CHAPTER 2

DATA, SCOPE AND METHODOLOGY

The previous chapter outlined the role and need of competition and competition policy particularly for enhancing the industrial competitiveness. The new economic reforms adopted in India aimed at exacerbating industrial competitiveness through free and fair competition by adopting new competition policy. In this context, the main objective of the present study is to analyse the effectiveness of India’s new competition policy in augmenting the competitiveness of the Indian industry.

Data and Scope of the Study

The present study spans over the period from 1975-76 to 2006-07, which has been further divided into two sub-periods on the basis of the paradigm shift in macroeconomic policy regime governing the Indian economy: i) Pre-reforms period (1975-76 to 1990-91); and ii) Post-reforms period (1991-92 to 2006-07). The study makes use of Annual Survey of Industries (ASI) data for the registered industrial sector. The EPW research Foundation has created a systematic electronic database using the results from the ASI for the periods 1973-74 to 2003-04, which has been extensively used in the present study. The Variables used in this study relating to the Indian manufacturing sector such as output; emoluments; capital; revenue; fuels consumed; materials consumed, etc. have been drawn mainly from this database as well as various publications of CSO. Data regarding exports, imports, FDI, number of patent applications, R&D and advertising expenditure have been culled from RBI Bulletins and the publications of Department of Science and Technology (GOI) including R&D Statistics and R&D in Industry. Besides these, data relating to peak tariff rates; bank rate; cash reserve ratio; prime lending rate; number of mergers; number of industries
reserved for public sector; number of industries under licensing regime; disinvestment proceeds; corporate tax rates, have been culled from various issues of Economic Surveys, RBI publications and annual reports of Ministry of Company affairs.

All monetary data have been deflated by using appropriate deflators by considering 1980-81 as base year.

**Data Variables**

**Capital** – is calculated by following the perpetual inventory method. The method requires a gross investment series, an asset price deflator, a depreciation rate and a benchmark capital stock. The following steps are adopted to obtain a series of gross fixed capital stock at constant prices:

**Step 1:** For constructing a series of gross fixed capital stock, the most important prerequisite is the figure of capital stock in the benchmark (initial) year i.e. $K_0$. To obtain $K_0$, we assume that the value of finished equipment of a balanced age composition would be exactly half the value of equipment when it was new. Hence, in the present analysis, twice the book value of fixed assets in the benchmark year at 1980-81 prices, has taken as a rough estimate of the replacement value of fixed capital i.e. $K_0 = 2 \times B_0$ (where $B_0$ is the book value of fixed capital net of the depreciation in the benchmark year). The studies by Banerji (1975); Goldar; (1986); Kumar (2006) and Sharma and Upadhyay (2008) have also followed this approach to calculate fixed capital stock for the benchmark year.

**Step 2:** After obtaining the estimate of $K_0$, we obtained the series of gross real investment $(I_t)$ as follows:

\[
I_t = \frac{B_t - B_{t-1} + D_t}{P_t}
\]

Where $B_t = \text{Book value of fixed capital in the year } t$, $D_t = \text{Value of depreciation of fixed assets in year } t$, and $P_t = \text{Implicit deflator for gross fixed capital formation for registered manufacturing sector}.$

**Step 3:** Given the estimate of $K_0$ and its series, the following relationship has been used to construct a series of gross fixed capital stock at 1980-81 prices:
Where, \( K_t = \text{Gross fixed capital at 1980-81 prices in the year } t \), \( I_t = \text{Gross real investment in the year } t \), and \( d = \text{Annual rate of discarding of capital} \). Following Unel (2003), we have assumed the annual rate of discarding capital equals to 5 percent.

The other variables used in the study which includes gross value added; employees; total persons engaged; emoluments; fuels consumed; output, etc. have been considered as defined by the Annual Survey of Industries (ASI).

**Hypotheses**

The present study would dwell and explore on the following hypotheses:-

1. Competition augments competitiveness of the industry and makes it more efficient and productive.
2. To make markets more competitive and contestable a competition policy is an imperative.
3. As the competition increased in India in the wake of reforms, the inflow of Foreign Direct Investment (FDI) and MNCs bound to escalate.
4. With increased inflow of FDI and MNCs, there is apprehension that domestic market in India may become vulnerable to anti-competitive practices of global competitors.
5. Therefore, a set of measures under new competition policy is required not only to stimulate competitiveness of Indian industry but at the same time to adopt countervailing measures to deter the anti-competitive practices of global players in India.

**Methodology**

The present study broadly consists of two parts:-

- Measurement of India’s Industrial Competitiveness in pre and post reform periods.
- Effectiveness of India’s New Competition Policy in Augmenting the Competitiveness of Indian Industry.
Variables for Measuring Competitiveness of the Indian Manufacturing Industry

The present study hinges on the following variables, indices and technical coefficients to measure the competitiveness of the Indian manufacturing industrial sector:

**Total Factor Productivity (TFP) -** Productivity is the relationship between input and output to produce a certain level of output. Higher TFP indicates efficient utilisation and deployment of resources. Porter (1990) stressed that productivity is the prime determinant of competitiveness. The TFP can be measured with the help of various methods. Ahluwalia (1991); Balkrishnan and Pushpangandan (1994); Goldar (2002); Unel (2003); Goldar (2004); Sharma (2004); Kumar (2006); Taneja et al., (2007) among others have measured the TFP by using various methods and periods to assess the impact of economic reforms on the industrial productivity. In the present study, TFP is calculated with the help of Tornquist-Divisia index. The most commonly used index for productivity measurement is the Theil-Tornqvist Index or the Translog-Divisia index, defined for two time periods s and t:

\[
\ln \frac{TFP_t}{TFP_s} = \ln TFP_t - \ln TFP_s
\]

\[
= \frac{1}{2} \sum_{i=1}^{N} (W_i s + W_i t) (\ln y_i t - \ln y_i s) - \frac{1}{2} \sum_{j=1}^{K} (\gamma_j s + \gamma_j t) (\ln x_j t - \ln x_j s)
\]

Where the y’s and x’s represent the value of output and input, and the w’s and γ’s represent value shares of outputs and inputs respectively.

For the labour input, γ is the labour income as given by salaries paid out to workers, and for the capital input, the share is given by income earned by capital.

**Index of Industrial Production (IIP) -** Index of Industrial Production (IIP) represents the status of production in the industrial sector for a given period of time with reference to a base period. It indicates the competitiveness of the industrial sector on output performance front. Nagraj (2002); Chaudhuri (2002) and Goldar (2004), deploy IIP for measuring the output performance of the manufacturing industrial sector.
**Capital Deepening Ratio**- Capital deepening ratio or capital intensity represents the relationship between capital and labour. The studies by Goldar (1986); Ray (2004); Sindhu and Balasubramanyam (2006); Kumar (2006) and Sharma (2010) highlight the importance of capital intensity in measuring the efficiency and growth performance of industrial sector in pre and post reforms period. Higher capital intensity signifies a greater degree of mechanisation and expected to augment operating efficiency. Therefore, it may be hypothesised that capital intensity has a positive influence on industrial competitiveness.

**Efficiency Measuring Ratios**- For determining the efficiency of manufacturing sector the relationship of gross value added to output and gross value added to capital can be examined. It represents technical efficiency of the manufacturing industrial sector. Higher technical efficiency highlights the competitiveness of the manufacturing sector (Patibandla, 2002; Goldar et al., 2004; Kumar, 2006).

**Average Cost of Production**- Average cost of production which includes all direct costs of production like cost of raw materials, labour, power charges, etc. is an effective indicator of competitiveness (Azeez, 2002 and Aggarwal, 2007). It shows the cost competitiveness of the manufacturing sector.

**Research and Development Intensity**- R&D intensity for a firm is measured as the ratio of R&D expenditure to its total revenue. Increased R&D expenditure favourably affects the productivity and efficiency of the manufacturing sector. High R&D intensity is likely to represent a greater in house repository of resources necessary to compete in a new technology intensive globalised world. The R&D intensity coefficient for a competitive firm is thus expected to be positive (Katrak, 1989; Siddharthan et al., 1994; Goldar and Renganathan, 1998; Goldar et al.; 2004; Chadha, 2006; Goldar and Kato, 2009).

**Advertising Intensity**- It represents the relationship between advertising expenditure and sales turnover of industry, and represents the capabilities of manufacturing industry to competitively extend its market share. Patibandla (2002); Ray (2004); Chadha (2006) and Joseph (2007) have used advertising intensity to analyse the impact of new policy regime in enhancing industrial efficiency and competitiveness in India.
**Profitability Index**- Profitability or return on capital is predicted to have a positive relationship with technical efficiency and competitiveness. It is calculated as the ratio of contribution of capital (gross value added minus emoluments) to gross fixed capital (Chakraborty, 1982).

**Export Intensity**- Manifesting in the ratio of manufactured export earnings to Sales/Revenue, is expected to have a direct bearing on industrial competitiveness. With the opening up of the Indian economy, the manufacturing sector moved towards foreign markets to sell their goods. Higher export intensity indicates the export competitiveness of the manufactured exports in the global market (Goldar et al., 2004; Chadha 2006; Kumar and Pradhan, 2007; Joseph, 2007; Goldar and Kato 2009).

**Skill Intensity** - represents the availability of human skills and highlights the availability of the trained manpower including supervisory, administrative and managerial staff. Skill enhances efficiency in production and competitiveness. The industries employing higher skilled persons are able to compete and sustain in the market. Skill Intensity is measured as the ratio of supervisors and managerial employees to total persons engaged in the industry (Mani and Bhaskar, 1998; Kumari, 2003; Joseph and Abraham, 2007).

**Labour Cost per Unit** - is an effective indicator of competitiveness. Unit labour cost is defined as compensation of employment divided by a volume measure of output (Khara and Garcha, 2005 and Singh and Kundu, 2005.)

**Exports Of Manufactured Goods To Total Exports** -The liberalisation of trade and tariff policies for manufacturers accompanied by rationalization of export incentives and liberalisation of export policy led to a major transformation of the trade policy regime from a highly restricted to open in India. Increased proportion of manufactured exports in the total exports is an indicator of enhancement in the competitiveness of the Indian manufactured goods in the international market (Kathuria, 1998; Lall, 2001 and Goldar and Kato, 2009).

**Computing the Competitiveness Index**

The competitiveness of the Indian industry has been measured and analysed by using above variables and making comparative analysis in respect of pre and post
reforms period with tabular analysis based on the computation of ratios and percentages. To calculate the growth rates of these indices for individual industrial group, the linear spline function has been used. The growth rates during the period 1975-76 to 2006-07 have been estimated from the following semi-log equation which takes the form as follows:-

$$\log Q_t = \phi + \lambda t + \varepsilon$$

Where, $Q_t$ represents the value of the dependent variable under consideration in time period $t$ and $\varepsilon$ is the white noise error term. The average annual growth rates for the entire study period have been obtained as $\lambda \times 100$. The average annual growth rates for the sub-periods on the basis of a linear spline function which has been applied by Goldar and Seth (1989); Seth and Seth (1994) and Pradhan and Barik (1998). Assuming that there are two sub-periods, two equations are needed to be formulated which takes the following forms:-

Sub Period 1: \[ \log Q_t = \phi_1 + \lambda_1 t + \varepsilon \] When $t < t_1$

Sub Period 2: \[ \log Q_t = \phi_2 + \lambda_2 t + \varepsilon \] When $t \geq t_1$

where $t_1$ is the point of structural breaks between two sub-periods. In order to tackle the discontinuities in the sub-period wise growth rates, the linear spline function is reparametrised as:

$$\log Q_t = \varphi + \partial_1 w_{1t} + \partial_2 w_{2t} + \varepsilon$$

Where, $w_{1t} = t$ and $w_{2t} = \begin{cases} 0 & \text{if } t < t_1 \\ t - t_1 & \text{if } t \geq t_1 \end{cases}$

The value $\partial_1 \times 100$ is the measure of pre-reforms average annual growth rate whereas, $(\partial_1 + \partial_2) \times 100$ provides average annual growth rate during post-reforms period. To check significance of the estimated growth rates during pre-reforms period, simple $t$-statistics has been use. However, to test the significance of post-reforms period, a restriction $(\partial_1 + \partial_2) = 0$ has been tested using $F$-statistics.

After measuring the industrial competitiveness with the help of above discussed variables, a combined weighted competitiveness index is computed by deriving
objective weights by using Principal Component Analysis (PCA). The competitiveness index is based on the various variables used for measurement of competitiveness of Indian industrial sector. PCA is a statistical technique used to examine the interrelations among a set of variables in order to identify the underlying structure of those variables. It is a variable reduction method, which summarises a large number of interrelated variables into a smaller number of uncorrelated composite variables (Harman, 1967 and Malhotra, 2006).

Principal Component Analysis is useful when a number of variables have some redundancy i.e. some of the variables are correlated with one another. Because of this redundancy, it is possible to reduce the observed variables into a smaller number of principal components (artificial variables) that will account for most of the variance in the observed variables.

The set of original variables are first standardised and then are aggregated into the composite variable by providing weights known as factor loadings. These weights are in fact correlation coefficients of the variables with the constructed principal component. The first principal component explains the maximum variance in the set of standardized indicators while the second component explicates the maximum in the residual variance (i.e., variance not explained by the first component) and so on. (Pradhan and Puttaswamaiah, 2008).

The basic terms relating to PCA are explained as follows:-

**Principal Component** – It is a linear combination of optimally-weighted observed variables. The principal components are derived in PCA to examine the significant variance. The components having significant variance would be retained for further analysis. The number of components extracted in PCA is equal to the number of observed variables being analysed. The first component extracted in a PCA accounts for a maximum total variance in the observed variables, while the second component explicates the maximum in the residual variance (i.e., variance not explained by the first component) and so on.

**Component- loadings** – The values which explain the inter-relationship of the variables to each factors discovered i.e. variation in a variable explained by the
component. It is similar to correlation coefficients, squaring them give the amount of explained variation. Therefore the component loadings tell us how much of the variation in a variable is explained by the component

**Eigen Value** – The sum of squared values of component loadings relating to a component is called eigen value or latent root. It represents association between the components and the original variables

**Variance** - In principal component analysis, the observed variables are standardised. This means that each variable is transformed so that it has a mean of zero and a variance of one. The total variance in the data set is simply the sum of the variances of these observed variables. Because they have been standardised to have a variance of one, each observed variable contributes one unit of variance to the total variance in the data set. The analysis continues in this way until all of the variance in the data set has been accounted for.

There are different methods for number of factors to be extracted. The cumulative percentage of variance extracted by the factors has been used in the present study. In this approach, the number of factors extracted is determined so that the cumulative percentage of variance extracted by the factors reaches a satisfactory level. It is recommended that the factors extracted should account for at least 60 percent of the variance (Malhotra, 2006).

After the computing the composite competitiveness index, multiple regression (step-wise) analysis is deployed by regressing independent chosen variables of competition policy on weighted combined competitiveness index as dependent variable. A variable representing time period (t) is also included to reckon with the time trend. For the purpose of step wise regression analysis, the method of backward elimination has been applied for variable selection. In the backward stepwise model selection procedure, variables are sequentially removed from a given model. Stepwise regression is a systematic method for adding and removing terms from a multilinear model based on their statistical significance in a regression (Malhotra, 2006). The maximum p value (alpha value) for a term is to be added. In the present model it is taken 0.05. After fitting the initial model, any term in the model having p-values less than an entrance tolerance
is added and removed if it exceeds the exit tolerance. Depending on the terms included in the initial model and the order in which terms are moved in and out, the method may build different model from the same set of potential terms. The method terminates when no single step improves the model.

The following geometric regression equation has been utilised to assess the effectiveness of competition policy in stimulating the competitiveness of Indian industrial manufacturing sector:-

$$Y_t = A \prod_{i=1}^{k} X_{it}^{\beta_i} e^{u_t}$$

$$\log_e Y_t = \log_e A + \sum_{i=1}^{k} \log_e X_{it} + U_t$$

Here, $Y_t = \text{Competitiveness Index (Dependent Variable);}$

$X_{it} = \text{Competition Policy Variables (Independent Variables);}$

$A = \text{Intercept;}$

$k = \text{Number of Variables (Independent);}$

$t = \text{Time;}$

$\beta = \text{Elasticity Parameters; and}$

$U_t = \text{White noise disturbance term.}$

As the above model is log linear in nature, the co-efficients of this explains respective elasticities given as:-

$$\gamma_i = \frac{\partial \log_e Y_t}{\partial \log_e X_{it}}$$

**Variables of Competition Policy**

The following variables (independent) of competition policy have been taken to assess the effectiveness of India’s new competition policy on the competitiveness of the Indian industry:-

**Trade Openness** - Trade policy is the most important factor to promote competition in the market whose tools includes tariffs, quotas, subsidies and export restrictions. Trade liberalisation and competition policy are complementary to each other. Free trade induces competition in the markets, which is the aim of the competition policy for the
economic development (Palande, 2000; Nayar, 2001; Virmani, 2003). In the present study, trade openness has been taken as a measure of trade policy. Trade openness has been measured as the ratio of total exports and imports to the GDP.

**Product Dereservation Policy**- Reservation of products for small scale industry (SSI) has led to poor quality of products and overall inefficiency. The presence of a large number of small producers in exports has also reduced in low value realisation for many export items. The poor efficiency of such producers is due to lack of skills; inadequate finance; outdated technology and poor cost control (Palande, 2000 and Jain, 2005). The new economic policy of 1991 announced various policy measures for providing enhanced support to the SSI so that it flourishes in an environment of economic efficiency and technological upgradation. Keeping this view, the number of products reserved for small scale sector has been reduced in order to induce competition and promoting efficiency. For the purpose of present study, the number of products reserved has been considered as a component of competition policy.

**Intellectual Property Rights Policy** - There is significant relationship between competition policy and intellectual property rights (IPRs). The enhanced efforts for the attainment of competitive advantage ensure industrial competitiveness. India has made significant efforts to enhance the industrial competitiveness in the era of competition by adopting appropriate strategies and measures for promoting R&D (Siddharthan et al., 1994; Kumar and Pradhan, 2007; Peter, 2009). The number of patents applications filed in India has been taken as a variable of competition policy.

**Industrial Deregulation Policy** - The attainment of technological dynamism and international competitiveness requires that enterprises must be enabled to respond to the changing environment. This can be done only if the role played by the government were to be changed from controller to facilitator. In order to make Indian industry competitive, restraints on internal competition have been dismantled through various industrial policy reforms. These measures have been taken to encourage free and fair competition in order to promote efficiency and competitiveness of industrial sector (Sandesara, 1987; Krishna, 1993; Mani and Bhaskar, 1998). The number of industries
under the licensing regime and the industries reserved for the public sector has been taken as measure of variable of competition policy.

**Investment Policy** - Investment is crucial to augment the resource availability for the economic development. Investment liberalisation both at domestic and foreign level is a pre-requisite for the effective implementation of the competition policy. An effective competition policy facilitates enhanced investment by providing appropriate legal and regulatory environment. FDI can increase competition in the markets and the application of competition policy can be significant for the maximisation of the potential benefits of FDI (Lall, 2001; Nagarj, 2003 and Chakravarthy, 2005). The domestic investment performance has been measured as a ratio of GFCF (in registered manufacturing sector) to GDP. On the other hand, the FDI is taken as a ratio of FDI to GDP.

**Privatisation Policy** - Competition policy ensures efficiency and growth by eliminating inefficient industrial units. The government has disinvested shares of public sector undertakings in order to release resources and raise the level of ownership participation by the general public in these undertakings (Gedam, 1996; Mani, 1997 and Palande, 2000). The ratio of disinvestment proceeds to capital employed of the public sector undertakings has been taken as a variable of competition policy.

**Financial sector policy** - Financial reforms were related to greater liberalisation of the banking sector to promote a diversified, viable, efficient, transparent and competitive financial system. One of the objectives of the financial reforms was to move towards market determined interest rates. The major aim of the reform process was to improve allocative efficiency in financial markets and, at the same time, ensure macroeconomic stability in the economy (Rajan, 1998 and Nagraj, 2003). In the present study, bank rate/repo rate, statutory liquidity ratio and minimum general rate of lending have been taken as a measure of competition policy.

**Merger Policy** - The corporate sector in India has witnessed a substantial growth of Mergers and Acquisitions (M&As) during the 1990s. The immediate effect of a Merger is to increase the degree of concentration as it reduces the number of firms. Introduction of deregulatory policy measures in general and competition policy in particular since 1991 have resulted in a significant increase in the number of mergers and acquisitions in
Indian corporate sector. The Competition Act, 2002 attempts to make a shift from curbing monopolies to curbing practices that have adverse effects on competition both within and outside India (Basant, 2000 and Agarwal, 2006). The total number of mergers in the Indian corporate sector as a measure of competition policy has been used in the present study.

**Exit policy** - If competition is an engine of growth then it is necessary that the laws should encourage the viable, well managed and efficient units and allow the non-viable, ill-managed and inefficient unit to exit. Firms which are not able to survive in a competitive market should be capable of closing down. Along with free entry, a necessary condition for efficiency is free exit. As the competitive business environment forces inefficient firms to close down, the average level of efficiency of various industries would improve (Mani, 1997 and Rajan, 1998). Under the Sick Industrial Companies Act, 1986, the Board of Industrial and Financial Reconstruction (BIFR) was set up in 1987 to review the viability of sick industrial units and to recommend rehabilitation or closure. In the present study, total number of cases recommended and dismissed by BIFR has been taken as a variable of competition policy.

**Fiscal Policy** - India implemented economic reform since the middle of 1991, and has made drastic changes in trade policy to reorient itself to integrate with the global economy guided by the need to improve the competitiveness of Indian industry (Virmani, 2003 and Bhavani and Bhanumurthy, 2007). The basic aim of tariff reform was to enhance competitiveness of Indian industries. The increased competitive pressure on industrial units in a liberalized import regime will force them to be more efficient in the use of resources coupled with expanded opportunities for importing technology and capital goods will bring greater technological dynamism in industrial firms (Virmani et al., 2004). In the present study, peak tariff rate has been taken as a measure of competition policy.

**Taxation policy** - The taxation policy in India has evolved in response to the development strategy. The taxation reforms are essential to attain fiscal consolidation, minimise distortions and creation of stable market for efficient functioning. Besides efficiency consideration, the tax reforms had to address the issue of replacing public
enterprises profits with taxes as a principal source of revenue and aligning tax policy to the development strategies (Bagchi and Nayak, 1994; Rao, 1998; Rao, 2000; Siggel and Aggarwal, 2009). The maximum corporate tax on the domestic companies has been considered as a variable of competition policy in the present study.

CHAPTER 3
REVIEW OF LITERATURE

Introduction
Competition is an essential ingredient for enhancement and maintenance of industrial competitiveness. Competition has become a dominant force with increasing number of countries giving greater impetus towards promoting competition and moving towards a market economy. The thrust of economic reforms has been to allow for more competition in order to promote sustained high level of industrial progress, enhance productivity and attain international competitiveness. Competition creates opportunities for new firms, including small businesses, to enter markets and grow; puts pressure on existing firms to innovate and contributes towards economic development. Competition enhances productive and allocative efficiencies and sharpens the competitive edge of the national economy. It is a driving force for building up the competitiveness of the domestic industry and ensures freedom of trade and prevents abuse of economic power for promotion of economic democracy.