CHAPTER - 3

METHODOLOGY, DATABASE, VARIABLES AND SAMPLED INDUSTRIES PROFILE

Industrial development plays a considerable role in the overall development of any economy. Increase in the share of industrial production in GDP of any economy overtime is an indicator of economic progress (Meier and Rauch, 2003). Apart from production activities, manufacturing sector in the complete process of production and ultimate disposal experiences number of changes in it's inter and intra industry environment. These changes ultimately reflect in the form of market concentration, changes in monopoly power overtime, their behavior towards prices, output, competition strategy, R & D and so on. Consequently, firms register improvement in their performance in the form of profitability, price-cost margins, sales, equity participation, efficiency etc.

Market concentration is an important determinant of market structure and indicates number and size distribution of firms in any industry. Increase in market concentration has considerable effect on the performance of firms (Bain, 1951, 1956; Bresnahan, 1987; Kambhampati, 1996). In the literature of industrial economics, both positive and negative relationships between market concentration and performance are established (Bain, 1951, 1956; Weiss, 1971, 1974; Cowling and Waterson, 1976; Kambhampati, 1996). Impact on performance through changes in market concentration influences the market concentration in the industry in next round of production (Brozen, 1971; Demsetz, 1973, 1974; Schmalensee, 1989).

As the firms grow in size, they become capable of listing themselves in the stock market; consequently they get market valuation in the market. Market
concentration through performance and expected performance variables affect the firm’s performance in stock market (www.myiris.com). It is expected that higher concentration raises profitability of firms which in turn is positively reflected in stock market (Kewai Hou and David T. Robinson, 2000; Fama, 1990, 1995, 2000; Ross Stevens, 1996).

Better performance in stock market enhances the market valuation of firms. Subsequently, it becomes easy for performing firms to mobilize more funds from the market for further expansion. If these funds are invested in same product line in the subsequent rounds of production industry may register higher market concentration.

In this background, present study is concerned to study such relationships in Indian industry especially electronics and pharmaceutical industry. This study is intended to analyze the nature of relationship between market concentration, performance and stock market performance in the sampled industries in India. Following hypotheses are taken to carry on the study.

HYPOTHESES

1. Indian industries have experienced increased market concentration overtime.
2. Firms in their respective industries are performing better overtime.
3. Market concentration in both the industries under study is positively linked to performance.
4. Positive relationship between market concentration and performance leads to better performance of firms in stock market.
5. Increase in market valuation augments market concentration over a period of time.
6. Electronics industry is expected to perform better in stock market as compared to pharmaceutical industry, for market concentration is expected to be higher in electronics industry.

**OBJECTIVES**

1. To study the level and growth of market concentration in pharmaceutical and electronics industries in India.
2. To study the level and changes in performance of electronics and pharmaceutical firms overtime.
3. To examine the relationship between market concentration and performance variables.
4. To look at the behavior of firms in stock market in relation to concentration and performance patterns.
5. To determine the role of market valuation in enhancing market concentration.
6. To compare the performance of electronics and pharmaceutical industries in stock market in relation to market concentration and performance variables.

**3.1. Data Base and Period of Study**

The study is based on secondary data, both for industry and at firm level, sourced from Annual Survey of Industries, RBI Handbook of Statistics on Indian Economy, CMIE’s Prowess data base on firms, Bombay Stock Exchange Official Directory and various on-line data providing sites (content.icicidirect.com, www.hdfcsec.com, www.bseindia.com, www.nseindia.com) for the period of 1996-2008. The websites of the selected firms are also used to corroborate. Data of 134 electronics firms and 145 firms related pharmaceutical industry is included in the study dictated by the information supplied by the CMIE’s Prowess data base on firms.
These firms represent more than 65 percent of industry’s output. Hence, selected firms are expected to reflect the shade of industry well. The period of study encompasses the boom and slowdown hence it may reflect sufficient reflections on the concentration, performance and stock market valuation. Besides, Period of study is dictated by the availability of appropriate data on firms. MS Excel, Statistical Package SPSS are used to analyse the data.

3.2. Methodology

To study the aforementioned objectives various statistical, econometric and standard techniques are used. Concentration ratios, Harfindhal-Harishman index, coefficient of variation are used to measure market concentration. Market performance is measured through the level of profitability, price-cost margin and net-worth. Performance in stock market and its relationships with performance and market concentration are captured with market value over book value of assets, earning per share, price earning (PE) ratio and capital asset pricing model. Trend growth rate has been used to calculate growth overtime.

\textit{Trend Growth Rate}: Growth of different variables overtime is measured by the method of trend growth rate; let

\[ Y_t = a (1 + r)^t \quad \text{---------- (3.1)} \]

Here, \( Y_t \) is the value of variable in terminal year, \( r \) is the average annual trend growth rate and \( t \) represent the number of years.

Let \((1+r) = b\), Hence equation (3.1) becomes;

\[ Y_t = ab^t \quad \text{------------------ (3.2)} \]
Taking log on both sides to equation (3.2)

\[ \log Y = \log a + t \log b \quad \text{-------------------(3.3)} \]

Equation (3.3) has been estimated by using Ordinary Least Squares (OLS), Value of \( \log b \) has been obtained, to obtain the value of b, take antilog of (\( \log b \)), hence

\[ r = (b - 1) \times 100 \]

\subsection*{3.2.1 Measurement of Market Concentration:}

Methods used to measure the market concentration are describes here in detail:

\textit{Coefficient of variation:}

It is a crude method to measure the market concentration as its value indicates the level of variation in the variable concerned. High value of coefficient reveals the existence of large and small firms together in the industry and expected to show the high level of concentration. However, low value of CV indicates the less concentration in the industry. Moreover, CV also indicates the difference in the performance of the firms. The coefficient of variation is calculated by the following formula;

\[ \text{Coefficient of Variation} = \frac{\sigma_X}{X} \]

Here, \( X \) is variable whose variation is desired and \( \sigma_X \) is the standard deviation of variable \( X \).

\textit{Concentration Ratio:} In economics, a concentration ratio is a measure of the share of output produced in an industry by a given number of firms in the total output of that industry. The most common concentration ratios are the \( \text{CR}_4 \), \( \text{CR}_8 \) and the \( \text{CR}_{20} \), which means the market share of the four, eight and twenty largest firms. Concentration ratios are usually used to show the extent of market control of the
largest firms in the industry and to illustrate the degree to which an industry is oligopolistic.

The concentration ratio is the percentage of market share held by the largest firms (m) in an industry.

\[ CR_m = \sum_{i=1}^{m} S_i, \quad m = 4, 8, 12, \ldots, 20. \]

Here, \( S_i \) is the market share of the \( i \)th firm in descending order.

In the literature of market concentration, calculating four, eight and twenty firms’ concentration ratio is very popular; hence, this practice is applied in this study depending on the nature of the industry.

This measure is subject to some criticism. The first is that it measures only one point on the curve. So the rankings of the industries depend critically on the point chosen. The second is that it takes no direct account of the number of firms in the industry. More importantly the concentration ratio provides only limited information about actual market structure. To take an extreme example a market where the top four firms each had a market share of 22.5 percent would have a CR of 90 but so would a market where one firm had a market share of 60 percent and there were three firms with 10 percent each. However company behavior may differ greatly in these two situations with very different competitive outcomes.

*The Herfindahl-Hirschman Index (HHI):* This index is a measure of the size of firms in relation to the industry and an indicator of the amount of competition among them. Named after economists Orris C. Herfindahl and Albert O. Hirschman, it is an economic concept widely applied in competition law, antitrust and also technology management. It is defined as the sum of the squares of the market
shares of firms within the industry, where the market shares are expressed as fractions. The result is proportional to the average market share, weighted by market share. As such, it can range from 0 to 1.0, moving from a huge number of very small firms to a single monopolistic producer. Increases in the Herfindahl index generally indicate a decrease in competition and an increase of market concentration, whereas decreases indicate the opposite.

\[ H = \sum_{i=1}^{N} S_i^2 \]

Here, \( S_i \) is the market share of the \( i \)th firm.

3.2.2: Performance Measurement:

Performance of an industry is its ability to achieve its goals or realize its objectives. As the performance of an industry is the aggregate result of performance of firms working in the industry, its performance is the fulfillment of their respective objectives by its firms. Firms may have alternate objectives like maximizing profit, maximizing sales, growth in size, utilizing maximum capacity, customer satisfaction etc. but the most accepted goal is attaining maximum profitability. Analysts, in attempt to test relationship between concentration and performance, have framed many measures of performance of a firm which are based on various dimensions of performance like profits, sales, growth, employment provided and capacity utilized. Some of the important measures used in this study are discussed here:

*Price-Cost Margin (PCM):* Following formula is used to measure price-cost margin;

\[ PCM = \frac{R - C}{R} \]
Here, $R$ is total revenue and $C$ is total cost of production.

Price-cost margin has been used in numerous industrial organization studies in order to measure performance of a firm or an industry. The primary appeal of this measure is its compatibility with census data. Furthermore, it can be easily used for the firms with diversification of output. Problem with the use of this measure is the availability of reliable data of costs and revenue, especially of the firms engaged in cross-industry diversification.

**Profitability with respect to output:** Computation of earnings as compared to output generated during a specific period of time is named profitability with respect to output (profit-output ratio). It’s one of the highly used financial ratios that are used to assess the performance of firm or an industry. The measure is useful because the ratio presents a profound and clear estimate of performance of an industry and firms.

**Profitability with respect to net worth:** Firm’s total asset minus total liabilities is its net worth. To measure the performance of an industry/firm profit is taken as a ratio to net worth. This method is useful as it provides a deep and long-term insight into performance of the industry. The limitation of this measure lays in the unavailability of appropriate data.

3.2.3 **Performance in the Stock Market:** Improved performance of firms (in the form of profitability, increased market share, assets growth etc.) may lead to its better performance in the stock market. Therefore, performance in the stock market is measured by using the following stock market concepts.

**Book Value:** The value at which an asset is carried on a balance sheet. It is calculated by reducing accumulated depreciation from the cost of an asset.
It is a financial measure that represents a per share assessment of the minimum value of a company's equity. More specifically, this value is determined by relating the original value of a firm's common stock adjusted for any outflow (dividends and stock buybacks) and inflow (retained earnings) modifiers to the amount of shares outstanding.

**P E Ratio:** It is a measure of the price paid for a share relative to the annual Earnings per Share (EPS);

\[
P E \text{ Ratio} = \frac{\text{Market Value per Share}}{\text{Earnings per Share (EPS)}}
\]

The price-earnings ratio reflects the capital structure of the company in question. The price-earnings ratio is a financial ratio used for valuation: a higher P E ratio means that investors are paying more for each unit of net income, so the stock is more expensive compared to one with a lower P E ratio. The P E ratio can be seen as being expressed in years, in the sense that it shows the number of years of earnings which would be required to pay back purchase price, ignoring inflation and time value of money.

**EPS:** The portion of a company's profit allocated to each outstanding share of common stock is called its EPS. Earnings per share serve as an indicator of a company's profitability. Calculated as:

\[
EPS = \frac{\text{Net Income} - \text{Dividends on Preferred stocks}}{\text{Average Outstanding Shares}}
\]
Basic earnings per share should be calculated by dividing the net profit or loss for the period attributable to equity shareholders by the weighted average number of equity shares outstanding during the period. The EPS formula does not include preferred dividends for categories outside of continued operations and net income. Earnings per share for continuing operations and net income are more complicated in that any preferred dividends are removed from net income before calculating EPS. Earnings per share are generally considered to be the single most important variable in determining a share's price. It is also a major component used to calculate the price-earnings valuation ratio.

*Capital assets pricing model (CAPM):* A model that describes the relationship between risk and expected return and that is used in the pricing of risky securities. The capital asset pricing model is used to determine a theoretically appropriate required rate of return of an asset, if that asset is to be added to an already well-diversified portfolio, given that asset's non-diversifiable risk. The model takes into account the asset's sensitivity to non-diversifiable risk (also known as systematic risk or market risk), often represented by the quantity beta (β) in the financial industry, as well as the expected return of the market and the expected return of a theoretical risk-free asset.

\[
\bar{r}_2 = r_f + \beta_a (\bar{r}_m - r_f)
\]

Where:
- \(r_f\) = Risk-free rate
- \(\beta_a\) = Beta of the security
- \(\bar{r}_m\) = Expected market return

*Beta:* It is a measure of the volatility or systematic risk of a security or a portfolio in comparison to the market as a whole. Beta is used in the capital asset pricing model.
(CAPM), a model that calculates the expected return of an asset based on its beta and expected market returns. Beta is calculated using regression analysis, and we can think of beta as the tendency of a security's returns to respond to swings in the market. Value of beta equal to one indicates that the security's price will move with the market and value of beta less than one shows that the security is less volatile than the market. More than one beta value shows the more volatility of the security as compared to market. Moreover the value of beta in the negative zone indicates that the security concerned move opposite to the movement of the market.

The formula for the beta of an asset within a portfolio is:

$$\beta_a = \frac{\text{Cov}(r_a, r_p)}{\text{Var}(r_p)}$$

Where $r_a$ measures the rate of return of the asset, $r_p$ measures the rate of return of the portfolio, and $\text{cov}(r_a, r_p)$ is the covariance between the rates of return. The portfolio of interest in the CAPM formulation is the market portfolio that contains all risky assets, and so the $r_p$ terms in the formula are replaced by $r_m$, the rate of return of the market.

To study the relationship between market concentration and performance variables including stock market variables in both the industries the techniques of correlation and regression have been used. Karl-Pearson’s correlation technique has been used to establish such relationship. Higher the value of correlation between the market concentration variables and the performance variables indicates high level of relationship and vice versa. Moreover, positive value of correlation highlights the movement of both the variables in the same direction and negative value indicates the movement of the variables concerned in the opposite direction.
To study the cause effect relationship (that is whether market concentration determines the performance or the performance determines the market concentration) between the market concentration and performance variables, the following linear and non-linear regression equations are estimated:

\[ PCM_t = a + bCR_t + e_t \]  
\( (3.4) \)

This equation studies the impact of market concentration on the market performance variable PCM; it is assumed here that the relationship between these two variables is linear. However, the relationship between the market concentration and PCM may observe to be non-linear, hence the following equation has also been estimated and the most appropriate has been interpreted.

\[ PCM_t = a + bCR_t + c CR_t^2 + e_t \]  
\( (3.5) \)

Performance of the firms in terms of price-cost margin may influence the concentration ratio in the subsequent period; hence following equation has been estimated:

\[ CR_{t+1} = a + b PCM_t + e_t \]  
\( (3.6) \)

Here, \( CR_{t+1} \) is the concentration ratio in period \( t+1 \).

The level of concentration in period \( t \) is also influenced by the concentration in the previous period, for the large firms are likely to be able to consolidate their position overtime. Hence, the following regression equation has been formulated and estimated:

\[ CR_t = a + bCR_{t-1} + e_t \]  
\( (3.7) \)
Concentration ratio is considered as the partial measure of market concentration, HHI is more comprehensive and expected to give better results so far the relationship between market concentration and performance is concerned.

\[ \text{PCM}_t = a + b \text{HHI}_t + e_t \quad \text{---------- (3.8)} \]

Here CR and PCM stand for concentration ratio and price-cost margin. HHI is the Harfindahl-Hirschman Index value. a and b are constants.

3.3. Terms Defined:

*Market Structure:* Market structure is the pattern of market shares in an industry. This is concerned with number of firms in an industry and their size. The characteristics of a market, including concentration, extent of product differentiation, entry conditions and degree of vertical integration taken together constitutes market structure. Market structure can be stated as interconnected characteristics of a market, such as the number and relative strength of buyers and sellers and degree of collusion among them, level and forms of competition, extent of product differentiation, and ease of entry into and exit from the market.

*Market Concentration:* Market concentration is an important element of the market structure which plays a determinant role in the behavior of a firm in the market. Market concentration is the extent to which a market is taken up by a limited number of firms (Oxford Dictionary of Economics). In the other words high market concentration is the situation when an industry or market is controlled by a small number of leading firms which are exclusively or at least very largely engaged in that industry. The number of the firms in industry and their relative size are the two variables that are of relevance in determining the concentration of a market. Market
concentration is a function of the number of firms and their relative shares of the total production in a market. In other words, it is a criterion that can be used to rank order various distributions of firms’ shares of the total production in a market (Wikipedia).

**Market value of assets:** The current quoted price at which investors buy or sell a share of common stock or a bond at a given time, however its face value and book value may be much less than the market value. For, market also takes into account future growth potential of the firms concerned.

**Scale (size) and Economies of Scale:** Scale of a firm refers to the size at which the firms operate. This is, generally measured by output, sales, capital invested, employment. Size of the firm has many implications for the firm itself, industry and the economy as a whole. Economies of scale are the cost advantages that an enterprise obtains due to expansion. There are factors that cause a producer’s average cost per unit to fall as the scale of output is increased. ‘Economies of scale’ is a long run concept and refers to reductions in unit cost as the size of a facility and the usage levels of other inputs increase.

**Value of output:** Value of output is defined to include the ex-factory value, (i.e. exclusive of taxes, duties, etc. on sale and inclusive of subsidies etc., if any) of products and by-products manufactured during the accounting year, and the net value of the semi-finished goods, work-in-process, and also the receipts for industrial and non-industrial services rendered to others, value of semi-finished goods of last year sold in the current year and sale value of goods sold in the same condition as purchased.
**Gross value added:** This is the increment by the firm to the value of goods and services that is contributed by it and is obtained by deducting the value of total inputs from gross value of output.

**Labour productivity:** Labor productivity measures the amount of goods and services produced by one unit of labour. More specifically, labor productivity measures the amount of real GDP produced by a unit of labour. Growing labour productivity depends on three main factors: investment and saving in physical capital, new technology and human capital.

**Fixed Capital:** Fixed Capital represents the depreciated value of fixed assets owned by the factory as on the closing day of the accounting year. Fixed assets are those, which have normal productive life of more than one year. Fixed capital covers all types of assets, new or used or own constructed, deployed for production, transportation, living or recreational facilities, hospitals, schools, etc. for factory personnel. It includes land, building, plant and machinery, transport equipment etc. It includes the fixed assets of the head office allocable to the factory and also the full value of assets taken on hire-purchase basis excluding interest element. It excludes intangible assets and assets solely used for post-manufacturing activities such as, sale, storage, distribution, etc.

**Total Persons Employed:** Total Persons Employed are all persons engaged by the firm whether for wages or not, in work connected directly or indirectly with the manufacturing process and include all administrative, technical and clerical staff as also labour in production of capital assets for factory’s own use. This is inclusive of persons holding position of supervision or management or engaged in administrative office, store-keeping section and welfare section, watch and ward staff, sales
department as also those engaged in the purchase of raw materials etc. and production of fixed assets for the factory.

**Total Emoluments:** These are defined as payment to all employees plus imputed value of benefits in kind i.e. the net cost to the employers on those goods and services provided to employees free of charge or at markedly reduced cost which are clearly and primarily of benefit to the employees as consumers. It includes profit sharing, festival and other bonuses and ex-gratia payments paid at less frequent intervals. Benefits in kind include supplies or services rendered such as housing, medical, education, recreation facilities, personal insurance, income tax; house rent allowance, conveyance etc.

**Diversification:** when a company has multiple, unrelated businesses it is called diversification. Unrelated businesses are those which (1) require unique management expertise, (2) have different end customers and (3) produce different products or provide different services. One of the benefits of being a diversified company is that it protects a company from dramatic fluctuations in any one industry sector by cross subsidization.

**Economic Globalization:** Economic globalization means deeper integration and more rapid interaction of economies through production, trade, and unregulated financial transactions by banks and multinational corporations, with an increased role for the World Bank and the International Monetary Fund, as well as the more recent World Trade Organization.

**Footloose Industry:** Footloose industry is the industry that is not tied to any particular location or country, and can relocate in response to changing economic conditions. Many manufacturing industries seem to have such characteristic like electronics industry.
Sunrise industry: Sunrise industry is an emerging industry that is gaining favor with investors and is expected to be an engine of future economic growth through steadily rising generation of employment and profits, and comparatively lower environmental costs.

Monopoly power: Monopoly power is degree of price setting power held by a firm or supplier on the basis of its market share.

T-value: T-value is a measure of the statistical significance of an independent variable $x$ in explaining the dependent variable $y$. It is determined by dividing the estimated regression coefficient $b$ by its standard error. Thus, the $t$-statistic measures how many standard errors the coefficient is away from zero. Generally, any $t$-value greater than +2 or less than -2 is acceptable. The higher the $t$-value, the greater the confidence we have in the coefficient as a predictor. Low $t$-values are indications of low reliability of the predictive power of that coefficient.

Financial meltdown: An informal definition of ‘meltdown’ is a rapidly developing disastrous situation. The 2007 collapse of the U.S. housing market and the worldwide economic damage that followed in 2008 and 2009 brought forward the term ‘economic meltdown’.

Drug Formulation: Drug Formulation involves developing a preparation of the drug which is both stable and acceptable to the patient. For orally taken drugs, this usually involves incorporating the drug into a tablet or a capsule. It is important to appreciate that a tablet contains a variety of other substances apart from the drug itself.

Bulk drugs: Bulk Pharmaceutical Chemical is defined as a pharmaceutical product derived by chemical synthesis, in bulk form, for later dispensing, formulation or compounding, and filling in a pharmaceutical finishing facility.
Generic drugs: When the patent of a brand name medication expires, a generic version of the drug can be produced and sold. Generic versions of a drug must use the same active ingredients as the brand name drug, and it must meet the same quality and safety standards.

Orphan drugs: An orphan drug is a pharmaceutical agent that has been developed specifically to treat a rare medical condition, the condition itself being referred to as an orphan disease. The assignment of orphan status to a disease and to any drugs developed to treat it is a matter of public policy in many countries, and has resulted in medical breakthroughs that may not have otherwise been achieved due to the economics of drug research and development.

Investment Portfolio: It is combining the assets of various formats such as stocks, mutual funds, debt, real estate, and cash in such a way that the maximum returns can be ensured in different circumstances of the market.

Stock market: A stock market or equity market is a public entity (a loose network of economic transactions, not a physical facility or discrete entity) for the trading of company stock (shares) and derivatives at an agreed price; these are securities listed on a stock exchange as well as those only traded privately.

Stock market valuation: Stock market valuation or stock market capitalization is the total value of the tradable shares of a publicly traded company; it is equal to the share price times the number of shares outstanding.

Dotcom Bubble: The dot-com bubble (also referred to as the Internet bubble and the Information Technology Bubble) was a historic speculative bubble covering roughly 2000-01 during which stock markets in industrialized nations saw their equity value rise rapidly from growth in Internet sector and related fields.
Product mix: Product mix is the variety of product line that a firm produces. Product mix usually refers to the length (the number of products in the product line), breadth (the number of product lines that a firm offers), depth (the different varieties of product in the product line), and consistency (the relationship between products in their final destination) of product lines.

Merger: The combining of two or more companies, generally by offering the stockholders of one company securities in the acquiring company in exchange for the surrender of their stock.

Acquisition: The purchase of one corporation by another, through either the purchase of its shares, or the purchase of its assets.

3.4. Profile of Selected Industries:

To find above discussed linkages electronics industry and pharmaceutical industry are selected as representatives of Indian industry. Both of these are very significant manufacturing segments in Indian industrial scenario. Both industries contribute significant share (about 5 percent) of industrial production. In recent years, both the industries have registered dramatic growth and have some influence on the pattern of industrial growth in India. Electronics and the pharmaceutical industries have economic, social and strategic significance for the national economy of India. Therefore, both these industries concern the democratically elected government in India.

Indian electronics industry

To study the market concentration and performance in Indian electronics industry, it is important to study the profile, nature and patterns of the industry to have
better understanding of the trends and reasons behind and so on. It is one of the fastest growing manufacturing segments of the Indian economy. Being of the size of US $ 45 billion electronics industry is growing at a rate of 21 percent. The share of electronics production in India's GDP has increased from 1.6 per cent in 2001-02 to 1.95 per cent in 2009-2010 (Business Line, Dec. 14, 2011, and June 8, 2012). It provides employment to over 2.5 million people in the country (www.articlesbase.com). The historical background and evolution of the industry need to be discussed here to get deep insight into the nature of the industry.

Information Technology revolution in the 1970s transformed the electronics industry into a ‘major’ growth pole in the industrially advanced economies. Most of the developing countries have been attempting to develop an electronics base through different strategies. In this world wide trend, India has not been left behind. Attempts towards developing a broad base and technologically dynamic electronic industry resulted in a significant increase in the total electronic output. It increased from Rs. 173 crore in 1970-71 to Rs. 2,47,500 crore in 2011-12. However even today electronic accounts for only about less than 3 percent of the total industrial output in the country. Still it accounts very low share as compared to the developed countries.

According to the department of electronics (GOI, 1996) estimates, the Indian electronics industry consists of about 3,500 firms. Out of these about 3,000 units (86 percent) are in the small scale sector. Of these 300 units account of about 70 percent of the total output, 100 units out of these 300 firms are in small scale sector. The significant position small scale used to hold during 1970’s was the outcome of electronics policy of the 1970’s. However, with the changes in the policy frame work in 1980’s, there has been a steady and definite shift in production away from the small to the large scale sector. The small scale segment in the electronics industry output recorded 12 percentage points decline during 1981-95.
During 1970s in accordance with the existing industrial policy, number of products were exclusively reserved for the public sector. At that time there were 13 central public sector units with 29 state public sector units engaged in production of electronics goods. With the change in focus of policy in 1980s, the share of public sector starts declining.

The main focus of our analysis here is to discuss the structure of the industry and its relation with the performance of the industry in broad framework of structure-Conduct-performance paradigm. Hence, we begin with an attempt to trace the market structure of the industry after independence.

The first firm that entered the Indian computer market was International Business Machines (IBM). It started its operations in 1964 with installation of 1401 systems. In due course, other foreign companies also entered the Indian computer industry. As a result, the market structure of industry became highly concentrated with a couple of foreign firms accounted for high market share. IBM alone accounted for nearly 75 percent of the systems installed in India between 1960 and 1966. By 1967-72 the market concentration and foreign domination remained high with IBM and ICL (International Computer Limited) together accounting for nearly 85 percent share (Vikas & Ravichandan, 1978).

The concentrated market structure had its reflection on the behaviour of firms in the industry. None of these firms had their manufacturing base in the country. The usual practice was to import and refurnish the already used system. The system installed in India during this period were the ones which had been introduced in the developed counties up to nine years earlier (Grieco, 1984)

Noting such practices, Bhaba committee (1966) in its report argued that the establishment of a definite base for indigenous development and production was
strongly needed. Acting on the report of the committee, the government insisted on the foreign companies to increase their manufacturing operation within the country and associate Indian capital in their manufacturing enterprises. IBM did not yield to the government directives. Consequently, it was forced to wind up its operation in India. The other major foreign firms like ICL and Philips changed according to the government regulations and reorganized themselves. The government also made efforts to promote domestic manufacturing in almost all the branches of electronics. The declared objective was to develop indigenous industrial base under the aegis of the small scale and public sector.

In the 1960s a computer group was setup in the Electronics Corporation India limited (ECIL) to design develop and manufacture computer systems. The government also made attempts to develop self-reliant T.V. industry. It entrusted the Central Electronics and Engineering Research Institute (CEERI), Pilani, to develop an indigenous black & white T.V. design (GOI, 1975).

Later on in the case of computer the government shifted from its strategy of meeting the requirements of the country through a few large systems to the manufacturing of small and medium system. The government actively emphasized on the strategy to establish and maintain a wholly indigenous industry based on system engineering rather than manufacturing each and every component at home (GOI, 1974).

As a result ECIL, under the strong protection of the state, emerged as the market leader and competitor to IBM by the late 1970s. It accounted for more than 40 percent to the total number of computers installed during 1973-77. The rest of the market was shared by the foreign firms but their individual share was too marginal to exercise dominance.
The T.V. industry during the 1970s was characterized by a competitive market structure. All the major firms in their industry were small scale units. This was facilitated by due nature of market and the preferential policies of the govt. The small-scale based growth strategy also resulted in some adverse effects like high cost and lack of international competitiveness. For example, during 1970s, a typical 51 cm b & w T.V. set in India was priced at more than three times that of international prices (GOI, 1978). Lack of financial resources with small scale units stood in the way of investment in R&D and testing facilities. These units were also not capable of importing components on a large scale which could have substantially reduced their cost of imported components. These were the reasons due to which the government felt the need of large scale operation and limiting role of small scale units. It was against this background that the new policy measures were adopted during 1980s.

1980s witnessed the dismantling of the most of the instruments that acted as entry barriers in the most branches of electronics. The result was a large scale entry of new firms to this industry and a diversification of product line by the exiting firms. Firms like Delhi Cloth and General Mills Company Limited (DCM), Hindustan Computer Limited (HCL), Operation Research Group (ORG) and International Data Management Limited (IDM) entered the microcomputer industry during this era. The entry of private sector firms should have made the industry more competitive in structure. Evidences from four-firm ratio, however, did not support this presumption. It presented the picture of a concentrated market structure in 1978-80 (Joseph 2004). Also the domestic price was much higher than the international price (Joseph 1997). The firms were operating under such policy environment that there was hardly any scope for cost reduction and increasing competitiveness. Realizing this the government announced the new computer policy in November 1984, aimed at
augmenting the growth process by removing most of the institutional barriers, including entry barriers on large industrial houses (MRTP companies) and foreign controlled firms (FERA companies). The import of technology, components & capital goods were made more liberal. The immediate effect was the rapid increase in the number of firms in the computer industry. It increased from 20 in 1982 to 101 in 1985. It resulted in reduction in the degree of seller concentration in 1980s compared to 1970s.

The reforms were also initiated in the T.V. industry. The policy of reforms and the increased demand for T.V. resulted in the entry of a large number of firms into this industry. With the entry of new firms there was a drastic reduction in the market concentration. The four-firm concentration ratio in 1988 in case of black and white T.V. was 16.4 percent, whereas it was 28 percent in case of colour T.V. industry. It is also evident that as against the domination of the small scale units during the 1970s, the organized sector dominated the production in 1988. The scale of operation increased significantly as a result.

The new liberalized industrial policy of 1991 included the measures to globalize the electronics industry by removing the entry barriers for foreign firm. It assigned a greater role for the market forces. Reduction in the import duty on components and capital goods and removal of restrictions on the use of foreign brand names were also among its features. This facilitated the entry of a number of foreign firms into the industry with equity participation.

As a result of this policy a large number of unviable units closed down and new foreign firms made their entry. Today almost all the world leaders in electronics have their presence in the Indian electronics industry. In case of computers foreign
participation mostly took the form of joint ventures. The observed pattern is found to be different in case of T.V. receiver. Almost all the new entrants like Sony, Akai, Samsung, Thomson and so on preferred to setup fully owned foreign subsidiaries.

Firm level data collected from the Centre for Monitoring Indian Economy shows that there is a marked increased in the market concentration as an effect of new liberalized policy. For example in case of T.V. receiver, market concentration was a low as 28 percent in 1988 which increased to as high as 63 percent in 1996 but leading position was held by domestic firms like BPL and Videocon. However most recently, Indian firms lost their grip over the market and products of MNCs are dominating the market.

**Indian Pharmaceutical industry** is one of the leading segments of Indian manufacturing sector. This sector has over 20,000 registered units. Leading 225 firms have 70 percent market share with market leader having 7 percent share. Having around 2 percent share in industrial production, it provides employment to over three million people. The Indian pharmaceutical Industry has witnessed a robust growth of around 14 percent since the beginning of the 11th Plan in 2007 from about Rs 71,000 crores to over Rs. 1,00,000 crores in 2009-10 comprising some Rs. 62,055 crores of domestic market and exports of over Rs. 42,154 crores (planningcommission.nic.in).

The industry has its roots in ancient eras. Before British period indigenous Ayurvedic system of medicine alone was in use in India. Government of British India made efforts to start allopathic system during their rule. The government set-up medical schools, initiated production of modern drugs, started research institutes and opened government medical stores (Pharmaceutical Enquiry Committee, 1954; Drug Enquiry committee, 1931).
The industry got a push due to some indigenous efforts. Setting up of Bengal Chemical and Pharmaceutical Works in 1892, Alembic Chemical Works in 1907 and Bengal Immunity in 1919 gave a boost to the industry. By the time World War II started several firms like Zandu Pharmaceutical Works, Calcutta Chemicals, Standard Pharmaceuticals, Chemical Industry and Pharmaceutical Laboratories (Cipla), East India Pharmaceutical Works etc. were manufacturing drugs in India (GOI, 1980). Increased demand and decreased imports during World War II resulted in setting-up of new firms like Unichem, Chemo Pharma, Indo Pharma, Indian Process Chemical Laboratories, Biochemical and Synthetic Products etc.

‘Therapeutic Revolution’ in the early 40’s lured the drug firms in developed countries to the field of research for developing new drugs\textsuperscript{10}. This change made a ground for the MNCs in India because indigenous firms were more interested in manufacturing already developed drugs rather than developing new drugs. Increased demand due to World War II also helped the MNCs in establishing themselves in Indian market. MNCs were already importing drugs to India. But they started setting-up their manufacturing units in the 1940’s. Glaxo and Boots set up their manufacturing units in the late1940s. Cyanamid, Parke Davis, Merck Sharp & Dohme followed suit in the 1950’s. Among the late starters in India were the MNCs like E.Merck, Richardson Merrell (Richard Hindusthan in India), Bayer, Warner Lambert (Warner Hindusthan in India) and Searle. Meanwhile many firms were set up in indigenous sector in post-independence period and contributed to the expansion of

\textsuperscript{10} In the early 19th century, the focus of medical research changed from a generalized pathology concerned with bodily humors to a localized pathology concerned with physiology and disease transmission. This transition, known as the “therapeutic revolution” occurred during the early 20th century when research came to focus on specific diseases. The therapeutic revolution is generally understood as the moment when medicine began to work.

Growth of the Industry

By the time of independence there were about 1,600 drug manufacturing units working in India. About 32,000 people were employed in them. Value of their production at current prices was about Rs 10 crore (Pharmaceutical Inquiry Committee, 1954). The activities of most of these were confined to mere refining and bottling of imported materials.

Since then the industry has grown at a remarkable pace. In 1995 there were more than 19,000 units employing more than 3.8 lakh people (Working group on drugs and pharmaceuticals for the ninth five-year plan period (1997-98 to 2001-02), 1996). The value of production had increased to Rs 9,125 crore in 1995-96. The country is almost self-sufficient in formulation (meeting 98 percent of the requirements). Exports of drugs and pharmaceuticals increased from a meager Rs. 2 crore in 1963-64 to Rs 2,337 crore in 1995-96. The country has become a net exporter since 1988-89. Trade surplus as a percentage of exports was 20.1 percent in 1995-96 [IDMA, annual publications (various issues)].

The pharmaceutical industry in India is quite distinctive. The growth of the indigenous sector has limited the dominance of the MNCs. There are thirty one companies registered in India but controlled solely or jointly by MNCs. The indigenous sector is divided into two parts (i) The public sector and (ii) The Indian
private sector. Public sector consists of five units owned and controlled by central government, six units jointly owned by state governments and central government and few units owned by state governments. The Indian private sector comprises all the remaining units numbering about 19,000 (in 1995). It includes well known companies such as Alembic, Cipla, Unichem, Ranbaxy, Dr Reddy’s Laboratories, Torrent, Lupin and Wockhardt. But in terms of size, most of the Indian private sector units are small scale units. The small-scale sector is an important source of bulk drugs for the organized sector. In 1997, the share of MNCs was one-third of the market with seventeen out of top fifty firms being MNC controlled (compiled from operations research groups (ORG), 1997).

There are about 143 in-house R & D units in the pharmaceutical industry, including 46 units in the small-scale sector. The industry spends about 2.1 percent of its turnover on R & D. This is significantly below the figure of about 12.15 percent on an average in the western countries and Japan (Indiabiznews, Aug. 6, 2012). Moreover only a few laboratories are engaged in research for development of new drugs in India. Most of these are working on developing process for manufacturing existing drugs. Among the few who are engaged in development of new drugs, most important is the Central Drug Research Institute (CDRI), Lucknow. The other is Regional Research Laboratory, Hyderabad (now known as Indian Institute of Chemical Technology).

Recently, some big Indian companies such as Ranbaxy, Dr Reddy’s Laboratories, Wockhardt and Dabur have set up new drug development research centers. They are yet to introduce any new drug. But a number of new chemical entities (NCEs) have been developed which are undergoing clinical trial. As of now, Dr Reddy’s Laboratory and Ranbaxy have been most successful in the business of new drug development. Dr Reddy’s spends about 6.2 percent of its turnover on R&D
(The Hindu, July 19, 2012) and Ranbaxy about 7 percent (www.ranbaxy.com) and both have plans to increase the outlay.

A major achievement of Indian pharmaceutical industry is the development of the bulk drug sector in which indigenous sector played the lead role. The MNCs have been in general more interested in formulation production rather than in developing bulk drugs. Large scale production of bulk drugs was started by the indigenous sector in late 1970’s and early 1980’s. Now, about 750 indigenous manufacturers produce about 1,300 bulk drugs and drug intermediates (Bulk drug Manufacturers Association, 1997). As a result, imports of these bulk drugs have decreased significantly. Consumption of these drugs has increased largely. It is also possible for us now to produce many drugs at much lower prices.

Indigenous firms such as Cipla, Alembic, Unichem, Cadila, Ranbaxy, Dr Reddy’s, Lupin and Kopran have developed the expertise to successfully develop the process for manufacturing bulk drugs. The indigenous sector has developed tremendous strength in developing coefficient processes from basic stages and transforming these laboratory processes into the plant scale in a short time for manufacturing drugs satisfying international quality norms. Indian firms are building global level plants and are competing successfully in the international markets (Madanmohan, 1997). Most of the large Indian firms have now become international firms. Ranbaxy (recently sold to Daiichi, Japan) has manufacturing operations in seven countries. Its products are sold in forty countries, including the US and developed countries in Europe. Dr Reddy’s laboratory has only one manufacturing joint venture in the Commonwealth of Independent States (CIS); Cipla has one in China; Wockhardt has each in China and Saudi Arabia.

Regulatory environment and government Policy framework related to these two industries will be discussed in specific chapters related to these industries.