$.

The specified equation of FS of Yarn producing sector is nonlinear in $ADV_{(t-1)}$ and linear in TFPG, NXI, $(\frac{K}{L})$ and MEI.

The reasons behind inclusion of the above said variables as determinants of FS equation in Yarn producing sector are as follows:

A positive relation between TFPG and FS may occur because with increase in TFPG, there is increase in output which may lead to increase in Firm Size. A positive or negative relationship between NXI and FS may occur. Positive relation may be due to the reason that with increase in net export, demand of domestic goods in foreign markets increases thereby raising production which can boost firm size and negative relation may occur i.e. import may have more favourable impact over export for raising production thereby increasing FS. Capital-labour ratio may have a positive relationship with FS as capital intensive industries by using advanced and sophisticated technology into the production process may help to increase production and hence Firm size. Advertisement expense intensity of the previous period may affect FS positively possibly as firms spending more on advertisement are more prone to introduce a new product in the market easily and increases sales thereby increasing firm size. More marketing activities may indicate strong firm's brand and product image which may lead to higher demand of product which may insist firms to produce more to meet up the extra demand created by marketing, thereby firm size may increase.

The specified equation for FS of Fabrics is nonlinear in $MEI_{(t-1)}$ and linear in TFPG, RDI, $NXI_{(t-1)}$, $ADV_{(t-1)}$ and $(\frac{K}{L})$.

The reasons behind inclusion of the above said determinants of FS equation in fabrics producing sector are as follows:

The relationship between FS and the explanatory variables like TFPG, K/L and ADV of the previous period have been already justified while explaining the FS equation of yarn producing sector. The new variables of FS in fabrics producing sector are RDI, NXI of previous period and MEI of the previous period.RDI may affect FS positively possibly due to the fact that R&D may increase the production of a firm using sophisticated technology in the production process, which may lead to more production and thereby increasing firm size. Relation between NXI of the previous period and FS may be positive or negative. Positive relation may happen due to increase in Net export of the previous period may mean more demand of domestic goods in foreign markets which may raise production thereby boosting firm size. Also negative relation may occur i.e. import may have more favourable impact over export to increase output and thus to promote FS. More marketing activities in the previous period may indicate strong firm's brand and product image which may lead to higher demand of product and may insist firms to produce more in the next period, thereby increasing FS.

The specified equation for RDI of Yarn producing sector is nonlinear in FS and linear in TFPG, NXI and PR.

A positive relation may prevail between TFPG and RDI as with increase in TFPG, the capability of firms increases through usage of its input efficiently and produces more output which may promote RDI. Also there can be a possibility of negative relation

between the two possibly due to several reasons which can make firms more productive and they may become more reluctant to invest further in R&D and so RDI may fall. A positive relationship may found between Firm size and RDI due to the fact that a larger firm can be able to exploit economies of scale and produce more which may influence firms to increase RDI. A positive association between NXI and RDI may exist possibly due to the fact that with increase in net export, firms may earn extra profit from foreign market which may help in expanding RDI. Firms' profit is an important stimulus to and source of funding for, R&D and there may be a positive relationship between profit and RDI.

The specified equation for RDI of Fabrics producing sector is nonlinear in FS and linear in TFPG, NXI and PR.

The relation between RDI and all the explanatory variables have already been discussed while explaining the RDI equation of yarn producing sector.

Before going to estimation of the model, one need to ensure that these three equations of the two models are identified or not. The identification of the models is tested in the presence of exclusion restriction and the models are found to be over identified.

The method of estimation of the model is the same as in the case of the model explaining growth of employment and also TE.

Like the previous two problems on growth of employment and TE, while estimating TFPG for the two sectors, the problem of identification and cross section heteroscedasticity as well as contemporaneous correlation has been taken into account. **This is the subject matter of Chapter 5.**

There are some concluding observations on the basis of the whole study.

Results on growth of Employment:

The results on the growth of employment issue discussed in chapter 3 can be summarized as follows:

First of all, the growth of employment series is Trend stationary (TS) type implying convergence towards stationary process and Variability of the series remains constant over time for both Yarn producing sector and Fabrics producing sector.

Secondly, the break point for employment series in yarn and fabrics producing sector according to Zivot and Andrews (1992) approach happened to be 2000 and 2007 respectively. For the yarn producing sector, the break may be due to the phasing out of the quota restrictions of MFA, Phase I which occurred during 1995-1997 and or may be the effect of Technology Upgradation Fund Scheme (1999). For the fabrics producing sector, the break occurred may be due to the complete phasing out of the quota regime of MFA in 2005. Whereas according to Sen (2003) approach the break point happened to be 1999 and 2004 respectively for the yarn and fabrics producing sector. For the yarn producing sector, the reason may be the phasing out of the quota restrictions of MFA, Phase I from 1995 to 1997 and for fabrics producing sector, it may be the impact of phasing out of the quota restrictions of MFA, Phase II which happened between 1998 to 2001.

Combining the results of Zivot and Andrews (1992) approach and Sen (2003) approach, it can be concluded that for employment, the major breaks occur for yarn and fabrics producing sector at or between the years 1999-00 and 2004-07 respectively.

Thirdly, the result of estimation using Zivot and Andrews (1992) approach suggests that there is an evidence of increase in growth of employment in yarn producing sector and an increase in the level of employment after the break point in the fabrics producing sector. For Yarn producing sector it can be said that the growth rate of employment before break is negative (i.e.-5.6%) whereas growth rate of employment after break is positive i.e. 5% and for Fabrics producing sector there is an increase in the level of employment after the break period.

According to the result suggested by Sen (2003), an evidence of increase in the growth rate of employment for both the sectors is found. There is also an increase in the level of employment after the break point in the fabrics producing sector. For Yarn producing sector it can be said that the growth rate of employment before break is negative i.e.-5.3% whereas growth rate of employment after break is positive i.e. 5% and for Fabrics producing sector growth rate of employment before break is negative i.e. -3.5% whereas Growth rate of employment after break is positive i.e. 6%.

Fourthly, the results of determinants of growth of employment of both the sectors show that the estimated equations of the fitted model are of nonlinear type. To capture the net effect of the variables having nonlinear relationship with the dependent variable, marginal effect has been calculated and the statistical significance of these variables has been checked by performing Wald test.

The model shows that there exists a simultaneous kind of relationship between growth of employment and Net export intensity for both the sectors.

The result of **Yarn producing sector** suggests the following:

In case of **Growth of employment equation**, it can be seen that the variable Profitability ratio have nonlinear statistically significant relationship with growth of employment and the marginal effect i.e. the net effect of Profitability ratio on growth of employment is positive whereas the other variables such as Output growth of previous period, Net export intensity, Firm size, Capital-sales ratio of previous period and Raw Material Intensity are linearly related having positive statistically significant relationship with growth of employment.

The result suggests that growth of employment increases with increase in PR, Y_{t-1}, NXI, FS, $(C/S)_{t-1,}$ and RI.

The positive relationship between growth of employment and Profitability ratio may be due to the fact that the profit acquiring firms which are shifting their profits towards labour market are able to hire more labour to produce more and may increase employment. A positive relationship is found between Output growth of previous period and growth of employment which may indicate that with increase in Output growth of previous period, firms may also increase production in the current period and since employment is one of the indispensable inputs of production, this may lead to employment growth (Goldar, 1987). Net export intensity and growth of employment are positively related may be with increase in net export intensity there may be increase in the demand of goods in international market. So firms may produce more to meet up this demand and increase in output may increase employment. There exists a positive relationship between firm size and growth of employment. With increase in firm size, output production rises which may be a cause of increase in employment. A larger firm can be able to exploit economies of scale

and generate higher employment opportunity through producing more output relative to smaller firms. With rise in Capital-sales ratio in the previous period, growth of employment may increase due to the fact that increase in capital usage may lead to increase in other indispensable inputs of production such as employment and this may increase growth of employment. A positive relationship is found between Raw material intensity and growth of employment. With rise in Raw material intensity for output production may increase growth of employment through output growth.

The effect of dismantling of MFA has a positive and statistically significant effect on growth of employment. Thus the dismantling of MFA has a favorable effect on growth of employment and promotes growth of employment of Yarn producing sector compared to the MFA period. The reason may be that export may increase due to removal of quota restriction after the dismantling of MFA. To meet this increasing amount of export, firms may increase its output which may lead to growth of employment.

In case of **Net Export Intensity equation,** Capital-sales ratio and Real effective exchange rate (REER) have nonlinear statistically significant relationship with NXI, being inverted U-shaped relationship between REER and NXI but the net effect of these variables on NXI are positive. Whereas growth of employment, Firm size and Research and development intensity of previous period are statistically significant and linearly related with NXI.

The net effect of Capital-sales ratio on NXI is positive. This may be due to the fact that increase in capital intensity in production may involve advanced and sophisticated technology thereby increasing amount of output which may increase net

export intensity. An inverted U-shaped relationship is found between REER and NXI. This is because an appreciation of REER leads to an increase in export and imports decline leading to an increase in net export intensity. But after some threshold level net export may fall may be due to the reasons that if REER is sufficiently high, the imports will be pushed to a very low level and it may have an adverse effect on exports. The net effect of REER on net export intensity is positive as revealed by the marginal effect. A positive relationship is found between growth of employment and NXI. A rise in growth of employment may lead to more production by the firms and hence export and thus net export may also rise. But FS is found to have a negative relationship with net export intensity. Large firms may have a problem of inadequate management which may lead to reduction in production and thereby fall in net export. Another reason may be that as FS rises, import rises more and more compared to export may be with the increase in these imports, the output production expands and the firms become large sized (De and Ghose, 2020). A positive relationship is found between RDI in the previous period and NXI. Firms engaged in R&D can invent superior processes technology or can produce better products employing the same level of input (Aghion and Howitt, 1992; Grossman and Helpman, 1991) which may increase output and hence net export intensity.

The results of determinants of growth of employment of **Fabrics producing sector** suggest the following results:

In case of **Employment equation**, it can be seen that Raw material intensity have nonlinear statistically significant relationship with growth of employment whereas the other variables such as Output growth, Firm size, Net export intensity, and Capital-

sales ratio of previous period are and statistically significant and linearly related with growth of employment.

Thus the result suggests that growth of employment increases with increase in RI, Y, FS and $(C/S)_{t-1}$ but falls with increase in NXI.

Since the marginal effect of Raw material intensity on growth of employment is found to be positive, as raw material intensity rises may be due to increased output of the firm it may increase growth of employment through output growth. Positive relationship is found between Output growth and growth of employment. This indicates that with increase in Output growth, growth of employment may increase (Goldar, 1987). Since employment is one of the indispensable inputs of production, output growth may lead to employment growth. The positive relationship between FS and growth of employment may be due to the reason that with increase in Firm Size may be due to increase in output production which may be a cause of increase in employment. A larger firm can be able to exploit economies of scale and generate higher employment opportunity through producing more output relative to smaller firms. But there exists a negative relationship between Net export intensity and growth of employment. This indicates that import have more favourable impact over export to promote growth of employment. The reasons may be while a firm imports quality raw material, machineries and technology it may improve its growth of employment. .Evidence also suggests that import intensity has a positive and significant effect on employment growth and import of technology in an industry is labour utilizing (Paul, 2014) and imported raw materials do not slowdown employment growth (Goldar and Ghosh, 2015). With rise in Capital-sales ratio in the previous period, growth of employment may increase due to the fact that increase in

capital in the previous period may increase other indispensable inputs of production i.e. employment thereby increasing growth of employment.

The effect of dismantling of MFA has a positive and statistically significant effect on growth of employment. Thus the dismantling of MFA has a favorable effect on growth of employment and promotes growth of employment of Fabrics producing sector compared to the MFA period. It may be the reason that the amount of export may increase after the dismantling of MFA with the removal of quota restriction. To meet the increasing amount of export, firms may increase its output which may lead to growth of employment.

In case of **Net export Intensity equation,** Real effective exchange rate (REER) have statistically significant nonlinear i.e. Inverted U-shaped relationship with NXI whereas Firm size, growth of employment, Research and development intensity, Capital-sales ratio and firm age are statistically significant and linearly related with NXI. The marginal effect of REER is found to be positive i.e. the net effect of REER is positive.

Inverted U-shaped relationship between REER and NXI may be because of an appreciation of REER which leads to an increase in export and imports decline leading to an increase in net export intensity but after some threshold level Net export may fall, the reasons may be if REER is sufficiently high, the imports will be pushed to a very low level and it may have an adverse effect on exports. The net effect of REER on net export intensity is positive as is revealed from the marginal effect. A negative relationship is found between growth of employment and NXI. This may be due to increase in growth of employment, output can be produced more through use

of quality raw material, technology and machineries which requires import from the foreign market, thereby importing more than export and thus NXI may fall. Increase in FS may increase NXI may be higher the Firm size less is the competition. As a result, utilizing the advantages of big size, better quality inputs and secured market, export increases and thus net export intensity also rises. The positive relationship between RDI and NXI may be that Firms engaged in R&D can invent superior processes technology or can produce better products employing the same level of input (Aghion and Howitt, 1992; Grossman and Helpman, 1991) which may increase net export intensity. The positive relationship between Capital-sales ratio and NXI may be due to the fact that with increase in capital, more advanced technology may increase the amount of quality output production which may raise the demand for export and hence net export intensity. Firm age is found to affect NXI positively. This may be due to the fact that older firms may have more experience, knowledge about perfect market strategy and may have easier access to finance and smooth buyer-supplier linkage which may result in higher production and more export thereby increasing net export intensity.

Finally, the common determinants of growth of employment for the two sectors turned out to be Output growth, Net export intensity, Firm size, Capital-sales ratio and Raw material intensity. Output growth, Firm size, Capital-Sales ratio and Raw material intensity may encourage the growth of employment in case of both sectors. For the Yarn producing sector in addition to these variables Net export intensity may also induce growth of employment.

Results on Efficiency:

The results on efficiency issue discussed in chapter 4 can be summarized as follows:

Firstly, Results on efficiency of **Yarn producing sector** shows that the mean OTE of the firms ranges from 0.165 to 1. The grand mean of OTE of the firms (GRM) is 0.766, implying on average the sector produces 76.6% of the maximum producible output. In case of **Fabrics producing sector**, the mean output oriented technical efficiency (OTE) of the firms ranges from 0.146 to 1. The grand mean of OTE of the firms (GRM) (i.e. the mean of average TE of the sample firms over the period 1991-2015) is 0.760, implying on average the fabrics producing sector produces 76% of the maximum producible output.

Secondly, for the **Yarn producing sector,** it is observed that 13.63% firms are fully efficient i.e. they are on the frontier with technical efficiency equal to one for the entire study period and the rest 86.37% of the sample firms under study are not fully efficient and the majority of the firms (63.64%) have their mean TE above the GRM. In case of **Fabrics producing sector** only 9.52% firms are fully efficient i.e. they are on the frontier with technical efficiency equal to one for the entire sample period and the rest 90.48% sample firms under study are not fully efficient and the majority of the firms (66.67%) have their mean TE above the GRM.

Thirdly, the result of the estimated model of both the sectors suggests that the estimated equations are nonlinear type. To capture the net effect of the variables having nonlinear relationship with the dependent variable, marginal effect has been calculated and the statistically significance of these variables have been checked by

Wald test. The fitted model of both the sector shows that there exists a simultaneous kind of relationship between TE and FS and between TE and RDI for both the sectors.

The results of determinants of Technical efficiency of **Yarn producing sector** suggest the following results:

In case of TE equation, it can be seen that the only variable Advertising intensity of previous period have nonlinear statistically significant relationship with TE i.e. inverted U-shaped relationship whereas the other variables such as Firm size, Research and development intensity, Firm age and Net export intensity are statistically significant and linearly related with TE.

Thus the result suggests that TE increases with increase in ADV_{t-1}, FS, RDI and FA but falls with increase in NXI.

The inverted U-shaped relationship is found between Advertising intensity of previous period and TE. This indicates that with increase in Advertising expense in the previous period, TE may increase but after some threshold level TE may fall. The result may be due to the fact that firms spending more on advertisement, are getting help to introduce a new product in the market easily, increases sales, fights market competition, enhances good-will with consumer and educates the consumers but after some threshold point with increase in advertising, technical efficiency decreases may be due customer annoyance considering more advertisement as an indication of fall in quality. The value of marginal effect of Advertising intensity of previous period on TE is found to be positive which implies that the net effect of Advertising intensity of previous period on TE is positive. TE is found to be positively related with firm size as large firms may be relatively more efficient than small firms may be due to scale

economies, imperfection in capital market and market power (Kumar, 2003). TE is also found to be positively related with RDI. R&D basically includes the search for various novel pathways and development of expertise which facilitate faster product development. On one hand, it generates new technologies and, on the other hand, it enhances a firm's ability to exploit existing technology and thus increases TE. TE also increases with increase in firm age. The reason may be that older firms have benefits of learning earlier and do not face hazards that the newcomers generally face (Stinchcombe, 1965), older firms may have more experience and may have easier access to finance and smooth buyer-supplier linkage which may result in higher efficiency level (Lall and Rodrigo 2001).But there exists a negative relationship between Net export intensity and TE. This may indicate that import can have more favourable impact over export to promote TE. The reasons may be while a firm imports more quality raw material and machineries it also improves its production efficiency. Evidence also suggests that the import of intermediary goods is an important channel through which technological diffusion takes place (Tybout, 2000); this may also affect the efficiency favourably. The effect of dismantling of MFA has a negative significant effect on Technical Efficiency. The efficiency level of the firms in the post MFA period may fall due to the failure of the firms to match the competitive pressures in terms of price and quantity from different countries and for this unfavorable situation the firms are unable to achieve the economies of scale in production and there may be fall in efficiency.

In case of **Firm Size Equation,** Technical efficiency and Research and development intensity have nonlinear statistically significant relationship i.e. U-shaped and inverted U-shaped relationship respectively with FS whereas Firm age and

Advertising intensity are linearly related. Marginal effect of Technical efficiency and Research and development intensity are found to be positive and the statistical significance of these variables has been checked by performing Wald test.

Technical efficiency is found to have a nonlinear i.e. U-shaped relationship with FS. This may be due to the fact that initially with increase in TE, FS may fall possibly due to investment in sophisticated technology and better management but after some threshold level with increase in efficiency, FS increases possibly due to the firms' usage of input efficiently and produce more output, so there can be increase in firm size. The marginal effect of technical efficiency on FS is found to be positive which implies that the net effect of Technical efficiency on FS is positive.

A nonlinear i.e. inverted U-shaped relationship is found between RDI and FS. The reasons may be that Firms engaged in R&D can invent superior processes technology or can produce better products employing the same level of input (Aghion and Howitt, 1992; Grossman and Helpman, 1991). Thus firms using superior processes technology may produce better and more products thereby increasing firm size but after some point increase in RDI decreases FS, may be due to heavy allocation of resources for R&D can also reduce efficiency if firms fail to get the benefit of R&D (Helpman, 1992) which may reduces FS. The net effect of Research and development intensity on FS is positive which is evident from the positive marginal effect.

A positive relationship is found between Firm age and Firm Size as well as Advertising intensity and FS. The positive relationship between Firm age and Firm Size may be due to the fact that firm staying in the market for long period, is capable of acquiring perfect market strategy and consumer faith and thus producing more

which may lead to increase in firm size. Also firms spending more on advertisement are more prone to introduce a new product in the market easily, increases sales, fights market competition, enhances good-will with consumer and educates the consumers which may insist firms to produce more to meet up the extra demand created by advertising, thus firm size may increase.

For the **Research and Development Intensity equation,** it can be concluded that the variables Capital-labour ratio and Profitability ratio have nonlinear relationship with RDI whereas Technical efficiency, Firm size and Net export intensity of previous period are linearly related. Capital-labour ratio has an inverted U shaped relationship with RDI. The values of marginal effect of Capital-labour ratio and Profitability ratio are found to be positive. It implies that these variables have positive relationship with RDI and the statistical significance of these variables has been checked by performing Wald test.

An inverted U-shaped relationship is found between K/L ratio and RDI. Possibly the capital intensive industries have a high potential to generate more profits and ability to generate mass production and high growth as well as the usage of high technology (Seenaiah and Rath, 2018) thereby raising RDI but after some threshold limit, increase in K/L may decrease RDI may be due to over mechanization and huge investment on machineries thereby reducing RDI. Also the net effect of K/L ratio on RDI is positive which is evident from the positive marginal effect.

Firms' profits are an important stimulus to, and source of funding for, R&D which in turn leads to a stream of health-enhancing new products (Scherer, 2001). So increase in PR may increase RDI may be due to increase in profit, firms have more surplus

fund in hand, which stimulates RDI. This result is similar to the findings of Tyagi, Nauriyal and Gulati (2018).

TE is found to have a negative relationship with RDI. The reason may be that if TE of the firms increases may be by investment for improvement in the ability of the workers, better management, adequate monitoring efforts, etc which may lead to more and more production, then firms may become reluctant to invest in R&D and so RDI may fall. Linear and positive relationship is found between Firm size and RDI. This may be due to the fact that a larger firm can be able to exploit economies of scale which influence firms to increase RDI.

Net export intensity of previous period is positively related with RDI. The reason may be that increase in net export may generate extra profit from foreign market and thereby raising RDI.

The results of determinants of Technical efficiency of **Fabrics producing sector** suggest the following results:

In case of TE equation, it can be seen that the Advertising intensity of previous period have Inverted U-shaped statistically significant relationship with TE whereas Firm size, Research and development intensity, Net export intensity of previous period and Marketing intensity of previous period are statistically significant and linearly related with TE. The marginal effect of Advertising intensity of previous period is found to be positive which implies that this variable has positive relationship with TE and the statistical significance of the variable has been checked by performing Wald test and found to be significant.

Thus the result suggests that TE increases with increase in ADV_{t-1}, FS, RDI, NXI_{t-1} and MEI_{t-1}.

The inverted U-shaped relationship is found between Advertising intensity of previous period and TE. This indicates that with increase in Advertising expense in the previous period, TE may increase but after some threshold level TE may fall. The result may be due to the fact that firms spending more on advertisement are more prone to introduce a new product in the market easily, increases sales, fights market competition, enhances good-will with consumer and educates the consumers and thus increases efficiency but after some threshold point increase in advertising decreases technical efficiency may be due to loss of consumer good-will with more advertisement. The net effect of Advertising intensity of previous period on TE is positive.

Firm size is positively related with TE as large size firms are found to be more efficient may be due to the scale economies, imperfection in capital market and market power (Kumar, 2003).

Positive relationship is found between RDI and TE. This may be due to the fact that R&D generates new technologies and also enhances a firm's ability to exploit existing technology thereby increasing TE.

There exists a positive relationship between Net export intensity of previous period and TE. With rise in net export intensity, technical efficiency may rise may be due to knowledge spillover from the international contacts and spillovers from technology diffusion.

Positive relationship is found between Marketing intensity and TE. Increase in marketing activities indicates an effort to strengthen the firm's brand and product image which may lead to higher revenue and in turn enhance output efficiency (Mark and Caves, 1988; Leffler, 1981).

The effect of dismantling of MFA has a negative significant effect on technical efficiency. Thus the dismantling of MFA has an unfavorable effect on technical efficiency and demotes technical efficiency of Indian Fabrics producing Sector. This may be due to the failure of these firms to match the competitive pressures in terms of price and quantity from different countries and for this unfavorable situation the firms are unable to achieve the economies of scale in production which may lead to decline in technical efficiency.

In case of **Firm Size Equation,** Technical efficiency has nonlinear statistically significant relationship i.e. Inverted U-shaped relationship with FS whereas Research and development intensity, Firm age, Marketing intensity and Net export intensity are statistically significant and linearly related with FS. Marginal effect of Technical efficiency is found to be positive i.e. this variable has positive relationship with FS and the statistical significance of technical efficiency has been checked by performing Wald test and turned out to be significant.

Technical efficiency is found to have a nonlinear i.e. inverted U-shaped relationship with FS. This may be due to the fact that with increase in efficiency the firm uses its input efficiently and produce more output, so there can be increase in firm size but after some threshold level with increase in TE, FS decreases possibly due to the failure of reaping the benefit instantly of huge investment in sophisticated technology

and better management there can be a fall in output and hence firm size. The marginal effect of technical efficiency on FS is found to be positive.

The relationship between RDI and FS is found to be positive. Firms engaged in R&D can invent superior processes technology or can produce better products employing the same level of input (Aghion and Howitt, 1992; Grossman and Helpman, 1991) thereby increasing profit and further production which may increase firm size.

Positive relation is found between Firm age and Firm Size. It may be due to the fact that staying in the market for longer period, firms are capable of acquiring perfect market strategy, smooth buyer-supplier linkage and consumer faith which may lead to increase in the firm size.

MEI and FS is also found to be positive related. More marketing activities indicates an effort to strengthen the firm's brand and product image which may lead to higher revenue (Mark and Caves, 1988; Leffler, 1981) which may promote FS.

Net export intensity affects firm size positively. Increase in Net export may mean demand of domestic goods in foreign markets increases thereby raises production which can boost firm size.

For the **Research and Development Intensity equation,** it can be concluded that Technical efficiency and Net export intensity have nonlinear statistically significant relationship with RDI whereas Firm size, Profitability ratio and Capital-labour ratio are linearly related. Technical efficiency has an inverted U-shaped relationship with RDI. The values of marginal effect of Technical efficiency and Net export intensity are found to be positive. It implies that these variables have positive relationship with

RDI. The statistical significance of the variable having nonlinear relationship has been checked by performing Wald test and came out as significant.

Technical efficiency is found to have a nonlinear i.e. inverted U-shaped relationship with RDI may be due to increase in TE, the capability of firms through using its input efficiently may rise and produce more output which can promote RDI but after some threshold level with increase in TE, RDI decreases if the rise in TE of the firms are due to improvement in the ability of the workers, better management, adequate monitoring efforts, etc. This may lead to more and more production making firms more reluctant to invest in R&D and so RDI may fall. The marginal effect of technical efficiency on FS is found to be positive.

The net effect of net export intensity on RDI is positive. The result may be due to the fact that increase in net export may increase RDI through generating extra profit from foreign market.

Positive relationship is found between Firm size and RDI. This may be due to the fact that a larger firm can be able to exploit economies of scale which influence firms to increase RDI.

Positive relationship is also found between PR and RDI. With increase in PR, firms may have more surplus fund in hand, which may stimulate RDI.

There exists a positive relationship between capital-labour ratio and RDI. This may be due to the fact that the capital intensive industries have a high potential to generate more profits and keep strategies for high growth and usage of high technology (Seenaiah and Rath, 2018) thereby increasing RDI.

Finally, comparing the results of determinants of technical efficiency of the yarn producing sector and Fabrics producing sector, the common determinants turned out to be Firm size, Research and development intensity, Net export intensity and Advertising intensity. Firm size, Research and development intensity and Advertising intensity may encourage the Technical efficiency in case of both sectors.

Findings on Productivity:

The results on productivity issue discussed in chapter 5 can be summarized as follows:

First of all, in case of **Yarn producing sector**, the mean MPI of the firms varies over the range 0.939-1.120. The average of the mean MPI or the grand mean (GRM) is 1.014. Among all the sample firms, 59.09% of firms exhibit mean MPI below the grand mean and the rest 40.91% of firms shows mean MPI above the grand mean. So the majority of the firms have their mean MPI below the GRM. The analysis reveals that yarn producing sector shows productivity increase at a rate of 5.4 % per annum.

For the **Fabrics producing sector** the mean MPI of the firms varies over the range 0.845-1.138. The average of the mean MPI or the grand mean (GRM) is 1.000. Among all the sample firms, 47.62% of firms exhibit mean MPI below the grand mean and the rest 52.38% of firms shows mean MPI above the grand mean. So the majority of the firms have their mean MPI above the GRM. The analysis reveals that fabrics producing sector shows productivity increase at a rate of 7.2 % per annum.

Secondly, all the three components of the productivity index namely technical change, technical efficiency change and scale efficiency change have contributions in determining the productivity of these sectors.

In case of **Yarn producing sector,** the contribution of **scale efficiency change** is the most important followed by technical change and the technical efficiency change. Yarn producing sector exhibits technical progress of 7.032% per annum. It should be noted that yarn producing sector moves to the most productive scale size since it shows positive value of scale efficiency change i.e. 11.599% and yarn producing sector improved in technical efficiency over the years as the value is 8.125%.

For **Fabrics producing sector also,** the contribution of **scale efficiency change** is the most important followed by technical change and the technical efficiency change. Fabrics producing sector exhibits technical progress of 12.947% per annum, scale efficiency change is 18.159% and fabrics producing sector improved in technical efficiency over the years as the value is 17.061%.

Thus for both Yarn and Fabrics producing sector, scale efficiency change is found to dominate over the other two components such as technical change and technical efficiency change. Therefore, scale efficiency change is the prime source of productivity increase.

Thirdly, the result of the estimated model of both the sectors suggests that the estimated equations are of nonlinear type. To capture the net effect of the variables having nonlinear relationship with the dependent variable, marginal effect has been calculated and the statistically significance have been checked by Wald test. The

fitted model shows a simultaneous kind of relationship between TFPG and FS and between TFPG and RDI for both the sectors.

The results of determinants of TFPG of **Yarn producing sector** suggest the following:

In case of TFPG equation, it can be seen that the variable Advertising intensity of previous period have nonlinear statistically significant relationship with TFPG. As the value of marginal effect of Advertising intensity of previous period is found to be positive, it implies that the net effect of Advertising intensity of previous period on TFPG is positive. Whereas the other variables such as Firm size, Research and development intensity, Net export intensity of previous period and Firm age are statistically significant and linearly related with TFPG.

Thus the result suggests that TFPG increases with increase in ADV_{t-1}, FS, NXI_{t-1} and FA but falls with increase in RDI.

The positive relationship between Advertising intensity of previous period and TFPG may be due to the fact that firms spending more on advertisement may be more prone to introduce a new product in the market easily, increases sales, fights market competition and thus may increase productivity.

There exists a positive relationship between FS and TFPG. Large firms may appear to become relatively more productive than small firms. This may be due to the fact that a big firm faces secured market, confronts less market competition, more cost conscious, and may use sophisticated technology in production process which may generate higher TFPG relative to smaller firms.

Net export intensity of previous period is found to have a positive relationship with TFPG. This indicates that with increase in net export intensity in the previous period, TFPG may increase. The result may be due to the fact that because of knowledge spillovers from the international contacts and spillovers from technology diffusion with the increase in net export intensity there can be shift in the frontier which may promote TFPG.

A positive relationship is also found between firm age and TFPG which means that TFPG may rise with increase in firm age. The older firms have benefits of learning earlier, may have more experience and may have easier access to finance and smooth buyer-supplier linkage which may help to increase production and may encourage TFPG.

But a negative relationship is found between RDI and TFPG. R&D expenditure may not enable firms to attain better TFPG rather it reduces TFPG possibly because of high adaptation cost of the new technology and inability to operate it and reap its potentiality instantaneously (Mitra and Jha, 2015).

The effect of dismantling of MFA has a negative significant effect on TFPG. The falling TFPG levels of the firms after the phasing out of MFA may be due to the failure of these firms to match the competitive pressures in terms of price and quantity from different countries and for this unfavorable situation the firms are unable to achieve the economies of scale in production and there may be fall in production which may discourage TFPG.

In case of **Firm Size Equation,** Advertising intensity of previous period has nonlinear statistically significant relationship with FS whereas TFPG, Net export intensity,

Capital-labour ratio and Marketing intensity are statistically significant and linearly related. Marginal effect of Advertising intensity of previous period is found to be positive, and the statistical significance of this variable has been checked by performing Wald test and turned out to be significant.

As the marginal effect is positive, thus net effect of Advertising intensity of previous period on TFPG is positive. Firms spending more on advertisement in the previous period are more prone to introduce a new product in the market easily; increases sales and fights market competition in the current period thereby increasing production to meet up the extra demand created by advertising. As a result, firm size may increase.

TFPG is found to have a positive relationship with FS. This indicates that with increase in TFPG, FS may increase. This may be due to the fact that with increase in TFPG, there is increase in output which may lead to firm size increase.

But there exists a negative relationship between Net export intensity and FS. This indicates that import have more favourable impact over export to promote FS. The reason may be with more import firms can have access to machineries which may improve its production process thereby increasing its output and thus FS.

Capital-labour ratio, which serves as a degree of mechanization is found to have a positive relationship with FS. The capital intensive industries have an ability to generate mass production and keep strategies for high growth, by using advanced and sophisticated technology into the production process which may help to increase firm size.

MEI is found to have a positive relationship with FS. More marketing activities indicates an effort to strengthen the firm’s brand and product image which may lead

to higher demand of product thereby increasing production to meet up the extra demand created by marketing. As a result, firm size may increase.

For the **Research and Development Intensity equation,** it can be concluded that the variable Firm size have a nonlinear statistically significant relationship with RDI whereas TFPG and Net export intensity are statistically significant and linearly related. The values of marginal effect of Firm size is found to be positive, it implies that Firm size have positive relationship with RDI and the statistical significance of Firm size has been checked by performing Wald test and turned out to be significant.

The positive relationship between Firm size and RDI may be due to the fact that a larger firm can able to exploit economies of scale and produce more which may influence firms to increase RDI.

But TFPG is found to have a negative relationship with RDI. In other words, increase in TFPG may decrease R&D expense may be due to the fact that with increase in TFPG which implies more production may be due to simply allocating inputs more appropriately and efficiently (Balk, 2001), effect of economies of scale on change in the scale of operation of a firm or industry firms (Jorgenson and Griliches, 1967) and organizational improvement (Solow, 1957), may become more reluctant to invest further in R&D and so RDI may fall.

Net export intensity is positively related with RDI. This may be due to the fact that increase in net export may generate extra profit from foreign market which may help in expansion of RDI.

The results of determinants of TFPG of **Fabrics producing sector** suggest the following results:

In case of **TFPG equation**, it can be seen that the Advertising intensity of previous period have nonlinear statistically significant relationship with TFPG and the net effect of Advertising intensity of previous period on TFPG is positive. Whereas Firm size, Research and development intensity, Net export intensity of previous period, Firm age and Marketing intensity of previous period are statistically significant and linearly related with TFPG. The marginal effect of Advertising intensity of previous period is found to be positive, it implies that this variable has positive relationship with TFPG and the statistical significance of the variable has been checked by performing Wald test and found to be significant.

Thus the result suggests that TFPG increases with increase in ADV_{t-1}, FS, NXI_{t-1}, FA and MEI_{t-1}but falls with increase in RDI.

The positive relationship between TFPG and ADV_{t-1}may be due to the fact that firms spending more on advertisement are more disposed to present new products in the market easily, increases sales and combats market competition thereby increasing productivity.

The relationship between TFPG and FS is also found to be positive. The reason may be that for a big size firm market is relatively secured, faces less market competition and are able to use sophisticated technology in production process which may generate higher TFPG relative to smaller firms.

There exists a negative relationship between TFPG and RDI. The reason may be that R&D expenditure may not enable firms to attain better TFPG rather it may reduce

TFPG possibly because of the inability to operate new technology and reap its potentiality instantaneously (Mitra and Jha, 2015).

Net export intensity of previous period is found to have a positive relationship with TFPG. This indicates that with increase in net export in the previous period, TFPG may increase. The result may be due to the fact that with rise in Net export intensity of previous period, knowledge spillover from the international contacts and spillovers from technology diffusion may take place which can promote TFPG in the current period.

A positive relationship is found between firm age and TFPG, which means that TFPG may rise with increase in firm age. The older firms have benefits of learning earlier, may have more experience and also may have easier access to funding compared to new firms which may help to increase TFPG.

There also exists a positive relationship between TFPG and MEI in the previous period. It may be the reason that a higher allocation of resources for marketing activities may indicate an effort to strengthen the firm's brand and product image which may lead to more production thereby encouraging TFPG.

The effect of dismantling of MFA has a negative significant effect on TFPG. The falling TFPG levels of the firms after the phasing out period compared to the MFA period may be due to the failure of the firms to match the competitive pressures of price and quantity from different countries and for this unfavorable situation the firms may be unable to achieve the economies of scale in production and there may be fall in TFPG.

In the **Firm Size Equation,** Marketing intensity of previous period has nonlinear statistically significant relationship with FS. The marginal effect of MEI in previous period is found to be positive, i.e. MEI in previous period has positive relationship with FS and is statistical significance. But TFPG, Research and development intensity, Net export intensity of previous period, Advertising intensity of previous period and Capital-labour ratio are statistically significant and linearly related with FS.

The positive relationship between MEI in previous period with FS may be due to the fact that more marketing activities may help to strengthen the firm's brand and product image which may lead to higher demand of product and firms may produce more thereby increasing firm size.

TFPG is found to have a positive relationship with FS. This may be due the reason that with increase in TFPG due to frontier shift, there is increase in output which may lead to firm size increase.

Relationship between RDI and Firm size is found to be positive. This may be due to the fact that R&D may increase the production of a firm using sophisticated technology in the production process which may lead to increase in firm size.

There exists a negative relationship between Net export intensity of previous period and FS. This indicates that import may have more favourable impact over export to promote FS. The reason may be that when a firm imports quality raw material and machineries it may improve its production, which can raise its output level thereby leading to increase in FS.

FS is found to have a positive relationship with ADV in previous period which may suggest that more advertisement in previous period helps to introduce a new product in the market easily and increases sales in the current period thereby increasing firm size.

Capital-labour ratio, which serves as a degree of mechanization is found to have a positive relationship with FS. The reason may be that capital intensive industries have an ability to generate mass production and adopt strategies for high growth employing advanced and sophisticated technology into the production process. This may help to increase Firm size.

For the **Research and Development Intensity equation,** , it can be concluded that Firm size have nonlinear statistically significant relationship with RDI. Marginal effect of Firm size is found to be positive, implying that Firm size have positive relationship with RDI and found to be statistically significant. Whereas TFPG and Net export intensity are statistically significant and linearly related with RDI.

A positive relationship is found between Firm size and RDI. This may be due to the fact that a larger firm can be able to exploit economies of scale thus producing more which may positively influence RDI.

TFPG is found to have positive relationship with RDI. Increase in TFPG may increase RDI may be due to increase in productivity firms may be capable to use its input efficiently and produce more output which may promote RDI.

Net export intensity is positively related with RDI. This may be due to the fact that with increase in net exports, firms have the scope of knowledge spillover from the international contacts and technology diffusion which may promote RDI.

Finally, Firm size, Research and development intensity, Firm age, Net export intensity and Advertising intensity are the common determinants of TFPG for both the sectors. Firm size, Firm age, Net export intensity and Advertising intensity may encourage the TFPG for both the sectors.

Comparison between Growth of Employment, Efficiency and Productivity:

Till now a detailed analysis regarding growth of Employment, Efficiency and Productivity of the Yarn producing sector and Fabrics producing sector of Indian Textile Industry have been made. Comparison between Growth of employment, Efficiency and Productivity of the two sectors suggest that:

First, firm size and net export intensity are the common variables affecting Growth of Employment, TE and TFPG for both the yarn and fabrics producing sector. Firm size affects Growth of Employment, TE and TFPG positively for both the sectors. Whereas Net export intensity affects Growth of Employment and TFPG positively but TE negatively for Yarn producing sector and for Fabrics producing sector it affects TE and TFPG positively but Growth of Employment negatively.

Secondly, the common factors which are responsible for affecting TE and TFPG for the yarn producing sector are Firm size, Research and development intensity, Firm age, Net export intensity and advertising intensity. Firm size, Firm age and advertising intensity affect TE and TFPG positively. Research and development intensity affect TE positively but TFPG negatively. Net export intensity affects TE negatively but TFPG positively.

For the fabrics producing sector, Firm size, Research and development intensity, Net export intensity, marketing intensity and advertising intensity are the common factors.

Firm size, Net export intensity, marketing intensity and advertising intensity affect TE and TFPG positively. Research and development intensity affect TE positively but TFPG negatively.

Finally, for both the Yarn and Fabrics producing sector, dismantling of MFA has a positive impact on growth of employment compared to the MFA period but negative impact on TE and TFPG compared to the MFA period.

Policy Suggestions

For the yarn producing sector, any policy aiming at increase in Firm size and advertising intensity will foster TE and TFPG. Similarly, policy changes leading to increase in Firm size and Net export intensity will help in promoting growth of employment and TFPG. In case of fabrics producing sector, any policy aiming at increase in Firm size, Net export intensity, marketing intensity and advertising intensity will boost up TE and TFPG. Similarly, policy changes leading to increase in Firm size will help in encouraging growth of employment and TFPG. Thus the whole analysis reveals that for both the sectors, any policy changes leading to increase in Firm Size may foster growth of employment, efficiency and productivity.

Limitations of the study

The limitation of the study is that since the present thesis have used CMIE data, so state level information regarding Indian Textile Industry are not readily available. In case of Indian Textile Industry, such State wise analysis cannot be neglected in determining growth of employment, efficiency and productivity.