DATA BASE, CONCEPTS AND METHODOLOGY

This chapter explains the methods of data collection and concepts related to the present study and statistical techniques used for analyzing the data.

The chapter has been organized in three sections. Section I deals with the database. It deals with size of the sample and the methods of collection of data. Section II explains the concepts related to the study. Section III describes the methodology which has been applied for analyzing the data.

SECTION I

Both primary and secondary data have been used in the study. For collecting the primary data, a detailed questionnaire dealing with different aspects of exports was prepared. The questionnaire was prepared after reviewing the existing literature and detailed discussions on this subject with exporters related with small scale industries in the study area. Pilot study of questionnaire was done and then a final questionnaire was prepared which has been given in the Appendix. The purpose of the questionnaire was to gather information on export prospects in the changing market scenario which the small scale textile industrialists hold for themselves in the near future. The primary data collected spans over the period 2002 to 2010.

The secondary data has been collected from various government publications available at the central, state and district levels. Some information was collected from the office of the Development Commissioner, Small scale industries, Ministry of Industry, Government of India, New Delhi; Directorate of Industries, Punjab, Chandigarh; District Industries Centre of Amritsar and of Ludhiana; Regional office of the Textile Commissioner, Amritsar and of Ludhiana; and Apparel Export Promotion Council, Ludhiana. The secondary data of Punjab and India for the period 1991-92 to 2009-10 has been selected in the present study as it covers the era of liberalization as well as impact of Multifibre Agreement (MFA) and Agreement on Textiles and Clothing(ATC) on textiles.
SAMPLE

The universe of this study constitutes small scale textile industry of Punjab. For the selection of small scale textile units, Amritsar and Ludhiana were purposively selected, since these two districts contribute about 60 percent of the total textile exports from the state. The textile units in the state are clustered and concentrated in these two districts.

AMRITSAR

The city of Amritsar has long been one of the biggest business and commercial centres in the northern zone of India. It is home to the Harmandir Sahib (referred to as the "Golden Temple" in the western media), the spiritual and cultural center for the Sikh religion. This important Sikh shrine attracts more visitors than Taj Mahal with more than 100,000 visitors on week days alone and is the most popular destination for Non-resident Indians (NRI) in the whole of India. The city also houses the Sikh temporal and political authority, Akal Takht, as well as the Sikh Parliament.

The 2011 Indian census reported the population of the city to be 2,490,891. Amritsar is situated 217 kilometers (135 miles) northwest of state capital Chandigarh and is 32 kilometers (20 miles) east of Lahore, Pakistan and therefore, very close to India's western border with Pakistan. Amritsar had a sex ratio of 884 females per 1,000 males (2011) and 10.7% of the population was under six years old. Effective literacy was 77.20%; male literacy was 81.20% and female literacy was 72.80 % (2011). Sikhism is the main religion followed in Amritsar, with Hindu and other religious minorities. The main spoken language in Amritsar and in the surrounding villages is Punjabi (census-2011).

During 1967-68, there were 27 large scale industries and 5500 small scale industries. These figures increased to 58 and 27221 in 2000 and further decreased to 13 and 25364 in 2009 (Directorate of Industries, Punjab). The textile industry of Amritsar includes woolen, silk, cotton, etc. Throughout India, Amritsar holds a place of prominence in the production of woolen fabrics like worsted, tweeds, blankets, shawls, etc.
LUDHIANA

Apart from Amritsar, textile industry of Ludhiana is also very important. Ludhiana, the first metropolitan centre of the state of Punjab is located on National Highway, 100 km north west of Chandigarh, the capital of Punjab and Haryana, 310 Kms from New Delhi and 150 km from Amritsar. It has emerged as the most vibrant and important business centre of Punjab. Positioned at 30 56' N and 75 52' E, Ludhiana is located about 10 km south of the Sutlej, one of the five major rivers of pre-independent Punjab. Ludhiana city, the district headquarter of Ludhiana district, is the only metropolitan city of Punjab. Ludhiana is the largest city in Punjab, both in terms of area and population. In 2011, Ludhiana had population of 3,487,882 of which male and female were 1,866,203 and 1,621,679 respectively. There was change of 15.00 percent in the population compared to population as per 2001. In the previous census of India 2001, Ludhiana District recorded increase of 24.89 percent to its population compared to 1991. The initial provisional data suggest a density of 975 in 2011 compared to 848 of 2001. Total area under Ludhiana district is of about 3,577 sq.km(Municipal corporation Ludhiana).

Average literacy rate of Ludhiana in 2011 was 82.50 compared to 76.50 of 2001. If things are looked out at gender wise, male and female literacy were 86.30 and 78.20 respectively. For 2001 census, same figures stood at 80.30 and 71.90 in Ludhiana district. Total literates in Ludhiana district were 2,579,209 of which male and female were 1,443,283 and 1,135,926 respectively. With regards to sex ratio in Ludhiana, it stood at 869 per 1000 male in 2011 compared to 2001 census figure of 824. The average national sex ratio in India is 940 as per latest reports of census 2011.

Being the hub of Indian small scale industry, especially the hosiery, it is popularly known as 'Manchester of India'. On the academic front, Ludhiana has some of the most prestigious institutions. There are two Medical Colleges, an Engineering College and the famous Punjab Agricultural University modeled on the "Land Grant of America". It is also known as “Small Scale Industrial Capital of India.” The city has its own individuality and character which is the result of its historical growth, physical, economic and social structure (Census-2011).

In 1901, Amritsar city with a population of 162,429 was the largest city of the state, whereas Ludhiana had a population of 48,649, which was nearly one-third of
Amritsar city. The gap in the population of these two cities remained almost static till 1941. Post-independence period showed narrowing down of this gap. Since then, Ludhiana has been experiencing virtual explosion in population growth in 1991, population of Ludhiana and Amritsar was 1,042,740 and 708,835 respectively. In 2001, population of Amritsar came to be nearly three fourth of Ludhiana. In terms of population, Ludhiana emerged as the largest city in the state in 1981 and maintained its position in 1991 and 2001 as well. The comparative decadal population growth between Punjab state as a whole and Ludhiana metropolitan centre indicates that Ludhiana has grown much faster. Population density of Ludhiana is increasing i.e. 55.2 persons per hectare in 1981 and 87.7 persons per hectare in 2001. This is because of large scale migration taking place in Ludhiana city due to the growth of industry, trade and commerce sectors (ibid).

The industry of Ludhiana alone contributes to nearly 60 percent of total textile exports from Punjab. It spins 10 per cent of countries yarn and contributes nearly 90 percent of acrylic industry. It also uses cotton and blended fiber to produce hosiery, knitwear and various readymade garments. These industries produce T-shirts, shirts, pullovers, cardigans, track suits, socks, jersey, sweat shirt, gloves, shawls, inner garments etc.

**TABLE 3.1**

<table>
<thead>
<tr>
<th>Year</th>
<th>Punjab</th>
<th>Ludhiana</th>
<th>Amritsar</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-2003</td>
<td>14884</td>
<td>7085</td>
<td>1955</td>
</tr>
<tr>
<td>2003-2004</td>
<td>14985</td>
<td>7099</td>
<td>2007</td>
</tr>
<tr>
<td>2004-2005</td>
<td>15082</td>
<td>7120</td>
<td>2059</td>
</tr>
<tr>
<td>2005-2006</td>
<td>15748</td>
<td>7128</td>
<td>2108</td>
</tr>
<tr>
<td>2006-2007</td>
<td>14741</td>
<td>6846</td>
<td>2152</td>
</tr>
<tr>
<td>2007-2008</td>
<td>14131</td>
<td>6620</td>
<td>1937</td>
</tr>
</tbody>
</table>

*Source*: Directorate of Industries, Punjab, Chandigarh and District Industries Centre Ludhiana

Convenient sampling technique has been adopted. There were approximately 2000 textile units in Amritsar at the time of collection of the data. But all these units were not engaged in exports. So only those units were selected which were directly or
indirectly dealing with exports. Another problem which was encountered when exporting units were shortlisted was that many of the units were closed down in subsequent period of time. Even the data shows that in 2007-08, there were just 1937 textile units in Amritsar. They reduced to 969 in 2010-11. The questionnaires were distributed and only 45 entrepreneurs responded that too, after reminding, visiting them personally more than once.

About fifty percent of the textile units in Punjab are concentrated in Ludhiana. The exporting units were shortlisted and the questionnaires were filled in by personally interviewing them and the data was collected accordingly. The sample size of Ludhiana consisted of 55 units. Thus the effective sample consists of 100 units (45+55) for the purpose of study.

SECTION II
CONCEPTS

For the purpose of present study, the trade from India in textiles and clothing is examined at four digit level HS Code. The Harmonized Commodity Description and coding system (HS) of tariff nomenclature is an inter nationally standardized system of names and numbers for classifying traded products developed and maintained by the World Customs Organization (WCO) (formerly the Customs Co-operation Council), an independent inter governmental organization with once 170 member countries based in Brussels, Belgium. The HS is a six digit nomenclature. The first four digits are referred to as the heading. The first six digits are known as a subheading. Countries that have adopted the Harmonized System are not permitted to alter in any way the descriptors associated to a heading or a subheading nor can the numerical codes at the four or six digit level be altered. The textile items which were included for study purpose bore the following codes:

Code 51 – Wool
Code 52 – Cotton
Code 54 – Manmade Filaments
Code 55 – Man made Staple fibers
Code 58 – Special Woven fabrics, embroidery
Code 60 – Knitted fabrics.
Code 61 – Articles of Apparel knitted or crocheted
Code 62 - Articles of Apparel not knitted or crocheted.
Code 63 – Other made up textile articles.

The definition of small scale industries has undergone changes in terms of investment limits in the following manner.

**TABLE 3.2**

**INVESTMENT LIMITS FOR SSI**

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>Upto 60 Lacs in plant and Machinery.</td>
</tr>
<tr>
<td>1997</td>
<td>Upto 1 Crore in plant and Machinery.</td>
</tr>
<tr>
<td>2006</td>
<td>Upto 5 Crore in plant and Machinery.</td>
</tr>
</tbody>
</table>

_Source: GOI, 2006._

**SECTION III**

**METHODOLOGY**

As per the objectives of the study, statistical techniques such as simple percentages, year to year growth rates, compound annual growth rates (CAG), Weighted Average Score (WAS) method, Data envelopment analysis (DEA) and multiple regression analysis have been applied.

3.1 WAS

Weighted Average Score (WAS) was calculated by ranking various reasons in order of importance; the weights/scores were given to each reason—one for important, two for more important and so on. With the help of frequencies, WAS was computed as below:

\[
W = \frac{1}{\text{f}_w} \sum_{w=1}^{n} \text{W}.\text{fw}
\]

Where ‘W’ is the weight given to a reason and ‘fw’ is the number of respondents who attached weight ‘w’ to the statement of reason.
3.2 Log linear form of regression model

The determinants of textile exports have been found in case of sample firms in Amritsar and Ludhiana separately and in Punjab collectively by using multiple regression. A log linear form of the model was used because it provided a better estimation for standard specifications of the model.

The analysis of determinants of textile exports have been examined by estimating the following models

**Model I**

\[
\ln \text{Tex} = a_0 + a_1 \ln S + a_2 \ln FI + a_3 \ln W + a_4 \ln A + a_5 \ln WD + a_6 \ln RP + a_7 \ln \text{REER} + \text{ATC} + \mu_1
\]

**Model II**

\[
\ln \text{Tex} = a_0 + a_1 \ln O + a_2 \ln FI + a_3 \ln W + a_4 \ln A + a_5 \ln WD + a_6 \ln RP + a_7 \ln \text{REER} + \text{ATC} + \mu_1
\]

where TEX-Textiles, S-Sales, W-Wage, A-Age, O-Output

WD—World Demand, RP—Relative Price, FI-Fixed Investment

REER—Real Effective Exchange Rate

ATC-Agreement on Textiles and Clothing

ATC, L are dummy variables.

ATC (2002-04) = 0 and 1 otherwise.

**Location** has been used as dummy variable in *pooled panel data* analysis (0 for Amritsar and 1 otherwise).

The estimated coefficients represent relative elasticities. It is hypothesized that \(a_6, a_7<0\), while \(a_1, a_2, a_3, a_4, a_5>0\).

Panel Regression equations have been estimated for Amritsar firms and Ludhiana firms separately and in the end, the data is pooled up and again with the help of panel regression, it is checked as to which variables affect exports significantly.

In order to study the effect of MFA (ATC) on exports of textiles, it was used as a dummy variable. Agreement on Textiles and Clothing came to an end in 2005, the period of study was divided into two parts—Pre MFA (ATC) period i.e. before 2005 and Post ATC period i.e. after 2005. Since data is primary and comprises of 100 units spanned over a period of 2002-2010, with the help of panel time series-appropriate model has
been chosen using Hausman statistic which is used to test the null hypothesis that the regressors and individual effects are not correlated. If null hypothesis is rejected then fixed effects model will be appropriate. The Hausman test statistic (p-value 1.0000) shows that the null hypothesis is not rejected, which indicates that firm specific effects are uncorrelated with the regressors. This suggests that Random Effects Model is appropriate and the Fixed Effects Estimates are not consistent.

3.3 Compound Growth Rates (CAGR)

Compound growth rates of variables during the study period have been estimated by following semi-log model.

\[ \log Y_t = \beta_0 + \beta_1 t + \mu_t \] (1)

Where \( Y_t \) is the value of the dependent variable at time ‘t’ whose growth rate is to be compounded, ‘t’ represents time variable and \( \mu_t \) is the stochastic disturbance term at time ‘t’ and \( \beta \)'s are the parameters to be estimated.

The percentage annual compound growth rate is given by the formula

\[ r = (\text{Antilog } \hat{\beta}_1 - 1) \times 100 \] (2)

Where \( \hat{\beta}_1 \) is the ordinary least squares estimator of \( \beta_1 \) in equation (1)

To examine the impact of ATC on textile industry, the following semi-log model including the binary variable was used:

\[ \log Y_t = \beta_0 + \beta_1 t + \beta_2 D.t + \mu_t \] (3)

Where ‘D.t’ is the binary variable taking following values

\( D = 0 \) for Pre ATC period 1991-2004
\( = 1 \) for Post ATC period 2005-2010

The compound growth rates per annum during Pre ATC period is given by:

\[ r_1 = (\text{Antilog } \hat{\beta}_1 - 1) \times 100 \] (4)

Whereas that corresponding to post ATC is given by:

\[ r_2 = [\text{Antilog } (\hat{\beta}_1 + \hat{\beta}_2) - 1] \times 100 \] (5)

Where \( \hat{\beta}_1 \) and \( \hat{\beta}_2 \) are OLS estimators of parameters \( \beta_1 \) and \( \beta_2 \) in equation (3).

Evidently, the increase or decrease of the growth rate of the variable under study is given by:

\[ r_2 - r_1 = [\text{Antilog } (\hat{\beta}_1 + \hat{\beta}_2) - \text{Antilog } \hat{\beta}_1] \times 100 \]
If the coefficient of Dt i.e. $\beta_2$ in equation (3) is significant on the basis of conventional t-test, it would mean that phase out of ATC had a significant impact on growth of textile exports in India.

3.4 **DEA**

The technical efficiency of the textile industry of 100 textile sample firms across time period of 2002-2010 from Amritsar and Ludhiana has been measured using Data Envelopment Analysis (DEA). DEA is the most appropriate method which takes into consideration multiple inputs and outputs and measures the efficiency of any decision making unit.

Assume, there are data on Q inputs and R outputs for each of S firms. For the $i^{th}$ firm, inputs and outputs are represented by column vectors $x_i$ and $y_i$ respectively. The QxS input matrix, $X$, and RxS output matrix, $Y$, represent the data for all S firms. Then, the efficiency of a textile firm is defined as the ratio of weighted sum of outputs to weighted sum of inputs ($u' y_i / v' x_i$). The optimal weights are obtained for the $i^{th}$ firm by solving the mathematical linear programming problem.

3.4(a) **Primal**

$$\begin{align*}
\max_{u,v} & \quad (u' y_i / v' x_i), \\
\text{s.t.} & \quad u' y_j / v' x_j \leq 1, \quad j = 1,2, \ldots, S \\
& \quad u,v \geq 0
\end{align*} \tag{1}$$

where

- $x_i$ = input vector of $i^{th}$ firm
- $y_i$ = output vector of $i^{th}$ firm
- $x_j$ = input vector of $j^{th}$ firm, where $j = 1,2, \ldots, S$
- $y_j$ = output vector of $j^{th}$ firm, where $j = 1,2, \ldots, S$
- $u$ = vector of output weight
- $v$ = vector of input weight

Solving this LPP allows finding values for $u'$ and $v'$, such that the efficiency of firm “$i$” is maximized, subject to the restriction that efficiency for the rest of the firms is smaller than or equal to 1. One problem with this particular ratio formulation (1) is that it has infinite solutions.
To avoid this, the next restriction is imposed $v'x_j = 1$, which provides Multiplier form of DEA and is expressed as:

$$\max_{u,v} (u' y_i),$$

$$s.t. \quad v'x_i = 1,$$

$$u' y_j - v'x_j \leq 0, \quad j = 1, 2, \ldots, S \quad (2)$$

Another possible solution to the multiplier form is to develop a dual formulation for (2)

3.4(b) Dual

$$\min_{\theta, \lambda} \theta,$$

$$s.t. \quad -y_j + Y \lambda \geq 0,$$

$$\phi x_i - X \lambda \geq 0, \quad (3)$$

$$\lambda \geq 0,$$

Where $\theta$ is a scalar and $\lambda$ is an $S \times 1$ vector of constants. Equation 2 involves the constraints based on number of firms, on the other hand equation 3 involves the fewer constrains based on the total number of inputs and outputs. Therefore, the envelopment model 3 is generally used based on constant returns to scale. The value of $\theta$ is the model efficiency score of the $i^{th}$ firm. When the firm achieves $\theta = 1$, then that firm is technically efficient.

The CRS assumption is only appropriate when all the firms operate at an optimal scale. To understand whether the inefficiency in the firms is due to inefficient utilization of resources or inappropriate scale-size, the aggregate technical efficiency has been decomposed into pure technical efficiency and scale efficiency using the BCC model. The BCC model can be written by adding the convexity constraint $S1' \lambda = 1$ in equation (3) which gives the equation:

$$\min_{\theta, \lambda} \theta,$$

$$s.t. \quad -y_j + Y \lambda \geq 0,$$

$$\phi x_i - X \lambda \geq 0, \quad (4)$$

$$S1' \lambda = 1$$

$$\lambda \geq 0,$$
where $S_1$ is an $S \times 1$ vector of constants. The above-derived models are input oriented models and the present study has made use of this model.

3.5 Limitations of the study

First, the limitations of primary data cannot be ruled out. Reluctance in filling the questionnaire by entrepreneurs was a usual scene. Secondly, export determination model takes into account only one side of the relationship i.e. fixed investment and world demand affect exports. The other side of relationship is also important – how exports affect fixed investment and world demand. Also certain variables like managerial capabilities, external technical information linkages, and advertisement intensity could not be used as variables because their data was not available. This could be the subject of further research.

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