Chapter 3

Analysis of employment of Indian Textile Industry and identification of its determinants

3.1 Introduction

The textile industry forms a significant manufacturing base of several developing countries. It delivers input to clothing industry thus providing strong vertical linkages. The Textile industry requires relatively greater labour and low investment, hence has been favored by developing countries. India has a strong bequest and significant capacities in textile sector. The Indian Textile Industry (ITI) is labour intensive and both skilled and unskilled people get employed in this industry (Ahlawat and Renu, 2018). The mass production sector focus on low production cost, standard products and at the lower-end it may also subcontract to household production.

ITI is composed of different sizes of firms like small, medium and large which operates under labour intensive as well as capital intensive production method, including different production process like spinning, weaving, knitting and processing [Devaraja (2011)]. Spinning process produces yarn and weaving process produces fabrics [Rao (1989), Bedi (2003), Devaraja (2011), IBEF Report (February, 2018)]. The performance of ITI is not at all uniform across firms or across sectors as each firm or sector has its own characteristics that persuade its growth and performance. There is inter firm or inter sectoral disparity in terms of employment as well. Yarn and Fabrics producing sector together contributes 60% of employment in Indian

Textile Industry (Annual Survey of Industries, 2016-2017). Thus the present thesis is concerned with some major employment generating sectors of ITI such as yarn and fabrics using firm level data.

There are empirical studies worldwide related to employment of different manufacturing industries considering different time periods and concluded accordingly. Focusing on the literature regarding employment of Indian textile industry, mention may be made of some names like Ahlawat and Renu (2018), Arora (2015), Oberoi (2012), Narayanan (2003) among others.

The perusal of literature on ITI suggests that not much attempt has been made on the issue of growth of employment in Yarn and Fabrics producing sectors of ITI separately using firm level data or by employing modern econometric approach and there is dearth in the literature relating to determinant analysis of growth of employment of the above mentioned sectors.

Apart from this the perusal of the empirical literature on growth put forward some limitations. Most of the growth analysis depend upon the conjecture of deterministic trend (assuming means and variances are well defined constants and independent of time) and hence they lack in testing for difference or trend stationarity using unit root of modern time series approach (with some exceptions such as Sarkar and Mukhopadhyay, 2001; Ghose and Pal, 2007; Sengupta, Ghose and Pal, 2009; Roy Biswas & Ghose, 2012 among others). But as researchers over the last three decades pointed out that those assumptions are not always valid as the series may be nonstationary in nature. Hence stationary properties of the series are to be checked in order to get a valid result. But in the presence of structural break, the standard Unit

Root test is not consistent against Trend Stationary Process[1] (TSP) (Perron, 1989). Perron (1989), in presence of one-time exogenous structural break in the series, suggested a method appropriate for testing Unit Root. Zivot and Andrews (1992) pointed out that Perron's procedure is not an appropriate one and argued that the break point should be endogenously determined (rather than exogenously determined Perron (1989)). However according to Sen (2003), the power of Zivot and Andrews (1992) test statistic is low and recommended some methods to improve the power of the test.

Thus it will be interesting to observe the true nature of the time series data of yarn and fabric producing sector of Indian textile industry and accordingly test whether the growth process converges to a path having trend preserving properties, to verify the presence of structural breaks (which may appear due to changes in economic regime over time) in both the series and its persistence level using the endogenous structural break model of Zivot and Andrews (1992) and Sen (2003) over the period 1991 to 2015.

Thus the major objectives of the present chapter are as follows:

First, to check whether the series of Employment for Yarn and Fabrics producing sector of ITI converges to a path having trend preserving properties. **Secondly,** to test for the presence of structural break for both the series. **Thirdly,** to analyse the growth pattern of ITI for the Employment series**. Finally,** it is important to identify the reasons behind the variation in growth of employment for the above mentioned sectors of ITI.

[1] A TSP implies that the effect of random shock is temporary around a stable trend.

Rest of the chapter is organized as follows:

Section 3.2 discusses methodology and data source. In subsection 3.2.1 the methodology for studying the growth performance of the employment using Zivot and Andrews (1992) as well as Sen (2003) approach of endogenous structural break and also Methodology for finding out determinants of Growth of employment are discussed. In subsection 3.2.2 Data Sources are discussed. Section 3.3 presents the results of analysis and Section 3.4 presents the summary and conclusion.

3.2 Methodology and Data Source

3.2.1 Methodology

The present chapter uses two stage methodologies. In the first stage, Growth pattern for employment are studied separately for the two sectors of ITI i.e. Yarn and Fabrics using both Zivot and Andrews (1992) as well as Sen (2003) approach of one-time endogenous structural break. In the second stage, Factors influencing Growth of employment are found out using simultaneous panel model.

3.2.1.1 Methodology for Studying the Growth Performance of employment using Zivot and Andrews (1992) and Sen (2003) approach of one-time endogenous structural break

Nelson and Plosser (1982) suggested that the nature of macroeconomic data follows two types of process: Difference Stationary Process (DSP) and Trend Stationary Process (TSP). The statistical test is called Unit Root test and the technique is put forward by Dickey and Fuller (1979, 1981).

For understanding the Unit Root test process, the following simple regression equation is considered:

$$Y_t = \delta_0 + \delta_1 t + \gamma Y_{t-1} + u_t$$

where $u_t = \alpha u_{t-1} + \varepsilon_t$, ε_t is Gaussian White-Noise, t is the time period considered, Y_t and Y_{t-1} are the values of Y at time t and t-1 respectively.

Test of the null hypothesis $H_0 : \gamma = 1$ is done against the alternative $H_1 : \gamma < 1$. If the null hypothesis is rejected then the underlying series follows TSP and if the null hypothesis is failed to reject then the underlying series follows DSP. According to Dickey and Fuller, the coefficient of Y_{t-1} does not follow the usual student's t distribution. This problem is solved by Fuller by obtaining the limiting distribution of this coefficient of Y_{t-1}. The Unit Root test has been modified afterward by Said and Dickey (Augmented Dickey-Fuller Test (ADF) (1985)), Phillips (1987), Phillips and Perron (1988) for the case where ε_t is not White-Noise. McKinnon (1990), at selected significance levels, derived the critical values from a much bigger set of replications.

A series following DSP basically implies stochastic trend where variability of the series depends on time and no definite conclusion can be made from the series. So for appropriate conjecture about the growth performance, only series following TSP will be considered. Provided that the series follows TSP, if the coefficient of time is statistically significant then it suggests that there exists a trend in the series and if the constant term is statistically significant, then it talks about the existence of drift in the model. If Y_t depends on ΔY_{t-j} (where j=1, 2, 3...T) then it means autoregressive

moving average series and the above test procedure is known as Augmented Dickey-Fuller (ADF) test.

Perron (1989) showed that in the presence of structural break, the standard unit root test is not consistent against TSP and has suggested a procedure for testing unit root in presence of one-time structural break in the series.

But Perron (1989) procedure for finding out the break point was criticized by Zivot and Andrews (1992) as it was based primarily on visual inspection of data and further argued that the break point should be endogenously determined (rather than exogenously determined, Perron (1989)) and can be evaluated by applying OLS considering models as below:

Model A: $$Y_t = a^A + b^A DU_t + c^A t + d^A Y_{t-1} + \sum_{j=1}^{k} \delta_j Y_{t-j} + e_t \quad \ldots 3.1$$

Model B: $$Y_t = a^B + g^B DT_t + c^B t + d^B Y_{t-1} + \sum_{j=1}^{k} \delta_j Y_{t-j} + e_t \quad \ldots 3.2$$

Model C: $$Y_t = a^C + b^C DU_t + c^C t + g^C DT_t + d^C Y_{t-1} + \sum_{j=1}^{k} \delta_j Y_{t-j} + e_t \quad \ldots 3.3$$

The error term in the model, e_t is assumed to be independently and identically distributed random variable with zero mean and constant variance i.e. $e_t \sim$ iid $(0, \sigma^2)$. Model A permits an endogenous break in the level of the series; Model B allows an endogenous break in the rate of growth and Model Cpermits an endogenous break both in the level as well as rate of growth.

The dummy variables of the three models can be defined as follows:

$DU_t = 1$ if $t > T\lambda$

$= 0$ otherwise

$DT_t = t - T\lambda$ if $t > T\lambda$

$= 0$ otherwise

where T stands for total time period and T_B is the break point**.** Then**,** $\lambda = T_B/T$ is the break fraction and ranges from 2/T to T-1/T

Zivot and Andrews (1992) suggested that out of the (T-2) regressions, that year is chosen as break year which gives the minimum value of't' statistics corresponding to the coefficient of Y_{t-1}. In addition to it, that model is chosen as the best fitted one which gives the minimum't' value of the coefficient of Y_{t-1}. After finding out the best fitted model and the break point, test for the hypothesis d=1 i.e. coefficient of Y_{t-1} =1is to be done and to compare it with the critical values given by Zivot and Andrews (1992) to determine whether the series is TSP or DSP.

But Sen (2003) criticized the conventional Unit Root procedure of Zivot and Andrews (1992) had been and argued that it may suffer from power distortion. Three types of characterizations are there in Zivot and Andrews (1992) namely Crash Model, Changing Growth Model and Mixed Model-of the form of break under the alternative of TSP. For all the three characterizations of the alternative, minimum t-statistics are used to test for a Unit Root, when the location of break is unknown (assuming endogenous structural break). Sen (2003) argued that since the form of break is treated as unknown, the appropriate alternative should be the Mixed Model. When the form of break is wrongly specified, there are serious implications for the

power of the minimum t-statistics. Simulation suggests that Crash Model (Changing Growth Model) minimum t-statistics fail to reject the Unit Root null hypothesis, provided that the break occurs according to the Changing Growth Model (Crash Model). Some loss of power is also found for Mixed Model minimum t-statistics, when the break occurs following the Crash Model or Changing Growth Model. Thus Sen (2003) applied his test on the Mixed Model which simultaneously allows for a break in the level as well as rate of growth and test for the existence of endogenous structural break (expression for Model C-equation (3.3)). The test statistic used by Sen (2003) is SupWald statistic, originally put forth by Murray (1998) and Murray and Zivot (1998). It actually gives the joint null hypothesis of a Unit Root with no break in the intercept and the slope of the trend function. Sen (2003) applied the F-statistic to calculate the maximum F-statistic for the null hypothesis in accordance with

$$F_T^{Max} = Max_{T_b \in \{[\lambda_0 T], [\lambda_0 T]+1, \ldots, T-[\lambda_0 T]\}} F_T(T_b)$$

where T_B is the break point which is a constant fraction of the sample size T i.e. $T_B = \lambda^C T$ with the current break fraction $\lambda^C \in (0,1)$ and the smallest integer function.

The Mixed Model (Model C) has been suggested by Sen (2003) having higher power than either Model A or Model B and also the F-statistic for testing the Unit Root hypothesis being more powerful than the traditional t-statistic and the power of F-statistic is more or less consistent. After getting the maximum F-statistic amongst the alternative regression equations, the estimated F-statistic ($F_T^{\max}$) is compared with

the asymptotic critical values of $F_T^{\max}$ given by Sen (2003). Finally analyzing the nature of series, it can be concluded whether the series follows TSP or DSP.

In equation (3.3), c i.e., the co-efficient of time (in Model C) represent growth rate for the entire sample period if g, the co-efficient of DT_t is not statistically significant. But if g is statistically significant c represent growth rate for the period before structural break whereas the growth rate after structural break is determined by the term c+g, provided g is statistically significant. Logarithm of the dependent variables are taken as regressands.

3.2.1.2 Determinants of growth of employment

A second-stage regression analysis of Growth of employment can help to identify factors that enhance or hinder it. This, in its turn, becomes helpful for public policy for improving growth of employment of ITI. To get a comprehensive picture about the possible determinants influencing growth of employment in ITI, panel estimation technique using firm level panel data from 1991 to 2015has been employed

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

The inclusion of the above explanatory variables can be justified as follows:

Output Growth(Y): An 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. So a positive relationship between the two is expected. Different studies in the international as well as Indian literature considered output growth as the determinants of employment growth at an aggregate country level or at sector level or at firm level (Behera (2019), Aydiner-Avsar and Onaran (2010), Goldar (2000), Nagaraja (2000), Goldar (1987) among others). Output is measured by the sum of sales value and change in stock (Deshmukh and Pyne (2013)).

Firm Size (FS): Increase in firm size occurs mainly due to increase in output and this expansion of output may be a cause of increase in employment. Thus a positive relation between Firm Size and employment growth is expected. The role of Firm Size effect in explaining the growth pattern is emphasized by Scott and Pascoe (1986). They showed that Firm Size effect is important in explaining structural variables. Different literature exists taking firm size as determinants of employment. Some names can be mentioned in this connection such as Banerjee and Jesenko (2016), Haltiwanger et al. (2010, 2013), Neumark et al. (2011), Davis et al. (1996) among others. Lawless (2014),Dixon and Rollin (2012),Huber et al. (2012), Earle and Telegdy (2011) among others find a positive relationship between net employment growth and firm size. Firm Size is obtained for each firm of each sector as the ratio of a firm's value of output in real terms to value of industry output in real terms.

Capital-Sales Ratio (C/S): The role of capital-sales ratio (C/S) is important while determining the factors explaining growth of employment of Indian Textile industry. Different studies in Indian literature considered capital intensity due to Mitra and Jha (2015) among others as a determinant of employment. 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 may deter or promote growth of employment of an industry by using advanced and sophisticated technology into the production process. Capital-Sales Ratio may be obtained for each sector by the ratio of capital to sales and may act as a proxy for Capital Intensity.

Profitability Ratio (PR): 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. Profitability Ratio is obtained for each sector by the ratio of profit to sales.

Raw material Intensity (RI): Raw material is a primary input of production. 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 is expected. Raw material Intensity is obtained for each sector by the ratio of Raw material expense to sales.

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). Thus a related question may arise that whether the employment of this industry is affected by trade related variables or not?

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. Thus the above discussion reveals that both exports and imports may affect growth of employment of ITI. So it may be interesting to find out the relative role of exports vis á vis imports in fostering growth of employment. But the major shortcoming of many of the empirical studies is their inability to separate the impact of exports and imports. Some focus on the one and neglect the other.

Some studies in the literature are found to use total trade (i.e. sum of export and import) as measure of openness ((Frank and Romer (1999) and Harision (1996)), assuming that export and import put in equally to the promotion of economic growth and that the import-intensity of export to be zero, which suffers from some drawbacks. Whereas Zhang, Ondrich and Richardson (2003), while evaluating how cross country differences in export and import openness in 1990 affected the level of real per capita income, used net exports (exports minus imports), which in turn imply distinct exports and imports effects. Their results support the conjecture that income is associated with net trade.

Net Export Intensity (NXI): 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).

The present study defined net export intensity as the ratio of Export minus import to sales.

International trade in the textile and clothing industry has long been administered by the Multi-Fibre Agreement (MFA), which set national quotas for export of textiles from developing countries to developed countries. With World

Trade Organization (1995), the Agreement on Textile and Clothing (ATC) replaced the MFA. Under ATC, a 10-year (1995-2004) quota phasing out transitional period was agreed upon, i.e. to phase out the quota restrictions progressively in four stages i.e. in the years 1995-1997 (Phase I), 1998-2001(Phase II), 2002-2004 (Phase III) and in January 1, 2005 (Phase IV). Export quota was removed for Textile and Clothing for the four scheduled groups viz. yarn, fabrics, made-ups and cloth/apparels at 16 %, 17%, 18% and 49% respectively [Verma (2000), Manoj and Muraleedharan (2016)]. Naturally the question arises that: What happens to the Growth of employment of ITI after the dismantling of MFA?

Policy Related Variable: Therefore, a time dummy, D is introduced taking value 1 from 2005 onwards (i.e. period of dismantling of MFA) and 0 for the rest of the year (i.e. MFA period).

Problem of Heterogeneity- For determinant analysis panel data estimation method have been used. By using panel data estimation method, variables are obtained which can be taken as significant determinants across all the firms for each sector. Panel data allows us to take into account the information provided by time series, something we cannot do with a single cross section. A panel data set also allows us to control for unobserved cross section heterogeneity. Panel regression analysis is done using a seemingly unrelated regression (SUR) framework where each regression was adjusted for contemporaneous correlation (across units) and cross section heteroscedasticity is adopted. Test for better model i.e. whether fixed effect or random effect model is the better one has been checked using Hausman specification test. Fixed effect model turned out to be the better one as suggested by Hausman specification test.

The seemingly unrelated regression (SUR) framework and the problem of adjusting heteroscedasticity using White Cross-Section can be found in **Appendix.**

Problem of Simultaneity- A common problem may be that there may exist simultaneity between E and NXI. It may be possible that high growth of employment may be due to high NXI. On the other hand high NXI may due to high growth of employment. Thus a problem of simultaneity is involved. Therefore to take care of this problem, simultaneous panel model has been framed 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.

Proposed model for yarn and fabric are estimated in a panel set up showing simultaneous relationship among the above mentioned variables.

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

The models for the yarn and fabrics producing sector are as follows:

For Yarn producing sector, the chosen model considered E and NXI as dependent variables and thus separate equations for each of these variables, i.e. equations 3.4 and 3.5 which are presented below:

$$E = f\left[Y_{(t-1)}, NXI, FS, \left(\frac{C}{S}\right)_{(t-1)}, PR, RI, PR^2, D\right] \quad \ldots 3.4$$

$$NXI = f\left[E, FS, RDI_{(t-1)}, \left(\frac{C}{S}\right), REER, \left(\frac{C}{S}\right)^2, REER^2\right] \quad \ldots 3.5$$

The specified equation for employment is nonlinear in PR. The specified equation for NXI is nonlinear in $\left(\frac{C}{S}\right)$ and REER.

The relation between NXI 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 Research and Development Intensity of the previous period 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 output and thus net export. Research and Development expense per unit of output is taken as Research and Development Intensity (RDI). 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.

For Fabrics producing sector, the chosen model considered E and NXI as dependent variables and thus separate equations for each of these variables, E equation (equation 3.6) and NXI equation (equation 3.7) which are presented below:

$$E = f[Y, FS, NXI, \left(\frac{C}{S}\right)_{(t-1)}, RI, RI^2, D] \quad \text{...3.6}$$

$$NXI = f[E, FS, RDI, \left(\frac{C}{S}\right), FA, REER, REER^2] \quad \text{…3.7}$$

The specified equation for growth of employment is nonlinear in RI. The specified equation for NXI is nonlinear in REER.

The relation between NXI and the explanatory variables can be justified as follows:

Relationship between NXI and E, FS, C/S and REER has been already justified 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. Research and Development expense per unit of output is taken as Research and Development Intensity (RDI). Also there may exists a positive relationship between Firm Age (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. Firm Age (FA) is obtained for each firm by the difference between present year and establishment year of that firm.

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 are tested in the presence of exclusion restriction and the models are overidentified.

Method of estimation- Two step estimation method

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.

3.2.2 Data Sources

The present study uses CMIE Prowess data base. 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 over the period 1991 to 2015.

Data on sales value, change in stock, Raw material expenses, salary and wages, profit, value of export, import and net fixed asset has been obtained from CMIE prowess data base (in Rs. Million). All the nominal values are deflated by appropriate whole sale price index, to obtain their real values i.e. value of sales and change in stock of the textile firms is deflated by price index of Textile, Expenditure

on raw materials by price index of material consumed and Expenditure on salary and wages by Consumer price index for industrial worker, expenditure on capital by price index of machinery and equipment. Relevant Price indices are collected from the Index Number of Wholesale Prices in India published by the Office of the Economic Advisor, Ministry of Industry, Government of India, Udyog Bhaban, New Delhi.2004-05 is taken as the base year for calculation of price index. Data on Real Effective Exchange Rate (REER) is obtained from Hand Book of Statistics on Indian Economy, Reserve Bank of India.

3.3 Results of Analysis

3.3.1 Estimated Results of Structural Break Analysis and Growth of Employment

The results of test on convergence of the employment growth series of Yarn producing sector and Fabrics producing sector, and the corresponding break points and also growth pattern of employment series are discussed in the following subsections:

3.3.1.1 Estimated Results of Yarn and fabrics producing sector using Zivot and Andrews (1992) approach

For the Yarn producing sector, the nature of the series i.e. whether the growth process of employment converges to a path having trend preserving properties are determined as well as the break points are found and the results are presented in **Table 3.1.**

For the Yarn producing sector, the employment growth series is of Trend stationary (TS) type implying convergence towards stationary process and Variability of the

series remains constant over time. The best fitted model turned out to be Model B. The break point (using Model B) for the yarn producing sector corresponds to the period 2000 which may be due to the phasing out of the quota restrictions of MFA, Phase I (1995-1997) which increased the export of Indian textile and the share of Indian textile in Global Textile Market, increase the opportunities for employment generation and economic growth of the country. The break point, 2000 may be also the impact of Technology Upgradation Fund Scheme (1999) to facilitate new and appropriate technology for making ITI globally competitive and to provide interest subsidy on borrowings. As the coefficient of DT_t is significant, as is revealed from the Table 3.1, it can be said that the growth rate of employment before break is negative (i.e.-5.6%) for the yarn producing sector whereas growth rate of employment after break is positive i.e. 5% which is presented in Table 3.2. So there is an evidence of increase in growth of employment in yarn producing sector.

For the Fabrics producing sector, the nature of the series i.e. whether the growth process of employment converges to a path having trend preserving properties are determined as well as the break point is found and the results are presented in Table 3.3.The best fitted model turned out to be Model A.

For Fabrics producing sector the employment growth series is also of Trend stationary (TS) type implying convergence towards stationary process and Variability of the series remains constant over time. The break point (using Model A) for the fabrics producing sector corresponds to the period 2007 which may be due to the complete phasing out of the quota regime of Multi-Fibre Agreement (MFA) in 2005 which increased the amount of export and the share of Indian textile in Global Textile Market and create opportunities for employment. From Table 3.3 it is clear that as the

coefficient of DU_t is positive and significant, there is an increase in the level of employment after the break period.

3.3.1.2 Estimated Results of Yarn and fabrics producing sector using Sen (2003) approach

The nature of the series i.e. whether the growth process of employment converges to a path having trend preserving properties are determined as well as the break points are found for the Yarn producing sector whose results are presented in Table 3.4.

For the Yarn producing sector, the employment growth series is of Trend stationary (TS) type implying convergence towards stationary process and Variability of the series remains constant over time. The break point for the yarn producing sector corresponds to the period 1999 which may be due to the impact of phasing out of the quota restrictions of MFA, Phase I (1995-1997) which increase the export of Indian textile and the share of Indian textile in Global Textile Market, increase the opportunities for employment generation and economic growth of the country. As the coefficient of DT_t is significant, from the Table 3.4, it can be said that the growth rate of employment before break is negative i.e.-5.3% for the whereas growth rate of employment after break is positive i.e. 5% which are presented in Table 3.5. Thus there is an increase in the rate of growth of employment after the break for the yarn producing sector.

For the Fabrics producing sector, the nature of the series i.e. whether the growth process of employment converges to a path having trend preserving properties are determined as well as the break point is found and the results are presented in Table 3.6.

For Fabrics producing sector the employment growth series is also of Trend stationary (TS) type implying convergence towards stationary process and Variability of the series remains constant over time. The break point for the fabrics producing sector corresponds to the period 2004 which may be due to the National Textile Policy (2000) and also may be the impact of phasing out of the quota restrictions of MFA, Phase I (1995-1997) and Phase II (1998-2001) that formulated with the objectives to increase the share of Indian textile in Global Textile Market, increase the opportunities for employment generation and economic growth of the country and facilitate the Indian Textile Industry to attain a sustainable pre-eminent worldwide standing in the manufacturing and export of clothing. From Table 3.6 it is clear that the coefficient of DU_t and DT_t are statistically significant. As DU_t is statistically significant, there is an increase in the level of employment after break. As DT is found to be statistically significant, growth rate of employment before break is negative i.e. -3.5%whereas Growth rate of employment after break is positive i.e.6% as is revealed from Table 3.7.

3.3.1.3 Comparison of the estimated results for yarn and fabrics producing sector using Zivot and Andrews (1992) and Sen (2003) approach

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.

The result of estimation using Zivot and Andrews (1992) approach suggests that there is an evidence of increase in growth of employment after the break in yarn producing

sector and an increase in the level of employment after the break in the fabrics producing sector.

According to the result suggested by Sen (2003), an evidence of increase in the growth rate of employment after the break for both the sectors are found. Also there is an increase in the level of employment after the break in the fabrics producing sector.

3.3.2 Results of Determinants of growth of employment

A second stage panel regression has been carried out to find out the major determinants of growth of employment of two sectors of the Indian Textile Firms namely Yarn and Fabrics producing sector. The variables considered are Output Growth (Y), Firm Size (FS), Capital-Sales ratio (C/S), Profitability Ratio (PR), Raw material Intensity (RI) and Net Export Intensity (NXI) for both the Yarn and Fabrics producing sector.

It may be mentioned that the estimated equations in the models for yarn and fabric are found to be nonlinear. Thus the sign of marginal effects will help to understand the positive or negative relationship for those variables which are nonlinearly related with the dependent variable in each equation. Needless to mention, those variables having linear relationship with the dependent variables in the different equations, sign of the corresponding coefficients will matter for finding out whether the concerned variable has a positive or negative relationship with the dependent variable.

While estimating the panel model, to test for appropriateness of the assumption of fixed effect vis a vis the random effect model, Hausman's specification

test is performed for each of the regression which strongly rejects the assumption of random effect model and supports the assumption of fixed effect model.

The estimated models also reports Adjusted R^2 which represents the overall fit of the model, which is based on the difference between residual sum of squares from the estimated model and the sum of square from a single constant only specification, not from a fixed effect only specification. High value of Adjusted R^2 shows that the fitted models are reasonably good.

The statistical significance of these variables has been checked by Wald test.

The results of determinants of growth of employment of yarn and fabric producing sector are presented in subsections 3.3.2.1 and3.3.2.2 respectively which are presented below:

3.3.2.1 Results of Determinants of growth of employment of Yarn producing sector

In this model, there are two equations namely growth of Employment and Net export Intensity.

The results of **Determinants of Growth of employment of Yarn producing sector** can be visualized from **Table 3.8 to Table 3.13.**

In case of **employment equation** whose result can be found in Table 3.8, it can be seen that the variable Profitability ratio have nonlinear relationship with growth of employment 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 with growth of employment. The statistical

significance of Profitability ratio has been checked by performing Wald test which is presented in Table 3.11.

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

As the marginal effect of Profitability ratio on growth of employment is found to be positive as is revealed from Table 3.10, it implies that the net effect of Profitability ratio on growth of employment is positive. The result 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. This 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).

A positive relationship is also found between Net export intensity and growth of employment. 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 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 the amount of 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 relationship with NXI. There exists an inverted U-shaped relationship between Net Export Intensity and REER. Whereas growth of employment, Firm size and Research and development intensity of previous period are linearly related with NXI as is revealed from table 3.9. As the marginal effect of Capital-sales ratio and REER are found to be positive as is revealed from Table 3.12, it implies that the net effect of these variables on NXI are positive. The statistical significance of the variables having nonlinear relationship has been checked by

performing Wald test and turned out to be significant which is represented in Table 3.13.

Capital-sales ratio is found to be positively related with NXI. 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. The rise in growth of employment may be due to more production of the firms employment is an indispensable input of production and hence net export may also rise.

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 Research and development intensity in the previous period and NXI. Firms engaged in Research and development 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.

3.3.2.2 Determinants of growth of employment of Fabrics producing sector

In this model, there are two equations namely growth of Employment and Net Export Intensity.

The results of **Determinants of Growth of employment of Fabrics producing sector** can be visualized from **Table 3.14 to Table 3.19.**

In case of **employment equation** whose result can be found in Table 3.14, it can be seen that Raw material intensity have nonlinear 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 linearly related with growth of employment. The statistical significance of Raw material intensity has been checked by performing Wald test and is found to be significant which is represented by Table 3.17.

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.

As the marginal effect of Raw material intensity on growth of employment is found to be positive as is revealed from Table 3.16, it implies that the net effect of Raw material intensity on growth of employment is positive. Rise in raw material intensity may be due to increased output of the firm which 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 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. The reason may be 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 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 linearly related with NXI as is revealed from table 3.15. As the marginal effect of REER is found to be positive as is revealed from Table 3.18, it implies that the net effect of REER is positive. The statistical significance of the variable having nonlinear relationship has been checked by performing Wald test which are statistically significant as is revealed from Table 3.19.

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 Research and development 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.

3.4 Summary and Conclusion

The present chapter analyses the growth performance of employment of the two sectors of Indian Textile Industry namely yarn and fabric using firm level data employing modern time series technique of Zivot and Andrews (1992) as well as Sen (2003) for the period 1991 to 2015.The chapter also recognized the major factors influencing growth of employment of yarn and fabrics producing sector of Indian Textile Industry. The major factors are found out estimating separate models for yarn

and fabrics considering the problem of simultaneity, which may occur between growth of employment and net export intensity using simultaneous panel estimation technique under a Seemingly Unrelated Regression (SUR) framework, adjusted for contemporaneous correlation across units and cross-section heteroscedasticity is taken care by White Cross-Section.

The major findings of the chapter can be summarized as follows:

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

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. Whereas according to Sen (2003) approach the break point happened to be 1999 and 2004 respectively.

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.

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.

Fourthly, the result of determinants of growth of employment of Yarn producing sector reveals that Profitability ratio is nonlinearly related with growth of employment but in case of Fabrics producing sector Raw material intensity is nonlinearly related with growth of employment.

Output growth of previous period is found to have a positive relationship with employment growth for Yarn producing sector and Output growth is positively related with growth of employment of Fabrics producing sector.

The result reveals that Firm size and Capital-sales ratio of previous period are positively related with growth of employment in both Yarn and Fabrics producing sector.

Raw material intensity is positively related with growth of employment of Yarn producing sector. Net export intensity is positively related with growth of employment for Yarn producing sector whereas it is negative for Fabrics producing sector.

The effect of dismantling of MFA has a favourable effect on growth of employment for both Yarn and Fabrics producing sector.

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.

Thus the analysis reveals that in order to promote growth of employment, any policy changes that will lead to increase in output growth, firm size, Capital and Raw material should be emphasized.

Table 3.1: Estimated Result of employment for Yarn producing sector using Zivot and Andrews (1992) approach

Sector	Constant	t	DT_t	Y_{t-1}	ΔY_{t-1}	Break Point	Underlying Series
Yarn (Model B)	**4.354*** (58.045)**	**-0.056*** (-8.244)**	**0.106*** (11.587)**	**0.002*** (4.922)**	**0.208 (1.212)**	**2000**	**TS**

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***

Table 3.2: Growth rate of employment before and after the Structural break

Sector	Growth rate before break	Growth rate after break
Yarn	-5.6%	5%

Table 3.3: Estimated Result of employment for Fabrics producing sector using Zivot and Andrews (1992) approach

Sector	Constant	DU_t	t	Y_{t-1}	ΔY_{t-1}	Break Point	Underlying Series
Fabrics (model A)	**4.713*** (25.093)**	**0.623*** (4.529)**	**0.001 (0.083)**	**-0.041*** (-5.899)**	**0.424 (1.071)**	**2007**	**TS**

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***

Table 3.4: Estimated Result of employment for Yarn producing sector using Sen (2003) approach

Sector	Constant	DU_t	t	DT_t	Y_{t-1}	ΔY_{t-1}	F-Value	Break Point	Underlying Series
Yarn	**4.411*** (59.341)**	**-0.091 (-1.381)**	**-0.053*** (-4.148)**	**0.103*** (7.852)**	**-0.035 (-1.578)**	**0.205 (1.095)**	**36.299*** **	**1999**	**TS**

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***

Table 3.5: Growth rate of employment before and after the Structural break for Yarn producing sector

Sector	Growth rate before break	Growth rate after break
Yarn	**-5.3**	**5**

Table 3.6: Estimated Result of employment for Fabrics producing sector using Sen (2003)

Sector	Constant	DU_t	t	DT_t	Y_{t-1}	ΔY_{t-1}	F-Value	Break Point	Underlying Series
Fabrics	**4.768*** (48.721)**	**0.338*** (3.822)**	**-0.035*** (-4.301)**	**0.095*** (7.294)**	**-0.008 (-0.316)**	**0.656*** (2.853)**	**48.526*** **	**2004**	**TS**

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***

Table 3.7: Growth rate of employment before break and after break for fabrics producing sector

Sector	Growth rate before break	Growth rate after break
Fabrics	**-3.5**	**6**

Table 3.8: Estimated Results of Simultaneous Equation Model of Yarn producing Sector: The Case of Growth of Employment Equation

Explanatory Variable	Coefficient	t-Statistic	p value
C	1.886***	18.336	0
$Y_{(t-1)}$	0.031***	9.849	0
NXI	0.342***	10.321	0
FS	0.428***	21.076	0
$(C/S)_{(t-1)}$	0.043***	9.197	0
PR	0.071***	21.935	0
RI	0.112***	28.069	0
PR^2	0.013***	23.723	0
D	0.272***	44.666	0
Adjusted R-squared	0.907		
F-statistic	670.278		
Prob (F-statistic)	0		

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***

Table 3.9: Estimated Results of Simultaneous Equation Model of Yarn producing Sector: The Case of Net Export Intensity Equation

Explanatory Variable	Coefficient	t-Statistic	p value
C	-27.364***	-10.315	0
E	0.604***	29.402	0
FS	-0.385***	-63.735	0
$RDI_{(t-1)}$	0.084***	32.721	0
(C/S)	0.140***	23.640	0
REER	0.497***	9.334	0
$(C/S)^2$	0.052***	30.521	0
$REER^2$	-0.002***	-9.095	0
Adjusted R-squared	0.903		
F-statistic	731.113		
Prob (F-statistic)	0		

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***

Table 3.10: Marginal Effects of the Explanatory Variables from the Simultaneous Equation Model of Yarn producing Sector: The Case of Growth of employment Equation

Variable	Marginal Effect
PR	0.048

Table 3.11: Wald Statistics of the Simultaneous Equation Model of Yarn producing Sector: The Case of Growth of employment Equation

	PR
Chi-square	5.802*

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***

Table 3.12: Marginal Effects of the Explanatory Variables from the Simultaneous Equation Model of Yarn producing Sector: The Case of Net Export Intensity Equation

Variable	Marginal Effect
C/S	0.150
REER	0.013

Table 3.13: Wald Statistics of the Simultaneous Equation Model of Yarn producing Sector: The Case of Net Export Intensity Equation

	C/S	REER
Chi-square	7.101**	5.842*

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***

Table 3.14: Estimated Results of Simultaneous Equation Model of Fabrics producing Sector: The Case of Growth of Employment Equation

Explanatory Variable	Coefficient	t-Statistic	p value
C	-1.502***	-26.497	0
Y	0.310***	38.645	0
FS	0.066***	7.859	0
NXI	-0.662***	-29.821	0
$(C/S)_{(t-1)}$	0.093***	16.844	0
RI	0.148***	26.936	0
RI^2	0.009***	9.240	0
D	0.425***	22.768	0
Adjusted R-squared	0.911		
F-statistic	767.234		
Prob (F-statistic)	0		

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***

Table 3.15: Estimated Results of Simultaneous Equation Model of Fabrics producing Sector: The Case of Net Export Intensity Equation

Explanatory Variable	Coefficient	t-Statistic	p value
C	-26.055***	-3.120	0
E	-0.309***	-7.747	0
FS	0.025*	1.829	0.068
RDI	0.084***	13.927	0
(C/S)	0.287***	23.768	0
FA	0.424***	10.859	0
REER	0.506***	3.008	0.003
$REER^2$	-0.002***	-3.103	0.002
Adjusted R-squared	0.873		
F-statistic	515.569		
Prob (F-statistic)	0		

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***

Table 3.16: Marginal Effects of the Explanatory Variables from the Simultaneous Equation Model of Fabrics producing Sector: The Case of Growth of employment Equation

Variable	Marginal Effect
RI	0.150

Table 3.17: Wald Statistics of the Simultaneous Equation Model of Fabrics producing Sector: The Case of Growth of employment Equation

	RI
Chi-square	8.136**

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***

Table 3.18: Marginal Effects of the Explanatory Variables from the Simultaneous Equation Model of Fabrics producing Sector: The Case of Net Export Intensity Equation

Variable	Marginal Effect
REER	0.109

Table 3.19: Wald Statistics of the Simultaneous Equation Model of Fabrics producing Sector: The Case of Net Export Intensity Equation

	REER
Chi-square	6.130**

****** Significant at 1% level, ** Significant at 5% level, *Significant at 10% level.***